

Viticulture Test & Trial Final Report



Kent Downs Area of Outstanding Natural Beauty

June 2021

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Title of report:	Final Report
T & T name:	Viticulture
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Date submitted:	30/06/2021
Version:	1
Reviewer name:	n/a
This report is submitted to Defra as part of the Test and Trial programme.	

Front cover image: Inter-row species rich grass sward at Nyetimber, Chartham, Kent

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25th June 2021

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28th June 2021

This report has been prepared by Mike Phillips of White Horse Ecology with contributions from Dr Alistair Nesbitt of Vinescapes, on behalf of the Kent Downs AONB Unit. The Test and Trial, as well as the production of this document, has been overseen by Pippa Palmar of the Kent Downs AONB Unit and its Director, Nick Johannsen.

The Viticulture Test and Trial is being carried out by the National Association for the Areas of Outstanding Natural Beauty on behalf of Defra. It forms part of the development of the schemes that reward environmental land management.



Contents

1	Executive summary	4
2	Definitions and Acronyms	7
3	Introduction.....	8
3.1	Background.....	8
3.2	Research questions and other aims.....	14
3.3	Key themes relating to Enhancing Access Opportunities.....	14
4	Methodology	17
4.1	Workshops.....	17
4.2	Case studies	18
4.3	Research into global best practice	19
4.4	Recommendations and proposed actions.....	20
4.5	Similarities between viticulture and row fruit production.....	20
4.6	Worked Examples.....	21
4.7	Questionnaire.....	21
5	Results and discussion	23
5.1	Can scheme actions deliver Public Goods within the vineyard setting?.....	23
5.2	Can scheme actions help to mitigate the impact of vineyards on landscape character?	34
5.3	Can scheme actions for viticulture be applied to other fruit grown in rows?.....	36
6	Conclusions	38
6.1	Recommended actions	39
6.2	Mapping the Test and Trial Themes	45
6.3	Other key findings	47
7	References	48
8	List of appendices.....	52

The Test and Trial was established and delivered with the assistance of the South Downs National Park Authority and the Surrey Hills AONB Unit.



SOUTH DOWNS
NATIONAL PARK



1 Executive summary

Background

Over the last 15 years there has been a 300% plus increase in the area of the UK devoted to vineyards. In 2019, it was estimated that there were over 700 vineyards covering around 3500 hectares (WineGB, 2019). Over a third of the UK's vineyard area is found within the three protected landscapes of the Kent Downs, Surrey Hills and South Downs. Continued climate change, and in particular, warming growing season (April – October) temperatures, is likely to increase the amount of land under vine as opportunities for rural land use diversification and varietal expansion increase. Viticulture (grape growing) is now one of the fastest growing agriculture sectors in the UK. For this reason, the Kent Downs AONB Unit felt it was important that the potential environmental gains within viticulture were included within Defra's flagship schemes that reward environmental benefits. These schemes will pay farmers and land managers for delivering Public Goods. These Public Goods are clean air, clean and plentiful water, thriving plants and wildlife, protection from environmental hazards, beauty, heritage and engagement with the environment as well as reduction of and adaptation to climate change.

The potential for vineyards to provide additional public benefits are high, as is the appetite amongst growers to provide them. Because over 80% of the area of a vineyard is inter-row alley 'space' and headlands (both with ground cover) and not used for the production of grapes, there is a high level of opportunity for gains in a number of Public Goods, as defined by Defra. This T&T has examined a range of actions that would be appropriate for vineyards, how these might be best applied and whether there is appetite within the industry to take part in the schemes.

Research Questions

This Test and Trial attempted to answer three fundamentally important questions.

1. **Can scheme actions deliver Public Goods within the vineyard setting?**
 - a. Are specific vineyard based actions required or can generic actions be applied?
 - b. What incentives are needed for vineyards to take-up scheme actions?
2. **Can scheme actions help to mitigate the impact of vineyards on landscape character?**
3. **Can scheme actions for viticulture be applied to other fruit grown in rows?**

Methodologies

To try and answer the research questions the following activities took place:

1. **Workshops** were held with vineyard managers and owners, which enabled land managers to speak freely about the kinds of actions they felt might provide Public Goods, the barriers that would make people reluctant to join schemes and how these barriers could be overcome.

2. **Case studies** were carried out with 18 grape growers to explore the research questions in more detail and examine how actions that result in Public Goods might be applied at the vineyard level.
3. A **global research project** was led by viticulture consultants, Vinescapes. This work examined best environmental practice around the world and included contributions from researchers in New Zealand and Australia.
4. The results of the workshops, case studies and research were used to compile a list of recommendations for how viticulture could deliver Public Goods through schemes that reward environmental land management. These were then refined into a series of **recommended actions** appropriate for the schemes.
5. Additional research into the Public Goods that could be provided by **row fruit** growers was conducted by Consult80. Actions that were appropriate for row fruit were recommended and compared with those recommended for viticulture.
6. **Worked examples** of 'best-practice' were created with vineyards. These studies identified where and how actions could be applied on individual holdings.
7. Finally, a **questionnaire** was distributed to growers asking for feedback on the actions that the Test and Trail is proposing.

Results and recommendations

The workshops, case studies and questionnaire all showed similar results. There is an appetite for becoming involved in schemes that reward environmental land management not just because it may provide an income source but because many were keen to get help to develop and implement best environmental practice. In the questionnaire, 93% of respondents stated that they would either 'possibly' or 'definitely or almost certainly' take part in environmental land management schemes.

The research showed that there is well established best practice guidance for both viticulture and other row fruit that can form the basis of payments made to growers for providing Public Goods. What also became clear is that there is a deficit of research into UK viticulture, particularly around which native insectary plants are most appropriate for use in UK vineyards. Consequently, additional research needs to be integrated into the delivery of schemes that reward environmental benefits.

All the evidence gathered from the research was used to create a series of **viticulture actions** that could reward growers through the schemes. It was also found that these would be well suited to other fruit grown in rows. These recommended actions address the research questions and growers should be able to pick and choose the actions that fit their individual circumstances. The actions include:

- Creating land management plans with the assistance of expert help at no or limited cost to the grower;
- Vineyard clusters and support for taking part in research programmes;
- Capital grants to support carbon reduction technologies as well as vineyard automation and precision viticulture techniques that reduce pesticide use;
- Soil regeneration techniques, maintaining ground cover and reducing tillage;
- Native windbreaks and hedges as well as other features to enhance biodiversity;
- Creating species-rich grass swards using local, native species and management through mowing at specific times of year or grazing;

- Promoting permissive access and well-interpreted landscapes;
- Providing educational access and health and well-being opportunities;
- Organic conversion and land management.

Five key findings:

1. There is both the capability and the appetite from vineyards to provide Public Goods as part of schemes that reward environmental benefits. Growers and wine producers have a clear desire to achieve environmental best practice, both as responsible land managers and as producers of high value produce with a customer base/market that values environmental care and provenance.
2. The most important factors that will determine scheme take-up are the payment levels and the amount of paperwork that the schemes generate. Many viticulturists and row fruit growers would like to see payments through schemes that at least recompense lost Basic Payment Scheme income.
3. Vineyards and arable land can deliver significantly different Public Goods from one another and should not be entirely combined as arable and horticulture have been in the Sustainable Farming Incentive pilots. However, there are sufficient similarities between viticulture and other fruit grown in rows for many scheme actions to be applicable to both sectors.
4. Whilst many of the actions proposed for viticulture could be applied to vineyards anywhere in England, there are actions that have the potential to target specific priorities that have been identified by Local Nature Recovery Strategies and may form the basis of Local Nature Recovery payments. Native species windbreaks and vernacular species-rich grassland creation and management through both grazing and mowing may be particularly well suited to these local objectives.
5. There is potential for sustainability and assurance schemes to work closely with Defra to ensure alignment with environmental land management schemes. This benefits not only the development of a unified best environmental practice but also a reduced administrative burden for growers and a better take-up rate for all schemes and certifications.

2 Definitions and Acronyms

Word or Acronym	Description or Definition
AONB	Area of Outstanding Natural Beauty
Defra	Department for Environment, Food and Rural Affairs
Growers	Used within this report to describe those responsible for the production of grapes in vineyards. It is a catchall term and may refer to the owner, manager or farmer that was involved within the T&T. It may not be the person responsible for growing the grapes.
Schemes	This term is used to reflect all of the different schemes (once referred to as Environmental Land Management Schemes) that may reward farmers and land managers for producing Public Goods or schemes that reward environmental benefits. Specifically, these refer to the Sustainable Farming Incentive, Local Nature Recovery and Landscape Recovery.
IPM	Integrated Pest Management - an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. (Definition from University of California)
PROW	Public Right of Way
T&T	Test and Trial for the environmental land management schemes

3 Introduction

3.1 Background

Recent sector expansion

The increasing presence of commercial vineyards in England and Wales today is mainly attributed to suitable climatic conditions, in particular to growing season temperatures that have increased under recent climate change. Indeed, during a period of lower temperature, known as the Little Ice Age (from the 16th to the 19th centuries), the number of vineyards in the UK declined. The subsequent revival of UK viticulture began in the early 1950s and, up until 1993, the volume and spatial distribution of UK vineyards continued to increase (Figure 1). From 1993 to 2004, however, both vineyard area (total area) and numbers declined by 29%, which has been attributed to a combination of factors, including sub-optimal varieties for the climatic conditions, poor vineyard site selection, poor winemaking, poor quality, high costs, low yield, strong international competition and marketing difficulties. Since then, however, a significant increase in the area under vine to approximately 3500 ha (WineGB, 2019) has been accompanied by an increase in vineyard numbers to more than 750¹ in 2019 (Figure 1). This turnaround was primarily triggered by the production of award-winning sparkling wine from Nyetimber and the associated realisation that high-quality wines could be made in England using the classic Champagne varieties of Chardonnay, Pinot Noir and Meunier.

Recent vineyard plantings have predominantly occurred in southern England (50 – 52°N), with vineyards in south-east (East and West Sussex, Kent, and Surrey) and south-central (Berkshire, Hampshire, the Isle of Wight, and Wiltshire) England accounting for around 70% of the UK total. Most large commercial vineyards are located within south-east and south-central England. More information about vineyards in the protected landscapes of south-east England can be found in [appendix XI](#).

Data from the UK Vineyard Register (Food Standards Agency, 2019) shows that the average vineyard size in the UK has increased from 1.98 ha in 1989 to 3.41 ha in 2018. Total UK vineyard area is greater than that of another emerging cool-climate sparkling wine-producing region, Tasmania with approximately 2000 ha under vine (Wine Tasmania, 2019), but significantly smaller than another closer and long-established producing region, Champagne in France, which extends over 35,000 ha, growing predominantly the same varieties as in the UK (Comité Champagne, Champagne Industry, 2020).

English sparkling wine in particular has received significant national and international acclaim for its quality. Whilst not all English sparkling wine is of an exceptional standard, those that are have been heralded by wine critics, competition judges, the wine (and other) media and customers as prestigious. Indeed, increasing recognition for its quality and associated awards were contributing

¹ For this study, individual vineyards are classified as being physically separated when more than 100m apart. Where two to three vineyards have different names, but which belong to the same business/owner and are within just a few metres of each other, they have been classified as one vineyard entity. Conversely, where two to three vineyards have the same name and belong to the same business/owner but are more than 100m apart, they have been classified, in this study, as individual vineyards.

reasons cited by English wine producers as drivers for recent growth of the sector (Nesbitt, Kemp, Steele, Lovett, & Dorling, 2016).

The recent rapid expansion of viticulture in England and Wales is predicted to continue, with a potential 40 million bottles of English wine being produced annually by 2040 and a potential retail value of £1bn or more (Wine GB, Looking to the future, 2018).

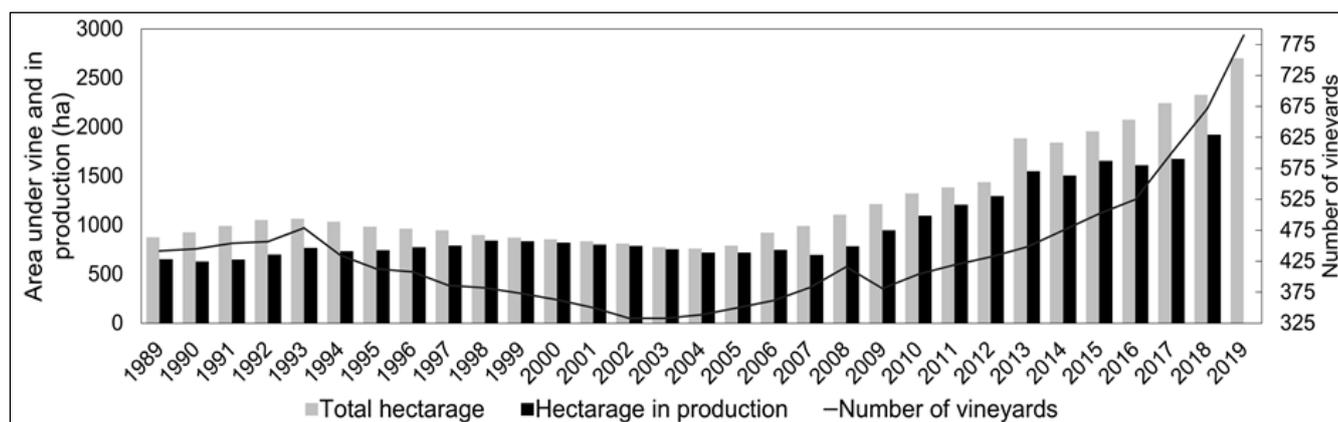


Figure 1. UK hectareage under vine and vineyard numbers (1989 – 2019).
Data source: (Food Standards Agency (FSA), 2019) and our team's own research.

The UK's 5-year average bottle production between 2014 and 2018 was 6.92 million/year, although 2018 was an exceptional year in which 13.2 million bottles were produced (Wine GB, 2019). WineGB's chairman has stated: '*English and Welsh wine is seeing growth far exceeding any industry forecasts and the sector is the bright light in UK agriculture with vineyards being planted across the breadth and depth of our island*' (Wine GB, An Industry Coming of Age, 2019). WineGB's research suggests that there is now the equivalent of approximately 2,100 full-time employees involved in the UK wine production sector and that by 2040 this employment level could grow to approximately 30,000. Many of these employees work in vineyards and wineries, but also in the associated tourism and commercial aspects of wine production businesses. Indeed one of the key differences between viticulture and arable or pastureland management (the common land uses vineyards replace) is the labour intensity that viticulture requires. Vineyards therefore contribute to an active and working landscape.

Climate change context

South-east, south-central and eastern England have seen a trend towards suitable cool-climate viticulture conditions over the last 20 years or so. Although there is much variability in growing conditions from one season to another, resulting in significant inter-annual yield variability (Nesbitt, Kemp, Steele, Lovett, & Dorling, 2016), warming temperatures (see Figure 2) have enabled the growing to commercial 'standards' of the now dominant grape varieties of Pinot Noir, Chardonnay and Bacchus. These and other varieties suitable for high-quality sparkling wine, and to a lesser degree still wine, in cool-climate viticulture conditions, are the main ones grown in the protected landscapes examined in this T&T.

In 2013, the Intergovernmental Panel on Climate Change (IPCC) first concluded that warming of the world's climate system was unequivocal (IPCC, Inter-Governmental Panel on Climate Change, 2013). Since 1960, the UK has seen warming occur faster than the global average (0.23 and 0.28°C per

decade, in winter and summer respectively) (Met Office, 2014), and records show that all of the UK's ten warmest years on record have occurred since 2002. Wine grapes (predominantly *Vitis vinifera* L.) are generally suited to specific climatic conditions, historically found in narrow latitudinal bands (30 – 50°N and 30 – 40°S) in which growing season conditions are often characterised by a lack of extreme heat and cold (White, Diffenbaugh, Jones, Pal, & Giorgi, 2006). However, recent research suggests that under future climate change higher-latitude regions may have increasing viticulture (Etien, et al., 2008; Schultz & Jones, 2010); this includes the UK (Kenny & Harrison, 1992; Fraga, Malheiro, Moutinho-Pereira, & Santos, 2013).

Using Met Office monthly average temperature data to compute the April–October growing season average temperature (GST) and rainfall (1970 – 2019) in south-east and south-central England, we can see in Figure 2 the marked warming of temperatures over the last 50 years, critically important for grape growing and the ripening of cool-climate varieties to commercially acceptable levels.

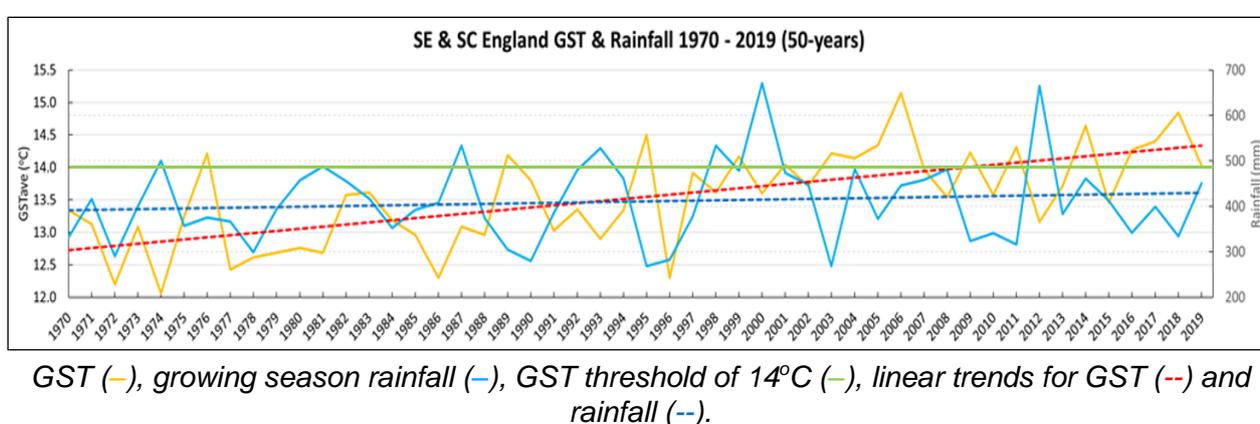


Figure 2. Average growing season temperature (GST) and growing season rainfall for south-east and south-central United Kingdom (1970 – 2019)

Whilst there is little sustained evidence of growing season rainfall patterns having changed in the last 50-years, temperature increases and heatwaves like that of summer 2018 (which led to bumper harvests in UK vineyards) are now 30 times more likely to happen than would have been the case without anthropogenic climate change, according to the Met Office. These changing conditions are likely to affect agri-economic activity both temporally and spatially, beyond their existing impacts, and indeed beyond viticulture.

25-year Environment Plan

In January 2018, the UK Government published a 25-year Environment Plan (Defra, A Green Future: Our 25 Year Plan to Improve the Environment, 2018). The overarching aim of the Environment Plan is:

‘To help the natural world regain and retain good health ... deliver cleaner air and water in our cities and rural landscapes, protect threatened species and provide richer wildlife habitats.’

The more specific 25-year goals link to the Environmental Land Management Public Goods. Of particular relevance to landscape, the Plan pledges to conserve and enhance the beauty of our natural

environment and make sure it can be enjoyed, used by and cared for by everyone, improving its environmental value while being sensitive to considerations of its heritage. This includes making sure that there is high quality, accessible, natural space close to where people live and work, particularly in urban areas, encouraging more people to spend time in these spaces to benefit their health and wellbeing, and focusing on increasing action to improve the environment for all sectors of society.

Following on from the Environment Plan, the Government commissioned a Designated Landscapes Review, which was completed by Julian Glover in 2019 (Glover, 2019). Chapter 3 of the report deals with living in the landscape. It notes that landscape has always been about people and that combining people and nature is a particular challenge for England's national landscapes. This is particularly relevant to viticulture and the related opportunities that viticulture and wine production can offer around social engagement, access and health and wellbeing, and which are addressed further in this report.

Viticulture environmental impacts and best-practice

The loss of biodiversity through habitat destruction and pesticide applications is of concern to the UK grape production sector. Whilst pest/disease pressure and pesticide requirements vary between vineyards (due to meso- and micro-scale climatic differences, varietal differences, and vineyard management differences), and the resulting fruit quality, quantity and value will vary, it is plausible that with improved technology, training, skills and knowledge, pesticide application rates could be usefully reduced.

This also points to an opportunity to develop a more integrated approach to plant protection, using a range of different pest management methods and using pesticides only when justified through monitoring the pest, host and environment, and using softer chemistry, such as biological control agents.

There is significant potential for vineyards to increase native flora and fauna in vineyard environments, boosting both biodiversity and ecosystem services, indeed such approaches have been adopted elsewhere and with some research could be readily adopted in the UK. It is important to note and not underestimate the desire of Growers to learn and do more to be good custodians of the land on which they operate, this is clear through the engagement and interaction with growers as part of this study and also the significant uptake of the new Sustainable Wines of Great Britain sustainability scheme (see below; Wine GB, 2020). It is also important to note that whilst different practices are employed in different vineyards, the impact of these activities may affect yields and fruit quality, which in turn impact the economic productivity and viability of the vineyard ventures. Where good practice is incentivised and employed, the risks of soil loss, soil health degradation, loss of soil biodiversity, pollution and eutrophication of bodies of water and the loss of aboveground biodiversity, are decreased. Table 1 summarises best practices as found in the T&T vineyards.

Table 1: Summary of best practice to mitigate environmental impacts.

Hazard	Best mitigation practice
Loss of soil through erosion	<ul style="list-style-type: none"> • Minimal cultivation – only pre-planting • Leaving strips of grass in cultivated areas
Degradation in soil health due to over-cultivation, loss of organic matter and compaction	<ul style="list-style-type: none"> • Carry out regular soil analyses, including of organic matter • Return of organic matter from prunings to soil by mulching • Addition of organic matter (e.g. PAS 100 compost) to soil • Subsoiling in alleys to counter compaction • Tractors with multiple implements to reduce passes
Loss of soil biodiversity through pesticide and fertiliser application	<ul style="list-style-type: none"> • Controlled use of herbicides and pesticides • No use of insecticides • Use of qualified agronomist to organise a plant protection programme • Monitoring for vineyard pests • Infrequent use of artificial fertiliser
Pollution and eutrophication of bodies of water	<ul style="list-style-type: none"> • Use of LERAP assessments • Use of 'tunnel'-shaped (recycling) and directional pesticide applicators • Granular lime applied to soil
Loss of aboveground biodiversity through habitat destruction and pesticide application	<ul style="list-style-type: none"> • Being conscious of the value of natural habitats in or around their vineyard • Workers discuss environmental conservation amongst themselves • Significant part of the estate is managed as a naturally wild area • Continuous grass cover in vineyard alleys, mowed infrequently or grazed • Alternate alley mowing • Cover crop trials to promote invertebrate biodiversity • Alleys planted with native naturally occurring plants • Allowing plants in alleys and headlands to grow tall and flower • Infrequent trimming of hedgerows • Planting trees around and across the vineyard • Significant habitats and conservation features mapped • Habitat creation (e.g. pond) • Informal biodiversity monitoring • Working with local conservation group • Conservation of specific native species at risk • Removal of invasive non-native species

Environmental Land Management among vineyard enterprises could be further adopted, supported and enhanced through schemes that facilitate or incentivise research and training, particularly in the following aspects:

- The importance of organic matter in vineyard soils;
- Managing the vineyard floor to promote biodiversity;
- Minimising environmental and human risks generated by pesticide applications;
- Promoting biodiversity in the vineyard environment through habitat management;
- IPM techniques for grapevine protection;
- Conserving native species and controlling non-native invasive species;
- Monitoring and reducing greenhouse gas emissions and water, energy and carbon footprints;
- Mitigating and adapting to climate change.

To put these ideas into practice, growers may find it more effective to take part in certified sustainability production schemes, such as Red Tractor, Linking Environment and Farming (LEAF), Organic (Soil Association, 2020) or Biodynamic (Demeter, 2020) production. However, during the lifespan of this study, WineGB, the national industry association for English and Welsh wines, has begun to address environmental conservation in UK vineyards and wineries through the Sustainable Wines of Great Britain (SWGB) Accreditation Scheme (Wine GB, 2020c). This ‘grass-roots’, ‘bottom-up’ approach to addressing risks and promoting opportunities where they exist may be somewhat in contrast to other farming regulations and subsidy incentives, but it will provide a platform for engagement with and development of further sustainable practice. As this scheme incorporates more subject areas, training and greater rigour in practice and assessments will undoubtedly follow.

Sustainable grape growing and wine production, and a drive towards best practice and associated Public Goods is not just a UK movement or desire. Internationally there are over 20 sustainable wine production ‘schemes’ and multiple research related stakeholders and knowledge contributors including the International Organisation for Biological Control (IOBC) and the International Organisation for Vine and Wine (OIV) - to whom the UK is a member. The OIV provide technical guidelines to member states and producers on sustainable viticulture.

All of these schemes provide well-established, valuable sustainability frameworks for growers to target best practice, but they do not necessarily incentivise or reward viticulture derived Public Goods. Indeed, as is evidenced in this report, the desire and need for schemes that fund, support and provide local technical and environmental knowledge to deliver Public Goods, amongst UK vineyards is significant.

3.2 Research questions and other aims

The T&T has three key research questions, one of which has two sub-questions. These are:

- 1. Can scheme actions deliver Public Goods within the vineyard setting?**
 - a. Are specific vineyard based actions required or can generic actions be applied?
 - b. What incentives are needed for vineyards to take-up scheme actions?

This research question formed the basis for the origination of the T&T. The most fundamental question that needed to be answered was whether vineyards and their setting (including the headlands and boundaries) had the potential to deliver environmental benefits that could be incentivised through public payments. Secondly, is viticulture so different from other agricultural production methods that it requires its own set of interventions. There are many similarities between the habitats found in vineyards and orchards for example but there are also fundamental differences. Do these differences necessitate different treatment for viticulture? Finally, this wide-ranging question has attempted to learn from growers what kinds of incentives are required for them to sign up for schemes. Many vineyard owners are non-traditional farmers with agriculture being a second career or a small-scale business. Motivations for these growers to adopt practices that provide Public Goods may be different from those growers that have diversified from more traditional agricultural crops.

- 2. Can scheme actions help to mitigate the impact of vineyards on landscape character?**

The expansion in the hectareage of land under the vine to approximately 3500 ha in recent years has disproportionately been within protected landscapes. The south facing scarp slopes of Southern England in particular often yield the most advantageous locations for vineyards (Vinescapes, 2020b). This has led to some localised but marked changes to the protected landscapes of these areas. This T&T has attempted to identify both whether there are actions that can help to mitigate this impact and whether there are ways that viticulture can actually enhance the landscape character where they are located. This question will address, amongst other things, the potential for species rich grassland restoration and enhancement between rows and in headlands.

- 3. Can scheme actions for viticulture be applied to other fruit grown in rows?**

Although not originally a research questions the first meeting with growers, many of whom also grow apples, pears and other fruit, showed that there may be many possible scheme actions that suit other fruit grown in rows equally as well as vines. Although there are similarities between grape growing and other row fruits the market that fruit is sold into can be quite different with multiple retailers being the drivers of standards in row fruit, whereas this is not often the case for viticulture in the UK. Consequently, additional work was carried out with growers of row fruit to establish whether actions that had been identified for viticulturalists might be appropriate for them as well.

3.3 Key themes relating to Enhancing Access Opportunities

There are six overarching themes laid out by Defra for the T&Ts. These have been supplemented by six strategic objectives laid out by the National Association of Areas of Outstanding Natural Beauty as part of the Farming for the Nation group of T&Ts. Table 2 shows how the viticulture T&T contributes to each of the themes and strategic objectives.

Table 2: Mapping themes, strategic objectives and T&T outputs (*strategic objectives in italics*)

Theme/<i>strategic objective</i>	Questions addressed during the research
Land management plans / <i>Integrated management plans</i>	<ul style="list-style-type: none"> • Is planning at a vineyard level essential to manage environmental benefits? • Who should be responsible for writing plans? • Is there a need for a standalone viticulture plan as part of the land management plan?
Advice and guidance / <i>Testing guidance & indicators for success</i>	<ul style="list-style-type: none"> • What guidance and advice is needed to create farm plans? • How do viticulture-based actions through schemes provide Public Goods as outlined in Defra guidance and the 25 Year Environment Plan?² • What mechanism can be used to ensure that all growers are aware of and able to achieve best practice?
Spatial prioritisation / <i>AONB Management Plans as strategic spatial frameworks</i>	<ul style="list-style-type: none"> • Do any scheme actions need to be prioritised based on the location of the vineyard? • What role can vineyards play in helping to deliver the management plans of protected landscapes?
Collaboration	<ul style="list-style-type: none"> • How can vineyards work together to both drive best practice forwards within viticulture as well as work with neighbouring holdings to create an integrated and connected functioning ecological network?
Payments / <i>Monitoring, verification and trigger payments</i>	<ul style="list-style-type: none"> • What level of payments will provide incentives for growers to take part? • What recording of activities is required? • Can monitoring be combined with assurance schemes?
Innovative delivery mechanisms	<ul style="list-style-type: none"> • No specific research carried out in this area

It should be noted that this T&T is looking specifically at one area of on-farm activity rather than an element of the delivery mechanism for schemes that reward environmental benefits. Consequently, the research questions do not easily fit into the themes laid out by Defra. Instead, the research questions posed and the evidence collected during our research cuts across multiple themes and strategic objectives. Although this table will be revisited in the conclusions section, the majority of the work of this T&T focuses specifically on the research questions. It should be noted that the T&T themes were developed after this T&T was commissioned.

² 25 Year Environment Plan: <https://www.gov.uk/government/publications/25-year-environment-plan>

Grape harvest near Faversham, Kent



4 Methodology

Central to the ethos of the Tests and Trials is the need to co-create proposed actions with the farming community. Taking this one step further, it was also felt that industry professionals should also play a central role in the T&T and shape the eventual outputs. To these ends, the following methodology was used to gather evidence for the research questions.

4.1 Workshops

The main technique used for gathering information from growers and other interested parties were workshops. Due to the restrictions on travel and meeting in groups in place due to the Covid-19 restrictions, all except the first workshop held in early March 2020 were held using online meeting software. It was not felt that this had a detrimental impact upon the workshops and had the added advantage of being able to invite participants from across the country as well as those that may not have been able to attend because of physical disabilities. The majority of the people attending workshops were growers or owners of vineyards though others involved in the industry did attend. All workshops lasted for a maximum of two hours with most meetings shorter than this. This was felt to be the maximum amount of time people could be expected to concentrate and engage using online meeting software. A total of 131 participants attended nine workshops from 48 vineyards covering over 1700 hectares. They represented approximately 50% of the entire vineyard area of the UK, now estimated at 3500 ha.

It was felt that a good cross-section of growers was represented at the workshops. Some of the largest wine producers in England were present as were some of the newest entrants to the market. Some of the growers solely grew grapes whereas others grew grapes as part of a wider farm business. Some of the people attending have holdings that were too small to be able to join either the Basic Payment Scheme or Countryside Stewardship. Most of the growers that were eligible did receive Basic Payment Scheme funding but the number involved in Countryside Stewardship was much lower and often this related to other parts of the farm business and not the vineyard.

Table 3: Summary of workshops

Group – date - attendees	Workshop themes/key questions
<p>Group 1 – Introductions A series of three introductory workshops. These were attended primarily by growers but also farm advisors and protected landscapes staff. One workshop was held in each protected landscape. <i>3 workshops (March 2020)</i> 29 attendees</p>	<ul style="list-style-type: none"> • Introduction to the schemes and the T&T. • What are the priorities of growers? • How can environmental benefits be achieved in vineyards? • Are there priority areas or do actions apply equally to all? • What are the barriers to take-up? What do schemes need to deliver? • What quality assurance is already in place?
<p>Group 2 - Draft Actions A wider group of predominantly growers but not restricted to protected landscapes.</p>	<ul style="list-style-type: none"> • Review of research from summer 2020. • Introduce proposed draft actions. • What do growers like? • Would they take part in schemes?

<p>4 workshops (November - December 2020) 64 attendees</p>	<ul style="list-style-type: none"> Do the actions appear to be realistic?
<p>Group 3 – Revised Actions Two workshops, one specifically for ‘industry’ including consultants, land agents, assurance schemes, industry bodies etc. and one for predominantly growers and owners. 2 workshops (February 2021) 38 attendees</p>	<ul style="list-style-type: none"> Present revised actions based on feedback from growers. Feedback in all areas requested. Is there anything we have missed?

4.2 Case studies

The project facilitator made multiple visits to vineyards in the three protected landscapes over the course of the T&T. The primary reason for these visits was to assess the work that vineyards were already doing to benefit the environment but also to interview growers about their attitudes towards being rewarded for providing Public Goods. The research contributed to the recommendations that were produced (section 4.4).

A total of 40 visits to vineyards (or online interviews with growers) took place over the course of the Test and Trial. These can broadly be grouped into three categories:

- 1. Grower questionnaires (17):** One-to-one interviews with growers about their current environmental work, what they would like to do and how schemes could help them to achieve this.
- 2. One-to-one meetings with other organisations (5):** Meetings were also set up with three organisations that could make specific recommendations and comments about the T&T. These were WineGB (the largest wine growing membership organisation in the UK), Sustainable Wines of Great Britain who run the newly launched assurance scheme, NIAB EMR who are a leading research institute, the assurance scheme Red Tractor and Buglife, who have been carrying out research into actions that benefit predatory insects.
- 3. Case studies (3):** Three inspiring examples of how growers have already embraced elements of best practice in vineyard environmental management.

4.3 Research into global best practice

This report and its recommendations have been informed by research and expert best practice studies commissioned as part of this work from other more established wine growing regions and expert technical viticulture knowledge relating to ecosystem services and best practice (Retallack, 2020; Wratten, Cairns, & Tarjomi, 2020; Vinescapes, 2020b).

The commissioned research was:

1. Research and a report by Dr Mary Retallack (2020) of Retallack Viticulture Pty Ltd, Australia. to determine the potential for native plants to provide beneficial ecosystem services in vineyards in specific landscapes. The potential was determined based on landscape character assessments in conjunction with local knowledge. The goals were to 1) identify suitable habitat to support populations of pest predators (arthropods, lizards, microbats insectivorous/raptor bird species), 2) identify the potential of persistent ground cover to suppress under-vine weeds and reduce the need for under row cultivation or herbicide use, 3) to identify opportunities for increased functional biodiversity in UK vineyards, create habitat corridors, and conserve locally endangered or threatened plant, arthropod and animal species.

The subsequent report highlights ecological restoration and functional biodiversity measures that can be employed to help 'future proof' the production of vineyards in the UK against the effects of climate change and extreme weather events. These recommendations go hand-in-hand with the proposed environmental land management schemes' focus areas and provide guidance to landholders who wish to pursue a step change in environmental stewardship, while increasing the resilience of their production systems. The report provides the evidence needed for growers to implement the recommended practices in an informed and scientifically evidenced way.

2. Research and a report by Distinguished Professor Steve Wratten, Sarah Cairns and Lorien Tarjomi (2020) via the Bio-Protection Research Centre, New Zealand. The purpose of the research and report was to provide a detailed case study of the 'Greening Waipara' project which began in 2010 in New Zealand and continues today, led by the Lincoln University and local vineyard business community. This was followed by the results of research/analysis undertaken by the above to provide a basis for this T&T project.

The results and report evidenced and recommended opportunities/protocols for vineyards to provide a vista that is aesthetically and visually pleasing. It identified flowering plants which are considered to meaningfully 'put back' and improve at least some of the functional biodiversity and aesthetics that the establishment of vines largely removed. Most are readily available in the UK as seeds.

3. Case studies developed by Vinescapes Ltd. (Vinescapes 2020c & 2020d) (Dr Alistair Nesbitt and Frances Trappey; Viticulturist) demonstrating how environmental land management has been successfully integrated and adopted in Champagne (France) and Oregon (U.S.A.), and what lessons could be learnt and applied to UK based schemes.

4. Research and a report by Vinescapes Ltd. (Vinescapes 2020e) (Dr Alistair Nesbitt and Frances Trappey; Viticulturist) into the potential for greater adoption of Precision Viticulture techniques (PV) and Automation. The goal of PV is to utilise technology to optimise grape yield and quality whilst minimising environmental impacts or risks associated with cultivating grapes. Typically, PV involves the collection of data through sensors (weather, soil, canopy images), the interpretation of data with a specialised software which ultimately leads to the implementation of a vine management plan (spraying, weeding, harvesting, irrigation). The plans can either be generated by the software or left to the viticulturist to further interpret the data based on their own knowledge. Significant potential was identified with the advent of new vineyard technologies, but barriers to adoption regarding funding and training were also identified.
5. Research and a report by Vinescapes Ltd. (Vinescapes, 2020f) (Dr Alistair Nesbitt and Frances Trappey; Viticulturist) into Mitigating Pesticide Use and Preventing Contamination of Water Resources in Viticulture within the Kent Downs AONB. The report identified risks and mitigants including phytoremediation potential.

The research provided a critical evidence base and the scientific background to support this project's recommendation and to further demonstrate the potential for Public Goods that viticulture can provide.

4.4 Recommendations and proposed actions

The research, the workshops and the one-to-one interviews were all used to develop a series of recommendations. These recommendations drew from the best practice established around the world in viticulture, where this could be applied in England. The workshops were used to identify barriers that would stop growers from taking part and were used to recommend a delivery mechanism that was likely to work for most growers.

These recommendations were then used to identify actions that could be delivered by the schemes (primarily the Sustainable Farming Incentive and Local Nature Recovery). These actions were refined over the course of the T&T based on feedback from growers and industry representatives.

4.5 Similarities between viticulture and row fruit production

As the T&T progressed, it became increasingly apparent that there were similarities between viticulture and row fruit and the environmental benefits that could be gained. Consult 80 were appointed to carry out some additional research into the opportunities to reward environmental benefits for growers of apples, pears, blackcurrants and other fruit grown in rows. This work included interviews with 19 growers, an examination of best practice and industry assurance standards as well as a workshop attended by 14 growers. The final report identified actions that were supported by growers and how they could be applied to the Sustainable Farming Incentive and Local Nature Recovery schemes.

4.6 Worked Examples

Following the final workshops and the actions being agreed, the project facilitator visited 3 vineyards and spoke to growers and managers about how they might choose to implement the actions on their land. This involved identifying locations where actions might be appropriate but, just as importantly, where the actions weren't considered appropriate. These visits were written up as additional case studies.

4.7 Questionnaire

Finally, in order to receive some quantitative feedback about how the grape growing community feel about the actions proposed by this T&T, a decision was made to send a questionnaire to everybody who had been involved in the project. Wine GB was also asked to distribute the questionnaire to members. This questionnaire asked closed questions that mostly either required a yes or no answer or a score out of ten. This allows for a degree of feedback on how positive growers and others feel about the proposed actions and whether they would be likely to participate in the schemes. A final open question was also included to allow detailed feedback for those that wished to. 41 people completed the questionnaire. A link to the questions, which were distributed in April and May 2021, can be found here: <https://forms.gle/SDFCYURxPDbtqGm6>

Inter-row ground cover



Nyetimber Vineyards: an example of current best practice

As one of the largest and most prestigious wine producers, Nyetimber Vineyards pride themselves on their environmental credentials and are an example of some good practices that the industry currently supports. Nyetimber manage eleven vineyards in West Sussex, Hampshire and Kent covering a total area of 350 hectares (ha). Six of the vineyards (178 ha) are in West Sussex with a further 58 ha in Hampshire across two vineyards and the final three being located in Kent (over 100 ha). The first vines were planted in 1988 and the most recent vineyard is at Amberley on the brow of the South Downs. Nyetimber are also rewilding on 33 hectares which was once arable land. All grapes are transported to either the Winery in Crawley or the new winery at West Chiltington. They have achieved the LEAF Marque Standard and support NIAB EMR's viticulture research so that they can remain at the forefront of best practice.



Actions taken by Nyetimber to work towards best environmental practice?

The operation focuses on a number of activities which promote sustainability as well as best practice in viticulture. These include:

- Ensuring that soil is in good condition and well prepared before planting. This results in vines with good vigour and is part of a holistic approach to environmental conservation. Good soil underpins the implementation of the IPM plan.
- Establishing an indigenous herb and wildflower mix which is relevant to both the soil and landscape type.
- Considering run off and how the seed mix will affect that.
- Managing the sward height in the first three year. Thereafter it will look after itself and become less competitive.
- Establishing some insectary plants such as red clover which will also fix nitrogen, thus lowering the required nitrogen which is spread onto the vineyard. Insectary plants are a food source for beneficiary insects.
- Working with entomologists and volunteers to assist with the conservation of the vineyard and its surrounding area.
- Using drones to map and analyse the health of the vines so that diseases or viruses can be identified before they spread widely.

5 Results and discussion

The results for this T&T will be grouped by research question rather than by research method. It is felt this will allow for the most coherent narrative. Ultimately, this will most effectively present what is felt to be a strong case for environmental land management scheme resources to be allocated to environmental benefits derived from viticulture.

5.1 Can scheme actions deliver Public Goods within the vineyard setting?

Viticulture is a rapidly expanding sector within the UK's agricultural landscape. However, at its current scale it is also a relatively 'young' sector (not withstanding some longer term established vineyards) and one of the consequences of such is that best practice environmental management is not embedded across all producers or areas of production. There is variability in adoption and implementation of best practice. However, there are good examples of best practice and many growers are interested in developing the narrative behind their wines based around environmental protection and enhancements and produce of provenance.

The recommendations (Vinescapes, 2020b) that were generated following the workshops, one-to-one sessions and academic research concluded that:

1. *Growers should be rewarded for measures that restore and enhance functional ecosystem services. These measures include biological control – supported by biodiversity and native insectary plants, weed suppression, erosion control, nutrient cycling, soil organic carbon and soil biological activity and soil water retention.*
2. *Growers should be rewarded for strategies that transition their businesses to the post carbon economy by 2040, who achieve zero carbon dioxide emissions and enhance carbon sequestration. These climate change mitigants include soil regeneration, use of renewable energy and optimising sequestration potential.*
3. *Growers should be rewarded for enhancing cultural ecosystem service delivery from vineyards. These services should go beyond those just for direct market reward and into facilitation of health and wellbeing through recreation opportunities, engagement and education, tranquillity and inspiration, and heritage value.*

In order to implement these recommendations, it was necessary to identifying the things within the vineyard setting that can help to provide the required outcomes and how they relate to each of the Public Goods (as defined by Defra). The information from workshops, expert opinion, research into best practice and the case studies have been used to identify the information in the table overleaf. It should be noted that not all of the methods for delivering Public Goods within viticulture have been adopted as proposed actions for scheme payments. Equally, some actions will contribute to more than one of the Public Goods and will appear in more than one row.

The methodologies identified within the table overleaf were the used to develop a set of recommendations ([appendix XII](#)) that resulted in a set of proposed actions for viticulture ([appendix XIII](#)). The proposed actions will be presented in further detail in the conclusions of this document.

Table 4: How viticulture can deliver Public Goods as defined by Defra

Public Good	Actions - How viticulture can deliver the Public Good	Evidence gathered / rationale	Links to Kent Downs AONB Management Plan ³
<p>Clean Air Actions that remove particulates and prevent the release of airborne pollutants.</p>	<ul style="list-style-type: none"> • Conversion to equipment powered by clean or renewable energy. • Tree planting (windbreaks and in-field around vineyards). • Mulching rather than burning prunings. • Use of spray equipment that limits drift or waste. 	<ul style="list-style-type: none"> • Reduction in particulate emissions into the atmosphere. • Trees catch any spray drift minimising air pollution and absorb some particulates. • Less burning reduces particulates in the air. • Reduced spray within the air 	<p>Policies detailed in the Kent Downs AONB Management Plan (Kent Downs, 2014) often cut across different Public Goods. Consequently, the policies relevant to the delivery of Public Goods by vineyards will be listed just once in this column.</p>
<p>Clean and plentiful water Actions that reduce the levels of contamination in watercourses or reduce water usage.</p>	<ul style="list-style-type: none"> • Reduced use of pesticides and fertilisers through use of insectary plants and investment in drone or remote application technology to target applications only where they are needed. • Investment in rainwater harvesting from viticulture associated infrastructure including wineries, where relevant. • Ground cover and other soil health actions that reduce 	<ul style="list-style-type: none"> • Native grasses provide a valuable complementarity habitat for arthropod species other than those commonly found in association with native woody perennial shrubs and may increase the net number of predator morphospecies by around 27% when planted in association with vineyards (Retallack, 2020). • Promoting more efficient use of water reduces demand. • Phytoremediation (using plants to decontaminate land; see Vinescapes 	<p>Policy FL1 The AONB will retain the principally farmed character for which it is valued.</p> <p>FL2 The targeting of public agricultural subsidy to make a positive, landscape scale contribution to conserving and enhancing the special characteristics, qualities and landscape character of the Kent Downs AONB will be pursued.</p>

³ In this table the Kent Downs AONB Management Plan policies were used. Due to lack of space within this report, direct mapping to management plans of other protected landscapes has not been included. However, both the Surrey Hills AONB Management Plan policies and the South Downs Partnership Management Plan priorities have been instrumental in developing actions that deliver Public Goods in viticulture.

	<p>water loss and increase infiltration.</p> <ul style="list-style-type: none"> Automation of integrated pest management using technological advances. LERAP assessments and adherence. 	<p>(2020c)) should also be adopted including the use of hyperaccumulators to prevent leaching into ground water.</p> <ul style="list-style-type: none"> It is estimated that 98% of sprayed insecticides and 95% of herbicides miss their intended target species (Retallack, 2020). LERAP is established best practice guidance. 	<p>FL3 Farming practices that improve AONB landscape character, or mitigate damaging impacts, will be supported.</p> <p>FL11 Activities will be supported that increase wider public understanding of farming and the benefits that the farmed landscape brings for high quality food production, recreation, well-being, nature conservation, the historic environment, landscape and a buoyant rural economy.</p> <p>LLC1 The protection, conservation and enhancement of special characteristics and qualities, natural beauty and landscape character of the Kent Downs AONB will be supported and pursued.</p>
<p>Protection from and mitigation of environmental hazards</p> <p>Primarily actions that reduce the likelihood of flooding.</p>	<ul style="list-style-type: none"> Maintaining ground cover to minimise rainwater runoff and reduce flood risk. Other natural flood management measures could be implemented in and around vineyards. 	<ul style="list-style-type: none"> It is well-established that maintaining ground cover reduces the rate that water leaves the land both reducing flood risk and soil erosion (Burgess-Gamble et al, 2017). These measures are more likely to be linked to specific flood mitigation projects rather than viticulture. 	<p>BD2 Local, regional and national biodiversity targets and spatial priorities for habitats and species distinctive to the Kent Downs will be supported; a Kent Downs AONB response to Biodiversity 2020 targets will be pursued.</p>
<p>Mitigation of and adaptation to climate change</p> <p>Actions that either reduce carbon use or aid sequestration of carbon as those that reduce temperatures locally.</p>	<ul style="list-style-type: none"> Soil health by cycling nutrients and carbon achieved through minimum tillage and maintaining appropriate ground cover. Organic (or similar) conversion or following organic or regenerative soil management practices. Mulching rather than burning prunings. 	<ul style="list-style-type: none"> Soil regeneration and functional biodiversity enhancements are critical to not only fulfilling international agreements on biodiversity protection, but also for the commercial benefit of an authentic ‘clean green’ brand. Meeting these challenges has been called ‘sustainable intensification’ (Garnett, et al.,2013; Pretty & Bharucha, 2014). Organic or regenerative farming practices leads to an increase in soil organic matter, potassium content, soil microbial biomass, plant-feeding and fungal-feeding nematode densities (Coll et al, 2011). Returning carbon to the soil rather than atmosphere. 	<p>BD3 Targeting of advice, grants and planning agreements to reduce fragmentation and enhance the</p>

	<ul style="list-style-type: none"> • Planting native species windbreaks and trees in or near vineyard. • Reduced tillage and maintaining ground cover to increase carbon content of soil. • Use of electric or renewable energy powered vehicles and reducing vehicle passes through the vineyard. • Integrated Pest Management driven by technological advances/remote sensing and data driven decision support. 	<ul style="list-style-type: none"> • Planting trees helps to sequester carbon – whether trees are native or non-native less important for this public good. • Biotic and abiotic carbon sequestration options have specific niches, are complementary, and have potential to mitigate the climate change risks (Lal, 2007). • The ability to automate vineyard tasks such as yield prediction, mechanical weeding, spraying as well as targeted pest control has the potential to reduce costs associated with labour, off target or inappropriately timed spray applications, improve accuracy of forecasts and reduce fossil fuel consumption (Vinescapes 2020d). 	<p>distinctive biodiversity of the Kent Downs will be pursued.</p> <p>BD5 The protection, conservation and extension of Kent Downs priority and distinctive habitats and species will be supported through the Local Plan process, development management decisions and the promotion of the Biodiversity Duty of Regard (NERC Act 2006).</p> <p>GNR4 Advice to farmers and land managers which seeks integrated environmental land and natural resource management in the Kent Downs will be encouraged.</p>
<p>Thriving plants and wildlife Actions that encourage wildlife and limit the negative impacts on biodiversity.</p>	<ul style="list-style-type: none"> • Maintaining a more diverse grass sward (range of species and structure of sward) in alleys and headlands. • Installing wildlife friendly features in vineyards (from bird boxes, bat boxes, raptor perches to reptile hibernacula and ponds). • Native species windbreaks. 	<ul style="list-style-type: none"> • Native grasses provide a valuable complementarity habitat for arthropod species other than those commonly found in association with native woody perennial shrubs and may increase the net number of predator morphospecies by around 27% when planted in association with vineyards (Retallak, 2020). • Well established rationale for installing features that both enhance biodiversity and increase the range of predatory species. • Denser, native species windbreaks provide habitat for a wider range of species. 	<p>AEU1 Coordinated information and interpretation for recreation, access, education, and health and well-being across the AONB which is accurate, well presented and appropriate to its setting, readily available in a variety of formats and fosters a greater understanding and respect for the AONB will be pursued.</p> <p>AEU7 Improvements to the Rights of Way Network to provide and improve countryside access, health and well-</p>

	<ul style="list-style-type: none"> • Reduced use of pesticides. • Restoration and management of species-rich grassland. • Organic conversion or following organic soil management practices. 	<ul style="list-style-type: none"> • Impact of pesticides on invertebrate communities in particular can be very detrimental (Parfitt, Personal comment, 2021). • Species-rich grass swards are well-established conservation targets in many localities and will be targets for Local Nature Recovery Networks. • Organic farming led to an increase in soil organic matter, potassium content, soil microbial biomass, plant-feeding and fungal-feeding nematode densities (Coll et al, 2011). 	<p>being opportunities, including way-marking, signposting and maintenance, new routes and establishment of higher rights which conforms with AONB policies and design guidance, will be supported.</p> <p>AEU9 Initiatives for children, schools and youth groups which encourage interest in and learning about the AONB and reconnection with nature will be pursued.</p>
<p>Beauty, heritage and engagement Actions that limit negative impact on landscape character and help people to enjoy and understand the environment.</p>	<ul style="list-style-type: none"> • Providing high quality public access on both Public Rights of Way and through permissive access. • Use of windbreaks for screening unsightly features. • Use of materials that complement the landscape. • Use of interpretation to help visitors understand the environmental benefits of the schemes. • Educational access visits. 	<ul style="list-style-type: none"> • Schemes that reward environmental land management provide a once in a generation opportunity to enhance public access to the environment in a way that provides substantial benefits to more diverse people as well as for farmers and land managers. (Kent Downs, 2021) • Widely adopted practice though likely to be part of planning process rather than scheme actions • Can include the use of wooden posts or posts that rust easily to minimise landscape impact. • As vineyards are relatively new elements of the landscape, interpreting the environmental benefits to visitors can help people understand the positive impacts. • Educational access can achieve considerably more than it does under Countryside 	

	<ul style="list-style-type: none"> • Restoration of grass sward with native and local species present. 	<p>Stewardship but the focus should be on engaging with people and communities that have limited experiences of the countryside. (Kent Downs, 2021)</p> <ul style="list-style-type: none"> • The landscape character of an area is made up of numerous features, one of which are the combination of plants that are distinctive of the natural and semi-natural habitats of the area. By restoring this suite of species vineyards can contribute positively to local landscape character. 	
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Which Public Goods should schemes deliver?

The table above summarises some of the actions that could be funded by environmental land management schemes. There are a number of factors that need to be considered in order to establish whether public money should be diverted to these actions. These include whether the benefits would represent value for money or whether they could be achieved through other means. This T&T considered the following factors:

- Is the practice already widely adopted and are incentives not required?
- Does the market support these actions? (are they profitable actions that are part of the normal running costs of a business?);
- Are the actions widely adopted already? (public funding could be used to help more growers adopt best practice);
- Do the actions provide sufficient public good to warrant public payments?
- Payments should not be made for simply meeting legal minimum standards;
- Can public payments be used to either encourage adoption of assurance schemes or build on the minimum standards laid out by assurance schemes?

The research, evidence from workshops and one-to-one interviews, as well as the expert opinion of the T&T's viticulture consultants all concluded that there were actions that were appropriate to the vineyard setting and which could deliver multiple Public Goods. Schemes that reward environmental benefits supported by good research into best practice and the growing adoption of assurance schemes all have a part to play in the delivery of Public Goods, as identified by Defra.

The T&T identified a number of actions that were deemed to warrant public funding. These are evidenced in the conclusions section of this report.

5.1.1 Are specific vineyard based actions required or can generic actions be applied?

During workshops and one-to-one interviews, participants were asked whether they felt viticulture was different enough from other forms of agriculture to require a set of actions specifically designed to suit vineyards.

There are similarities between the kinds of actions that may result in environmental benefits in vineyards, orchards and other fruit grown in rows. All have grass in alleyways between rows, significant headlands in which to turn machinery and most have hedgerows or windbreaks of some sort. Consequently, there are similar actions that could provide environmental benefits in all of these agricultural sectors. However, the first set of standards in the Sustainable Farming Incentive included two standards⁴ that are aimed at both arable and horticultural farmers. Whilst these address some of the actions outlined in section 5.1, there are numerous other benefits that can be derived from vineyards. The potential for species-rich grass cover and reduced levels of tillage are just two. The evidence from growers and industry is that vineyards can offer additional benefits over and above

⁴ Sustainable Farming Incentive standards (HM Government, 2021) - <https://www.gov.uk/government/publications/sustainable-farming-incentive-scheme-pilot-launch-overview/sustainable-farming-incentive-defras-plans-for-piloting-and-launching-the-scheme#annex-1>

those identified for arable and horticulture. This would require, at the very least, additional Sustainable Farming Incentive standards that encourage vineyard owners and managers to maximise their environmental benefits.

Vineyards can also offer benefits that may be more suited to Local Nature Recovery schemes. The local distinctive character of species-rich grasslands are likely to feature heavily in Local Nature Recovery actions. As grape vines only cover a small area of the vineyard surface (varies slightly by density and trellising type but is circa 15%), the scope for restoring and enhancing native and local species-rich grassland is high, particularly as many vineyards in South-East England are planted on thin, chalky soils that have exceptional potential for species-rich grass meadows.

Whilst it was clear from the research conducted and from discussions with growers that viticulture could offer benefits that required different incentives from other types of farming, there are also things about the nature of the wine industry in the UK that make it different from other types of agriculture. These differences are summarised below:

Size of holding – type of grower

There are a number of small vineyards in the UK. Many of these are too small to take advantage of current schemes such as Basic Payment Scheme and Countryside Stewardship. Of the 38 questionnaire respondents who grew grapes, half worked less than 5 hectares of vineyard. Interviews and workshops showed that many of these growers were keen to work towards best practice but needed help to do this. The incentives and benefits of working in cluster groups of other vineyards that are proposed by this T&T would be particularly beneficial to this group. It would be a lost opportunity if these growers were excluded from the schemes.

Maturity of industry

The wine production industry in the UK is currently undergoing rapid expansion. Changes in climate which facilitate growing more commercially acceptable grape varieties have driven this expansion. However, best practice in environmental management is not fully established for the UK and actions that vineyards take are varied and not always based on evidence. As the sector is new and still relatively small, industry best practice standards have not become fully established. Some growers are members of Red Tractor and the LEAF Marque, but this is usually as they are obliged to do this for other crops that are grown on the same farm. The newly launched Sustainable Wines of Great Britain sustainability scheme is introducing common standards and assurances but it is in its infancy and not adopted across the sector. The schemes that reward environmental benefits can be used to support those that work towards best practice through these assurance schemes.

Value of product

Grapes have a high value when compared with other crops. The potential value of a hectare of grapes may be significantly higher (more than £10,000 in some instances in 2020) than other farmland. Consequently, there were concerns that the level of incentive that could be provided by the schemes that reward environmental benefits may not be enough to drive take-up. The questionnaire and the feedback at workshops suggested that this would not be the case.

5.1.2 What incentives are needed for vineyards to take-up scheme actions?

One of the key questions asked of growers at workshops and in the one-to-one interviews was what would encourage growers to take part in a scheme. This question is inseparably linked to what barriers there are to take-up of schemes. The table below will address the barriers to taking part in schemes that reward environmental benefits and look at the incentives needed to overcome these barriers.

Table 5: Barriers to scheme take-up

Barrier	Incentives
Rates of compensation not being high enough to justify joining a scheme	<ul style="list-style-type: none"> • Develop schemes that provide appropriate monetary compensation for growers. • At workshops, most growers wanted to at least recoup the lost Basic Payment Scheme income. • Allow access to a full range of actions through the scheme.
Access to scheme and excessive paperwork and bureaucracy	<ul style="list-style-type: none"> • Allow small vineyards to join the schemes. • Ensure that access to schemes is easy and not bureaucratic. • Inspections and auditing can be integrated with assurance scheme evidence gathering. • Develop 'off the shelf' packages of actions that are appropriate for vineyards. • Allow vineyards to choose which actions are appropriate for different parcels of land. • Long-term agreements to assist farm and business planning. • Agreements can be added to once vineyards are ready. i.e. join with a set of actions and add to them if they work.
<p>High value of product may dilute the value of scheme funding</p> <p>and</p> <p>Scheme take-up has only limited financial value to small vineyards</p>	<ul style="list-style-type: none"> • Being paid to create a land management plan with expert help. • Vineyard clusters organised through the scheme can disseminate best practice. • Advice and guidance provided through the schemes. • Actions (particularly integrated pest management) will improve yield and minimise harvest losses. • Scheme take-up also allows access to capital payments and payments for taking part in trials. • Being paid to provide public access trails may drive footfall to wineries and other retail points.

Questionnaire results

Although attendees at workshops and one-o-one interviews identified a number of barriers to taking part in environmental land management schemes, the incentives that the recommended T&T actions provide appear to overcome the barriers to participation for most.

The questionnaire was an opportunity to assess whether there was an appetite amongst viticulturists to join the proposed schemes that reward environmental land management. The results suggest that there is significant interest in the schemes and that this support is consistent amongst both large and small vineyards. The table below shows the level of support for signing up to the scheme as a whole and for specific actions.

Table 6: Summary of questionnaire results (n=41)

Question	'Definitely or almost certainly'	'Possibly'
How likely would you be to take part in a scheme that rewarded environmental benefits (often referred to as ELMS)?	71%	22%
Would you join a cluster of vineyards that work together to drive forward best environmental practice and work together to develop applications to schemes that reward environmental benefits?	51%	34.1%
Would you consider maintaining continuous ground cover (except under vines) by not tilling soil, drilling or sowing insectary plants and leaving some parts of the headland unmown to qualify for a payment?	61%	24%
Would you consider developing and maintaining a species-rich grass sward with plants native to your locality and reflecting the character of local semi-natural grassland? This management practice could take place between rows and/or in headlands to qualify for a payment?	51%	42%
Would you consider installing wildlife friendly features (e.g. beetle banks, habitat piles, pollinator strips, long grass and low scrub) in or around your vineyard to qualify for a payment?	61%	37%
Would you consider allowing public access (usually a waymarked route) for a payment?	7%	37%

The results show that the majority of vineyards would consider joining a scheme and would be very interested in most of the actions. The exception to this was the provision of permissive public access. The questionnaire also showed that land management plans were popular and would be considered as a precondition for joining the scheme. Although the factor that was cited as the most important in terms of whether a vineyard would join the scheme was the level of payment, 25% stated that access to best guidance was the most important factor. The full results of the questionnaire can be found in [appendix XVI](#).

Greening Waipara

The New Zealand experience of putting science into environmental land management in vineyards.

Distinguished Professor Steve Wratten, in New Zealand, was funded for a six year programme called Biodiversity, Ecosystem Services and Sustainable Agriculture, by the NZ foundation for Research, Science and Technology. The aim was to work with the grape growers to return elements of functional ecology to vineyards, which were virtually monocultures. The idea was to identify and enhance above and below ground ecosystem services. These include soil biology and plant nutrition, protection from wind, water retention, conservation, predation of pests and plant disease and weed management. Also featuring strongly were enhancing landscape features. The key challenges were to move from simply enhanced biodiversity to outcomes i.e. making a difference. The vineyard area which was selected for this work was one hour north of Lincoln University, in the Canterbury province of New Zealand.

After three years this programme had spread to 51 vineyards in the region, to local schools and even the local Post Office! Because of the substantial funding, they were able to employ students to take part in the planting regimes, largely using endemic New Zealand perennial plant species. One of the best NZ botanists, Dr Colin Meurk from Manaaki Whenua Landcare Research (www.landcareresearch.co.nz) played a key part in selecting plants for their suitability as well as explaining where and how to plant them. The funding also enabled the programme to insert PhD students/researchers into the Greening Waipara project to provide solid evidence-based science as a foundation for the implementation plan. Two of the PhD students worked out the wide range of ecosystem functions that these plants provided and these attributes were rapidly passed onto the growers, partly to help them understand and promote their restoration work. Other related work concerned butterfly habitat use in the vineyards. They also used some non-native plants because they had proven value in enhancing biocontrol of pests, improving soil, enhancing pollination and ecotourism. Phacelia in particular was very attractive to honeybees and tourists, while buckwheat flowers enhanced the efficacy of biocontrol insects. A limited number of low-growing plants were planted under the vines while others were planted in the inter-rows. The third group (larger plants, including trees) were planted outside the vines and in the nearby townships. Importantly, "farmer to farmer" meetings were held to enhance communications. There is ample evidence world-wide that farmers are the best educators of farmers, operating in social networks rather than scientists trying to achieve and apply outcomes alone.

A key feature was the establishment of "Biodiversity Trails" within and outside the vines. Along these trails were interpretative signs which explained the ecosystem services of the added plants. Each sign comprised the English, scientific and Māori names for the plants, along with the ecosystem services which they provide and the traditional uses that Māori made of them historically. These include a member of the Piperaceae Macropiper, the leaves of which generate a hot, peppery taste when chewed and Māori used this plant to ameliorate the effects of toothache and bruising. In the UK, many of the native lowland plants historically have similar functions. These biodiversity trails were a world first in vineyards and led to visitors spending more time at the site and spending more money wineries and restaurants. Another strong outcome was such that many of the growers were so committed to the project that they re-designed the back labels of their wine bottles to give their marketing in the supermarkets a clear point of difference.

The Greening Waipara programme was funded for 6 years. It is tempting to ask what the extent of grower commitment would have been without the funding sources. Importantly, however, although some individual growers may have embarked on such changes anyway, there would still have had to have been a coordinating entity, otherwise the program delivery would have drifted and probably subsided within the early phase.

More information can be found in [appendix VI](#).

5.2 Can scheme actions help to mitigate the impact of vineyards on landscape character?

This question is both complex and, to a degree, subjective. The nature of landscape is that it is the blending of multiple factors such as geology, landforms, human activity, sounds, tranquillity and all of the things that go to make up the uniqueness of place. The growth in viticulture in recent years has been concentrated in certain landscapes. The protected landscapes of the South-East of England now have a disproportionate share of England's vineyards. Changes in landscape are simply a continuation of the changes that have taken place since humans first started shaping their environment. However, sudden, and sometimes dramatic changes, can negatively impact the landscape character of some of our most treasured, and protected, places. The wire work of vineyards, particularly large vineyards, can jar against a gently rolling, open landscape. Wineries, which are outside of the scope of this T&T, can also have a significant impact on landscape character. Some of the actions that have been considered by this T&T may have a positive impact on landscape character or mitigate against the impact of vineyards. Priorities addressing landscape character are likely to be made locally by Local Nature Recovery Strategies but some that may be considered are listed below.

Table 7: Actions that may have a positive impact on landscape character

Possible action	Discussion
Species-rich grassland	Vineyards, being at least 75% grass or some other species of ground cover, have the potential to act as linking features in a mosaic of semi-natural grassland. Often being sited on slopes in free draining areas, vineyards have the potential to contribute to an ecologically connected suite of semi-natural habitats. Some vineyards are already drilling or sowing species-rich grass in both alleyways and on headlands. Although there is some concern about the impact on levels of humidity and the impact on frost controls this is an opportunity to make a significant contribution to local and regional biodiversity targets. Additional research is required to identify appropriate species and how this approach aligns with integrated pest management strategies.
Native species windbreaks and hedgerows	Italian alder are often the species of choice for windbreaks. These are neither native trees nor truly appropriate to the landscape character of many areas. Alternative species choices for windbreaks or the use of native hedgerows can have a positive impact on biodiversity, integrated pest management and landscape character. One farmer did mention that once multiple species are used then the feature becomes a hedgerow and subject to different legislation.
Restoring and conserving local biodiversity	Although generic biodiversity enhancement features can be added to vineyards, the Local Nature Recovery Networks can develop strategies for specific species that are an integral part of the character of an area. Local actions could include cultivating areas of kidney vetch, required by the rare small blue butterfly in areas of chalk or creating foraging habitat for the shrill carder bee. All of

	these decisions on funding priorities need to be made locally and are ideally placed to be disseminated and promoted in vineyard cluster groups.
Substitution of galvanised vineyard trellising posts with more sympathetic alternatives. Colour of tree shelters and guards.	Incentives given to growers to use materials that limit the impact on the landscape. Although the main points of discussion at workshops and during interviews were replacing galvanised metal posts with coloured or wooden posts and the colour of tree shelters, this could relate to other features in the vineyard such as temporary toilets during picking season.

Headland and hedgerow of vineyard showing potential areas for biodiversity enhancements



5.3 Can scheme actions for viticulture be applied to other fruit grown in rows?

Nineteen growers of predominantly apples, pears and blackcurrants (though also stone fruits, hops and vines) were interviewed as part of a report commissioned to examine the Public Goods provided by row fruit growers that could be rewarded through schemes (Tinsley, 2021). The interviews and research showed that the Public Goods derived from row fruit growers are fundamentally similar to those from viticulture. Although there are differences, flexible actions within schemes can equally apply to both viticulture and other fruit that is grown in rows.

The drivers of environmental standards within row fruit are the Red Tractor and LEAF Marque assurance schemes. Unlike the wine sector, access to market through the multiple retailers is dependent upon being a member of an assurance scheme. This ensures both traceability of produce as well as assured environmental standards. It could be argued that the market dictates minimum environmental standards within row fruit. However, many of the growers interviewed indicated that the small profit margins mean that the continuation of existing environmental standards are unsustainable without support. Enhancements in the provision of Public Goods are simply not feasible without financial support from schemes. One grower stated that each year he ‘bet the farm’ and with one or two bad seasons he would go under and have to sell up.

A list of actions that could be funded through a scheme set up in a similar way to the pilots of the Sustainable Farming Incentive was recommended by the report. These had similar standards set at introductory, intermediate and advanced levels. The recommended actions are:

- Production of a Land Management Plan (LMP), with professional help where external expertise is required;
- Annual review of LMP against targets and timetable;
- Whole site evaluation to identify areas of lower productivity, awkward working etc. that could be suitable for turning into new wildlife habitat areas;
- Assessment and mapping of farm habitats and identifying priority areas for monitoring, managing and enhancing their biodiversity;
- Preparation and establishment of new wildlife habitat areas with suitable native plant species
- Ongoing upkeep and management of wildlife habitat areas unless specifically prohibited e.g. for an SSSI;
- When grubbing and replanting sites, replacement of existing single species wind breaks surrounding sites (and internal orchard/plantation wind breaks where practicable) with multi-species ones of native plants;
- Provision of habitat continuity by linking wind breaks, hedgerows, woodland, watercourses and ponds to form wildlife corridors;
- Management of the understory of wind breaks and hedgerows to include plants that attract and support insects;
- Management of ditches, watercourses, ponds and lakes to enhance their habitat and biodiversity;
- Use of a bio-bed or bio-filter to manage washings from crop protection equipment;

- Establishment and maintenance of flowering plants within the site in alleyways and headlands that attract and support insects according to the latest Research and Development findings;
- Management of the alleyway and headland sward to enhance biodiversity and insect activity according to the latest Research and Development findings;
- Establishment and ongoing management of nesting sites suitable for solitary bees, particularly the bare strip beneath trees/bushes maintained by judicious herbicide use;
- Placement of earwig refuges and bug hotels in and around sites;
- Placement of suitable bird nest boxes around sites;
- Improvement of soil organic matter levels and soil storage of carbon by the application of 10cm depth of organic mulch at least biennially;
- Pulverisation of prunings in situ to return organic matter to the soil;
- Pulverisation of whole plants in situ at the end of their life to store carbon in the soil and improve soil structure;
- Soil mapping and investment in GPS guided equipment for precision placement of fertilisers;
- Determination of the whole farm carbon footprint and deployment of the most efficient equipment and management programmes to minimise greenhouse gas emissions;
- Installation and maintenance of fencing and hedging alongside public rights of way to improve public safety and reduce environmental contamination by the public;
- Installation and maintenance of explanatory signage to educate the public about production, biodiversity and the local environment;
- Establishment and maintenance of permissive access where safe and appropriate;
- On farm public events to educate the public about production, biodiversity and the local environment.

Insectary plants in apple orchard



6 Conclusions

Following the research carried out by this T&T as well as the grower workshops and interviews, Vinescapes concluded that schemes that reward environmental benefits should ultimately result in an environment where:

“Grape growers are rewarded through Environmental Land Management (ELM) for practices which enhance long-term functional ecosystem services and Public Goods within vineyards and their setting. The enhancements should be regenerative and deliver healthy and thriving environments.”
(Vinescapes 2020b)

These principles have underpinned all of the recommendations that have been made by this T&T. The resulting 14 actions have been created to provide a range of options that are appropriate for vineyards. The following points may help to provide a context by which the recommended actions are more clearly understood:

- No actions are compulsory in order to sign up to the schemes;
- Actions can be applied to some parcels of land and not others;
- Each action has a proposed scheme (e.g. Sustainable Farming Incentive) but it is possible that some actions may be appropriate for more than one scheme;
- Vineyards may also be able to choose other actions outside of those recommended. It was felt that the proposed actions were appropriate to the circumstances of most vineyards;
- This suite of actions could be used by vineyards as an ‘off the shelf’ set of interventions to reduce the administrative workload of identifying possible actions;
- The actions would be refined over time as UK best practice evolves;
- In order for these actions to be most effective, agreements should be both flexible and long-term.

6.1 Recommended actions

The recommended actions from this T&T are recorded in a table 7 overleaf. More detailed descriptions of the actions can be found in appendices [XIII](#) and [XIV](#). Information about the Public Goods that are derived from these actions and the evidence to back them up can be found in table 4 of this report.

Table 8: Recommended viticulture actions

Action (and suggested component)	Additional detail <i>Suggested payment mechanism in italic</i>	Outcomes
1. Vineyard Land Management Plan <ul style="list-style-type: none"> • Sustainable Farming Incentive • Local Nature Recovery 	<p>It is envisaged that Land Management Plans for vineyards will be co-developed between growers and suitably qualified bodies (either individuals such as ecologists and agronomists or organisations such as FWAG and Protected Landscape Authorities where vineyards are within protected landscapes).</p> <p>The Land Management Plan for the vineyard will consider and balance viticulture/vineyard management needs with opportunities for ecosystem services and enhancements and will be designed and implemented for a minimum period of 5 years but with opportunities for reviews during that period and annual vineyard surveys. Annual surveys will test the success of scheme interventions and impacts,</p> <p><i>Flat fee for land management plan</i> <i>Possibly annual sums for surveys identified in plan</i></p>	<ol style="list-style-type: none"> 1. More vineyards working towards best practice. 2. Opportunity for vineyards, no matter what their size, to work with an expert. 3. Closer engagement between environmental and landscape authorities and land managers. 4. A vineyard delivering a sustainable product.
2. Farm Cluster Group <ul style="list-style-type: none"> • Local Nature Recovery 	<p>Vineyards join a defined (geographically or by production method, e.g., organic producers) cluster of other growers, ecologists, advisory groups and landowners to support them through best practice knowledge exchange.</p> <p>The clusters could target scheme funding for co-ordinated local activities such as Nature Recovery programs or educational access. The Clusters could be new or formed as part of existing groups such as the Farm Clusters in the SDNP, the Surrey Hills Cluster, Kent Downs/Kent Wildlife Trust, or initiatives such as SWGB. This could be a mechanism for training and sharing of best practice at demonstration vineyards.</p>	<ol style="list-style-type: none"> 1. Stronger potential of achieving best practice. 2. Knowledge enhancements. 3. Ecological connectivity. 4. Joint activities reducing duplication of efforts and administration. 5. Of particular benefit to smaller & newer vineyards. 6. Trained land managers.

	<i>Likely payments to facilitator and for group training sessions</i>	
3. Participate in on site research into activities that may derive Public Goods <ul style="list-style-type: none"> • Sustainable Farming Incentive • Local Nature Recovery • Innovation Research and Development Scheme 	<p>There is a lack of scientific research and innovation that vineyards can rely on with regards specifically to enhancing ecosystem services and Public Goods in UK vineyards. To help address this knowledge gap schemes could reward growers for participation in professional research and trials that use their vineyard space and risk their crop quality and quantity.</p> <p><i>Payment rates likely to be decided through Innovation Research and Development Scheme but recommendation that payments made to growers where appropriate (i.e., if yield may be impacted)</i></p>	<ol style="list-style-type: none"> 1. A greater understanding of new and emerging viticultural best practice and a likely increased uptake in activities that result in Public Goods.
4. Capital grants to support technological advances. <ul style="list-style-type: none"> • Sustainable Farming Incentive • Local Nature Recovery • Farming Investment Fund 	<p>Payments made to support, amongst other things, the purchase of:</p> <ul style="list-style-type: none"> • Vineyard equipment powered by renewable energy; • Remote sensing technology to map, monitor and determine areas for targeted pesticide or other management interventions; • Rainwater harvesting and storage infrastructure; • Compost and/or grape marc storage/holding tanks and required bunding. <p>Applications where machinery will be shared between vineyards will be looked upon more favourably where this can be identified as part of a farm cluster.</p> <p><i>One off payments paying for a percentage of approved expenditure.</i></p>	<ol style="list-style-type: none"> 1. Improved productivity. 2. Reduced carbon footprint. 3. Reduced use of pesticides. 4. Increased self-sufficiency of water (particularly valuable in Nitrate Vulnerable Zones).
5. Soil regeneration <ul style="list-style-type: none"> • Sustainable Farming Incentive 	<p>Soil management is a critical and common practice in UK vineyards. Soil is the medium through which water and nutrients 'feed' the vine via root systems. However, soil health in vineyards can remain low and its potential as a carbon sink often remains untapped. Payments can be made to reward the regeneration of soils and their increased carbon sequestration.</p> <p><i>Likely to be based on Sustainable Farming Incentive standards. It may be that these actions are covered elsewhere in this package of actions. (e.g., ground cover and restoration of species-rich grassland.)</i></p>	<ol style="list-style-type: none"> 1. Removal of accumulated soil contaminants. 2. Improved carbon sequestration. 3. Improved water infiltration and reduced runoff.
6. Ground cover <ul style="list-style-type: none"> • Sustainable Farming Incentive 	<p>By encouraging permanent ground cover within vineyards, it is possible to both improve soils and increase biodiversity. This will also help reduce the quantity of active pesticides that need to be applied by creating conditions that promote strong,</p>	<ol style="list-style-type: none"> 1. Reduction in pesticide applications. 2. Increased biodiversity.

	<p>healthy vine growth and the development of a functioning ecosystem where predatory insects can thrive and reduce the need for applying chemicals.</p> <p>This action would encourage:</p> <ul style="list-style-type: none"> • Reduction in tillage; • Sowing and drilling insectary plants and plants beneficial to soil health; • The creation of a more diverse vegetation structure within headlands and hedgerows to benefit invertebrate diversity. <p><i>One-off payment for planting on permanent grassland without ploughing.</i> <i>Annual payment for not cultivating or spraying herbicide under vines.</i> <i>One-off payment for establishing insectary plants.</i> <i>Annual payment for maintaining insectary plants.</i></p>	<ol style="list-style-type: none"> 3. Reduced risk of run-off into watercourses. 4. Disease profiling. 5. Increase in numbers of insects that predate on vineyard parasites. 6. Increase in number of pollinator species.
<p>7. Restoration and management of species-rich grass sward</p> <ul style="list-style-type: none"> • Local Nature Recovery • Landscape Recovery 	<p>Where vineyards are on soils that have the potential to provide species rich grassland between rows and on headlands, payments can be made to regenerate the native flora and fauna. This can have benefits for biodiversity on site but can also help to create a functional network of grassland sites within priority areas.</p> <p>Restoration can happen either by:</p> <ul style="list-style-type: none"> • Regenerating existing ground flora and grass sward through appropriate management and minimal inputs; • By mowing hard, scarifying the soil and adding a species-rich meadow mix appropriate to the soils and geology. <p>Management of established species-rich grass sward will include an agreed regime that may involve grazing and/or mowing and removal of arisings.</p> <p><i>Annual payments for hectareage managed in this method plus capital payments for fencing where needed.</i></p>	<ol style="list-style-type: none"> 1. Increase in native flora and fauna on-site including the potential to include locally and/or nationally significant species. 2. The potential to connect or extend existing habitats. 3. Improved carbon sequestration compared to many other land management techniques. 4. Increased predatory insect populations. 5. Reduced run off.
<p>8. Establishment and maintenance of native species windbreaks, trees and hedgerows</p>	<p>Hedges, windbreaks and woodland that provide biodiversity, pollination, carbon sequestration, erosion reduction, soil formation, nutrient cycling, wildlife corridors and enhance landscape character can generate payments including:</p>	<ol style="list-style-type: none"> 1. Increase in insectivorous birds and predatory insects. 2. Increased carbon sequestration.

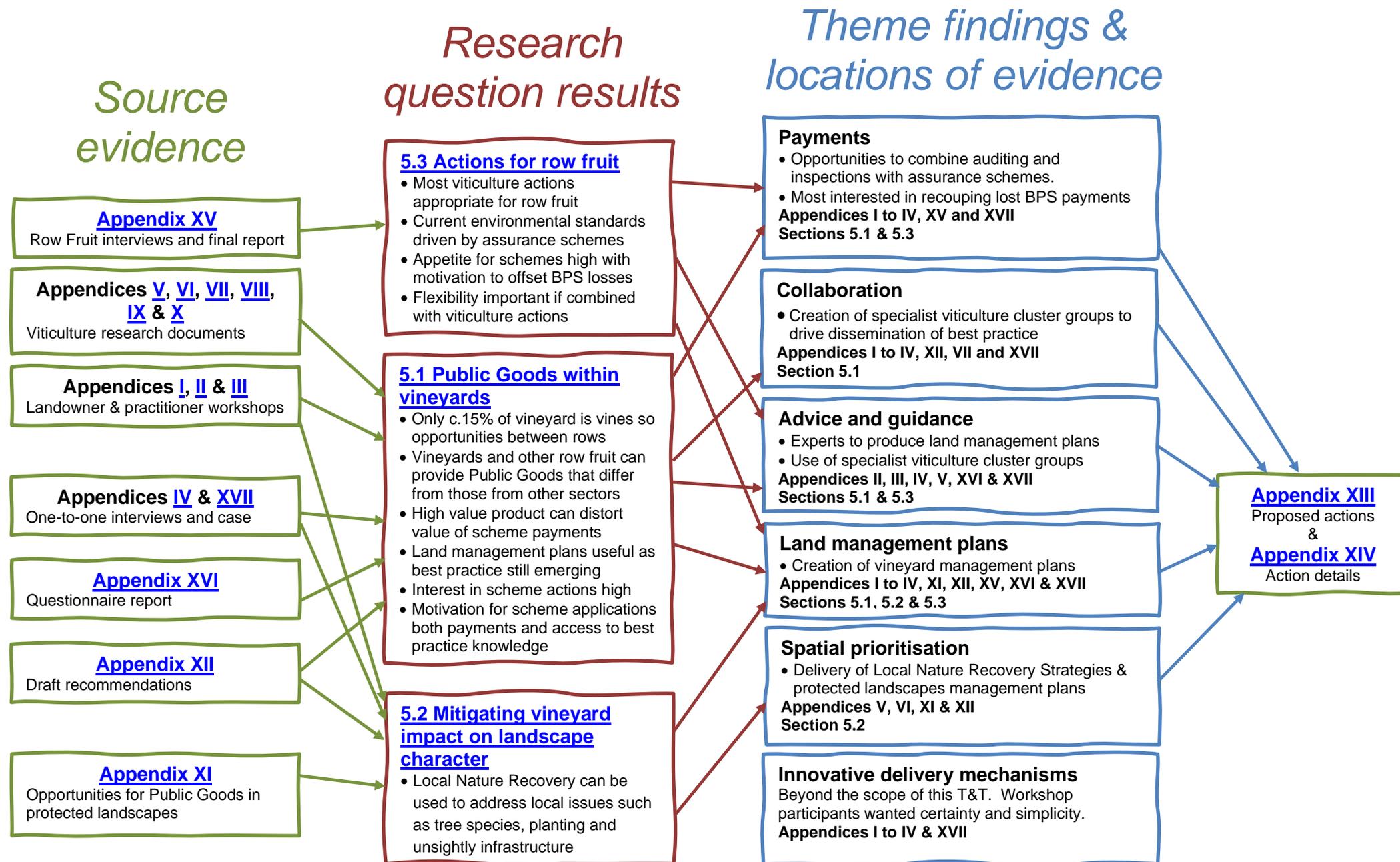
<ul style="list-style-type: none"> • Sustainable Farming Incentive 	<ul style="list-style-type: none"> • The establishment and management of trees, windbreaks and areas of woodland on adjacent land, including replacement of missing or poor performing trees with native species. • Windbreaks should involve corridors to encourage biodiversity not only in the trees but at the base. Timber should be used for habitat piles. • Hedgerows should consist of a species mix that provides a long flowering season. Hedgerows should not be cut annually and vegetation left to grow at their bases. <p><i>One-off payments for establishing trees.</i> <i>Annual payments for maintenance.</i> <i>Annual payments for land lost to tree planting (if woodland planted)</i></p>	<ol style="list-style-type: none"> 3. Increase in vineyard biodiversity. 4. Create habitats for nature recovery. 5. Can create wildlife corridors. 6. Contributes to landscape character enhancements. 7. Can improve productivity by reducing wind exposure.
<p>9. Biodiversity features</p> <ul style="list-style-type: none"> • Sustainable Farming Incentive • Local Nature Recovery 	<p>Installation of bird boxes, bat boxes, raptor perches to encourage both increased biodiversity and predators of pest species. These measures were specifically supported by project research and should be the highest priority but other features that may be appropriate to vineyards include:</p> <ul style="list-style-type: none"> • beetle banks • habitat piles • reptile hibernacula • badger gates • ponds and other freshwater habitats • areas of long grass and scrub • pollinator strips <p><i>One-off payments for construction/installation</i> <i>Annual monitoring payments</i></p>	<ol style="list-style-type: none"> 1. Increased biodiversity due to the creation of micro habitats. 2. Increased invertebrate diversity which may also assist integrated pest management. 3. Additional habitat types - greater structural diversity of vegetation. 4. Reduced run-off.
<p>10. Interpretation</p> <ul style="list-style-type: none"> • Local Nature Recovery 	<p>Payment for the creation of interpretation panels or other features within the publicly accessible area of the vineyard telling:</p> <ul style="list-style-type: none"> • How schemes are being used to enhance sustainability features; • The story of biodiversity on the site and how schemes are assisting in this; • The story of the vineyard and wine production (secondary to the above) <p>Should be linked to enhancing public access opportunities.</p> <p><i>One-off payment to include funds to cover ongoing maintenance.</i></p>	<ol style="list-style-type: none"> 1. Increased understanding of the public benefits of schemes. 2. Increased understanding of how vineyards can be sustainable and contribute positively to biodiversity and landscape character
<p>11. Permissive access</p>	<p>Create a new walking route in the vineyard or collaborate with a neighbour to create a walking route round and between the two vineyards and neighbouring farmland.</p>	<ol style="list-style-type: none"> 1. Increased routes for local people to enjoy.

<ul style="list-style-type: none"> • Local Nature Recovery 	<p>The Enhancing Access Opportunities Test and Trial run by the Kent Downs AONB Unit (2021) has looked in detail at payments for permissive access and has recommended that permissive and enhanced access should be paid for where there is a genuine public benefit. Access that schemes pay for should either create a circular walking route, should address fragmentation issues within the public access network or provide access to features in the countryside. Vineyards are well placed to offer good quality access as parking may be possible and there may be an incentive to have people visiting if on site sales are made. Collaboration with neighbouring farms and vineyards will be encouraged.</p> <p><i>Annual payments for permissive access.</i> <i>One-off payments for capital improvements.</i></p>	<ol style="list-style-type: none"> 2. A less fragmented public access network. 3. Enhanced access for those with limited mobility. 4. Public access to heritage features and viewpoints. 5. Increased footfall around wineries. 6. Receive payments for legitimising current trespassing.
<p>12. Educational access</p> <ul style="list-style-type: none"> • Local Nature Recovery 	<p>Create educational opportunities for people of all ages and backgrounds to learn about farming, wine production and the environmental benefits of the schemes. These can be for both children as part of school visits or other interested groups (e.g., botanical survey/guided walk session)</p> <p>All sessions will be free to attend. Under plans being developed in another test and trial, facilitators may be available to help connect vineyards to people from groups that are under-represented in the countryside.</p> <p><i>Annual base payment & cost per session.</i></p>	<ol style="list-style-type: none"> 1. Increased opportunities for people to learn about the countryside, sustainability issues and wine production. 2. Broaden the demographic base of people who visit and learn about vineyards. 3. Allows vineyards to connect with local communities.
<p>13. Health activities</p> <ul style="list-style-type: none"> • Local Nature Recovery 	<p>This action is similar to educational access but the outcomes are driven by the health and wellbeing agenda rather than education. There has been a lot of work providing evidence that access to the outdoors, particularly green spaces, can have a measurable effect on people's physical and mental health. This action would pay for sessions that would benefit health and wellbeing.</p> <p><i>Cost per session plus annual base payment if not receiving for education</i></p>	<p>As for educational activities</p>
<p>14. Organic conversion and management</p>	<p>Organic options have been funded through Countryside Stewardship and this is likely to continue into the new schemes. It is recommended that viticulture and row fruit are included in the organic options. Currently fruit for the production of alcohol</p>	<ol style="list-style-type: none"> 1. Lower inputs of inorganic chemicals. 2. Higher organic content of soils.

<ul style="list-style-type: none">• Sustainable Farming Incentive	is excluded but organic producers should be rewarded for the Public Goods that they provide. <i>Annual payments per hectare</i>	3. Improved water quality.
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6.2 Mapping the Test and Trial Themes

The key themes of the Defra sponsored T&Ts were not established until after this Test and Trial had been approved. However, these themes have been addressed by the work carried out to answer the research questions of this T&T. How these results link to the themes is shown below.



Plumford Farm: what could be achieved through environmental land management schemes

Plumford Farm on the outskirts of Faversham. It is a mixed farm that has been in the same family for over 50 years. The business has more recently diversified into viticulture but fruit and arable farming is still the main activity. Arable covers 58 hectares, fruit covers 50 hectares and there are 26 hectares of woodland.. The farm also contains a wildflower meadow in Higher Level Stewardship and the area under vines bring the total farm size to 153 hectares. Sustainable land management is at the heart of the business. They have achieved the LEAF Marque Standard and are a demonstration Marks and Spencer farm. In 2018, Plumford Farm planted their first vineyard and since, with further plantings, they are now growing a total of six hectares of vines. The farm has been growing top fruit for over 50 years and strives to achieve best practice. In a visit to the farm after the proposed T&T actions had been developed, a discussion about which actions might be appropriate for Plumford Farm took place.



Which of the recommended viticulture actions might be appropriate for Plumford Farm?

The farm would like to do a number of things that might be part of environmental land management schemes aimed at viticulture and row fruit. These include:

- Developing a Land Management Plan is imperative to understand how best practice will benefit biodiversity, the land, and the farm business. All assurance and certification schemes as well as Defra would ideally work together to produce one Land Management Plan template which they all sign up to with less or more actions for the requirement of each scheme.
- The creation of demonstration farms that work with cluster groups showing best practice.
- Receiving capital payments to purchase machinery powered by renewable energy.
- Increasing the number of native species windbreaks and installing more biodiversity features.
- Adding further permissive paths round the farm providing a self-guided walk.
- Installing more eye-catching interpretation to let people know about the work the farm is doing for the environment.
- Rewarding farmers for what they are already doing rather than just paying farmers for new actions.

Plumford Farms believe that all of the relevant actions could be achieved for both viticulture and row fruit.

6.3 Other key findings

Assurance schemes

With the exception of how growers could replace lost Basic Payment Scheme funding, the most commonly asked question during the co-creation process was how the schemes would link to existing assurance schemes. All of the row fruit growers interviewed and a small percentage of viticulturalists were members of Red Tractor with a subset of these growers also holding the LEAF Marque. Viticulture doesn't have the same access to market pressures that dictate high levels of Red Tractor membership within row fruit. However, the Sustainable Wines of Great Britain certification scheme is gaining significant traction including many of the largest vineyards in the country. It is highly probable that a large proportion of grapes will be grown under this certification scheme in the future and that multiple retailers may start to require it. It should be noted that this scheme also covers sustainability at wineries.

In order to provide the smoothest transition for grape growers (and other row fruit growers) into schemes that reward environmental benefits, it would be beneficial to ensure that inspections and auditing of assurance schemes are aligned with the inspections and auditing of schemes that reward environmental benefits. This will require both Defra and the assurance schemes to work together and be flexible in terms of their administrative burdens on growers as well as their expectations around environmental performance. This will benefit both the assurance schemes and improve the take-up of schemes that reward environmental benefits.

Similarities with row fruit

The environmental benefits that can be obtained from row fruit and grapes are broadly similar. The benefits gained from improving soil quality, ground cover, hedges and windbreaks as well as the potential for public access will lead to a similar set of actions being appropriate for all of these different crops. However, there are differences between different crops. Pest species often have specific or preferred host plants, which growers will want to manage out of their orchards or vineyards. Consequently, should similar actions be offered to both row fruit growers and viticulturalists there needs to be enough flexibility in how they are delivered on site to allow best practice production methods as well as best practice environmental systems.

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8 List of appendices

A number of documents have been produced that have shaped this final report and give much greater detail than it has been possible to provide here. All of these appendices are available online and can be found by clicking on the name of the appendix.

[**Appendix I: Viticulture Test and Trial – Summary of Workshop – March 2020**](#)

[**Appendix II: Viticulture Test and Trial – Summary of Workshop – December 2020**](#)

[**Appendix III: Viticulture Test and Trial – Summary of Workshop – February 2021**](#)

[**Appendix IV: Viticulture Test and Trial – Summary of One to One Interviews – summer 2020**](#)

These four documents contain notes from the nine workshops and 20 interviews that were held to gather people's opinions about the provision of Public Goods through viticulture and their responses to the draft actions that were proposed in November 2020.

[**Appendix V: Viticulture Test and Trial – Research – Biodiversity, Ecosystem Services and Sustainable Viticulture by Mary Retallack – 2020**](#)

In depth research looking at the potential for viticulture to deliver Public Goods. Applying global research to the UK.

[**Appendix VI: Viticulture Test and Trial - Research - Enhancing Ecosystem Services in Viticulture by Steve Wratten – 2020**](#)

Applying work carried out in New Zealand to the UK and including examples of public funded projects in New Zealand.

[**Appendix VII: Viticulture Test and Trial - Research - Mitigating Pesticide Use by Vinescapes – 2020**](#)

An assessment and recommendation of methodologies for mitigating the use of pesticides by identifying the negative impacts on groundwater and soils.

[**Appendix VIII - Viticulture Test and Trial - Research - Precision Viticulture and Automation by Vinescapes – 2020**](#)

An overview of the latest technologies available to automate production and reduce the amount of pesticide used through precision application.

[**Appendix IX - Viticulture Test and Trial - Case Study - Champagne sustainability by Vinescapes – 2020**](#)

[**Appendix X - Viticulture Test and Trial - Case Study - Oregon Sustainable Wines by Vinescapes – 2020**](#)

Case studies of best practice schemes and initiatives practiced in other wine growing areas.

[**Appendix XI - Viticulture Test and Trial - Opportunities for Public Goods in Protected Landscapes - June 2020**](#)

An assessment of how viticulture can provide Public Goods within protected landscapes with particular reference to the impact on landscape character.

[Appendix XII - Viticulture Test and Trial Draft Recommendations. October 2020](#)

A first attempt to summaries all of the information that had been gathered during the research phase of the T&T and identify underlying principles that could be used to generate scheme actions.

[Appendix XIII - Viticulture Test and Trial Proposed Viticulture Actions - February 2021](#)

The first draft of recommendations for scheme actions that were taken to workshops for feedback. These actions have been modified following the workshops.

[Appendix XIV - Viticulture Test and Trial Proposed Viticulture Actions Details - March 2021](#)

A spreadsheet that provides detail about each of the proposed action in greater detail including some of the unresolved issues, uncertainties and impacts on landscape character.

[Appendix XV - Viticulture Test and Trial Row Fruit Final Report - April 2021](#)

The final report from the Row Fruit research carried out by Andrew Tinsley at Consult80. This includes recommendations for actions appropriate for growers of apples, pears, blackcurrants and stone fruits.

[Appendix XVI – Viticulture Test and Trial Questionnaire Report – May 2021](#)

A short report detailing the results from a questionnaire of growers.

[Appendix XVII – Viticulture Test and Trial Case Studies – June 2021](#)

A selection of case studies looking at existing practices, what farmers would like to see subsidised and an example of how one vineyard felt the proposed actions could be applied on their land.