



**A Nuffield Farming Scholarships Trust
Report**

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**Farmer Coordination and Water
Stewardship**

Tom Ormesher

February 2020

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Nuffield Farming (UK) Scholarships Trust Report

February 2020



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

<i>Title</i>	Farmer Coordination and Water Stewardship
<i>Scholar</i>	Tom Ormesher
<i>Sponsor</i>	John Oldacre Foundation
<i>Objectives of Study Tour</i>	To explore the relationship between commercial farming, water management and wider public interest. Considering how best to coordinate the strategic water management and business development priorities of British farmers and growers.
<i>Countries Visited</i>	New York State, California, New Zealand, Spain, The Netherlands
<i>Key Messages</i>	<p>Sustainable water management requires strategic planning and investment; and this goes hand in hand with broader questions of rural economic development.</p> <p>Sustainable development in the rural economy will not be achieved without an enabling framework, providing food production businesses with the support, knowledge and financing arrangements to implement commercially relevant sustainability enhancements.</p> <p>Further investigation should assess the potential for expanding and incentivising formal, farmer led partnerships in England and Wales. These types of organisation could become the backbone of a new and effective working relationship with the regulator, whilst providing farmers with the opportunity for more coordinated commercial positioning.</p> <p>Defra should also review the structure and function of resource management advisory services in England and Wales, which is complex and fragmented. The review should consider the US model of <i>Resource Conservation Districts</i> as a valuable alternative.</p> <p>Finally, to meet future sustainability challenges, the sector needs better supporting services at regional and sub-regional level, providing company mentoring, mid-career business training and more cohesive business networks.</p>

EXECUTIVE SUMMARY

This scholarship has focussed on mechanisms of capacity building within commercial farming systems, so that farmers can secure more reliable access to critical resources such as water.

Sustainable water management requires strategic planning and investment at a farm and catchment scale; and this goes hand in hand with broader questions of rural economic development. Through a series of case studies, the report considers how best to coordinate the strategic water management and business development priorities of British farmers and growers, where three themes were considered:

- *Resilience Measures*: The physical measures employed to secure more reliable water availability.
- *Farmer led coordination*: The working relationships and organisations helping to secure resilient supplies and a better position in the supply chain.
- *Adaptive management*: The factors influencing wider uptake of sustainability measures.

The conclusions of this report focus around the fact that sustainable development in the rural economy will not be achieved without an enabling framework. A framework providing food production businesses with the knowledge and financing arrangements to implement commercially relevant sustainability enhancements.

It is the need for this framework, which is the core conclusion of this report and after reviewing several global examples, I believe the *Third-Party Partnership* offers the greatest potential for a British context. This offers the opportunity for groups of farmers to operate with a corporate identity, allowing them to take advantage of the commercial opportunities available through sustainability.

The formal farmer-led partnership also helps to develop long-term priorities whilst enabling a more streamlined mechanism for farmers to engage with their regulator. This approach is already taking place in the UK where the Greater Lincolnshire Local Enterprise Partnership has a Water Management Plan, which is embedded in their Agri-Food Strategy¹. This kind of strategic approach should be extended to other water stressed areas of the UK.

The main conclusion of this report is that a bespoke framework should be created for the British farming industry. This should incentivise collaborative and commercial farmer-led partnerships at a catchment and sub-catchment level. As is the case with the existing Producer Organisation model (which is a form of Third-Party Partnership), these arrangements are proven as a means of incentivising sustainability improvements within a commercial farming context.

The development and expansion of commercial coordination should be supported by regulatory agencies (such as Defra and the Environment Agency) in partnership with economic development bodies (such as Local Economic Partnerships, UKRI, AHDB), with programme oversight provided by an industry leadership group. This leadership group should follow the model of the *New Zealand Water Leaders Group* convened by the NZ Ministry for Environment².

¹ See *Water for Growth* www.greaterlincolnshirelep.co.uk/priorities-and-plans/priorities/water/

² See www.mfe.govt.nz/fresh-water/freshwater-leaders-group for details of membership and terms of reference.

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DISCLAIMER

The opinions expressed in this report are my own and not necessarily those of the Nuffield Farming Scholarships Trust, or of my sponsor, or of any other sponsoring body.

All photos are author's own unless otherwise stated.

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Chapter 1 – Personal Introduction

I've recently been thinking about a memory from when I was eight years old. I'm in the garden on a summer's day in 1987 holding one end of a hosepipe. My dad calls over "*is it on yet?*" He's stood over by the tap but at my end there's nothing.

"Is there something stuck in it?" he shouts, *"take a look"*. Of course, it's only when I look down that he turns the tap and I'm instantly soaked.

One of my favourite phrases learnt during the past year is "*drinking from a firehose*" to explain a great rush of information just like that day in the garden. This perfectly explains the Nuffield Scholarship. An incredible volume of experience and information that has genuinely caused me to change the way I think about all manner of things.

My family are from London but I grew up in the Kent countryside where my time spent at Wye College, Farm Image and Ripple Farm were formative experiences inspiring great interest and respect for British food and farming.

After University I spent my early career in a large environment and infrastructure consultancy working on a range of projects relating to water resources, energy, abstraction, biodiversity and watercourses. Since moving to the NFU in 2013 I've spent six years working closely with British farmers and growers, advocating their interests with decision makers and providing guidance on planning, environmental regulation and rural development.

I now live with my partner on her family's arable farm in West Sussex where we've converted an old stable block to a house, close to Chichester Harbour.





Chapter 2 – Background

The Complex Water Management Challenge and a Need for Coordination

The basic intention of my scholarship was to identify measures to enhance UK fruit and vegetable production in a context where water availability is a crucial factor affecting growth in the British industry.

The British water management challenge is complex and multi-dimensional influenced as much by our modern global supply chains as by political and regulatory regimes. To put this in context, British farms typically use less than 1% of total water resources on an annual basis, although as a nation we have a £10 billion trade deficit in fresh fruit and vegetables. We import a much greater proportion of fruit and vegetables than we grow, with much of this originating from water scarce countries.

Simplistically it would seem obvious that a more sustainable supply chain should involve more domestic production to substitute imports. However, at a farm level it's hard to forecast future water demand and over recent decades this has made it difficult to make a strategic case for public investment in water resource infrastructure for food production.

In England and Wales there are well documented concerns over water availability. Many catchments are considered over-licensed or over-abstracted and without appropriate investment, growth in public demand for water risks exceeding supply. From an irrigation perspective, increased soil moisture deficits resulting from climate change are projected to cause regional shifts in areas suitable for crops such as potatoes and carrots, with some estimates suggesting water for irrigation would need to increase seven-fold by the 2050's for present domestic levels of production to continue³.

At the same time as both UK and global population continues to grow, demands for water and food also follow this upward trend. Global demand for water is forecast to increase 55%, meaning that up to 40% of the world's population could then be exposed to severe water stress by 2050. According to the World Economic Forum, 'water crises' are now considered as the greatest risk to global society, with 'failure of climate-change mitigation and adaptation' and 'extreme weather events' among the most significant environmental risks⁴.

The above serves only to illustrate the complex, often conflicting challenges of securing sustainable water management, which is often described as a *wicked problem* due to the many different actors and decision makers with often competing values⁵.

The simple motivation behind this scholarship is to understand how these challenges have been coordinated in water stressed areas of the world and what commercially relevant options are available to farmers and the supply chain. The presence of many and varied coordinating entities and organisations in other places in the world, in comparison to the comparative lack of similar organisation in England and Wales inspired me to find out whether more can be done to better coordinate the strategic water management priorities of British farmers and growers.

³ Keay et al (2014) *The impact of climate change on the capability of soils for agriculture as defined by the Agricultural Land Classification*. Report to Defra. ADAS/University of Cranfield

⁴ World Economic Forum Global Risks Report 2019 14th Edition

⁵ Garrick (2015) *Water Trading, Transaction Costs and Transboundary Governance in Western US and Australia* Elgar



Chapter 3 - My Study Tour

The principle aim of my personal tour was to explore positive approaches to water management both from a water quantity and quality perspective⁶. My travel also focussed on locations known to be in the process of overcoming water management challenges, particularly those in developed nations with comparable economic and environmental constraints. Above all I've attempted to identify examples relevant to the UK where farmer groups have secured a commercial advantage through water resilience.

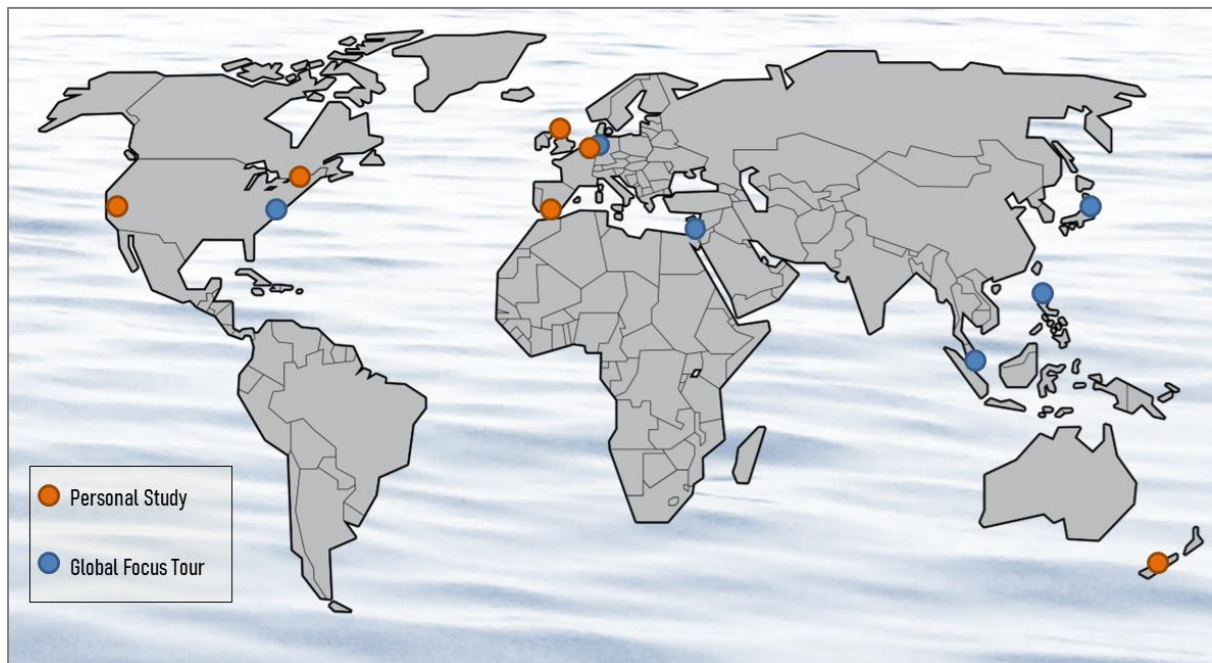
Throughout my study tour I've focussed on three themes:

- *Resilience measures*: The physical measures employed to secure more reliable supplies.
- *Farmer led coordination*: The formal and informal groups that through collaboration have managed to secure more resilient supplies, reduced impact and better supply chain relationships.
- *Adaptive management*: The factors influencing wider uptake of sustainability measures.

As summarised in the Table below I spent a total of ten weeks on my personal tour and conducted approximately 100 interviews, farm visits and meetings with farmers and related organisations. I also attended two conferences, a structured water tour of Northern California and a two-day training course on water stewardship in Edinburgh. Throughout this period, I've also undertaken numerous visits and interviews with farmers in the United Kingdom.

Singapore	Two days (before GFP)	Singapore Public Utilities Board and National University of Singapore
New York State	Three days (after GFP)	New York Watershed Agricultural Council
California	Three weeks, September 2018	Sonoma County (vineyards, dairy), North Coast Water Quality Control Board, Gold Ridge RCD, San Joaquin (Westlands Water District, Kings River Conservation District), Fox Canyon Groundwater Management Agency, Watershed Coalition of Ventura County, Farm Bureau Ventura, Santa Cruz RCD, Northern California Water Tour
New Zealand	Three weeks, January 2019	Dairy NZ, Ravensdown, Hurunui District Landcare Group, Barhill Chertsey Irrigation Ltd, Agri-Optics Ltd, the High Country Accord, NZ Merino Wool, Synlait Milk Ltd, Federated Farmers, Waitaki Irrigators Collective, LandPro, Environment Canterbury, Pomahaka Water Care Group, Wanaka/ Upper Clutha ICMP, Waimea Irrigators, Te Hono
Andalucía, Spain	Two weeks, May 2019	Optiriego, Ferdoñana, Iberesparagal, Good Stuff International
Conferences	One week, October 2018	<i>Water Science for Impact</i> Wageningen University <i>Alliance for Water Stewardship Global Forum</i> , Edinburgh

⁶ In this report I use the term *water sustainability* to mean both the reliable and renewable supply of freshwater quantity as well as water quality in terms of the amount of pollution inputs caused by agricultural operation (for example sediment, phosphates, nitrates and pesticides). In effect I have considered water quantity and quality as two sides of the same coin.



The remainder of this report communicates the main points gathered through my personal tour. It has clearly not been possible to report everything, but rather this is a personal interpretation. Twelve case studies have been selected, summarising a range of approaches that could be informative to the British farming industry.



List of Case Studies in the Report

Chapter 4 – Resilience

1. ***Benziger Family Winery, Sonoma County, California*** Page 10
A brand reputation built on sustainability, where a series of constructed wetlands recycle water for irrigation.
2. ***Westview Jersey Dairy, Sonoma County, California*** Page 11
Rainwater harvesting project makes farming resilient whilst providing habitat for an endangered species.
3. ***The Grasslands Bypass Project, Central Valley, California*** Page 12
Diverts polluted wastewater to protect a large wetland, which is used to grow a salt tolerant fodder crop.
4. ***Dinteloord Aquifer Storage and Recovery, The Netherlands*** Page 13
Sugar beet process water stored below ground for irrigation provides cost effective grower security.

Chapter 5 - Coordination

5. ***Third Party Programmes, California*** Page 15
Streamlined compliance mechanisms administered by intermediaries between farmer and regulator.
6. ***Watershed Agricultural Council, New York State*** Page 17
Farmer run institution coordinates farm investments to deliver clean water for the City of New York. *An Enabling Partnership*
7. ***Water Care Group, Central Otago, New Zealand*** Page 19
Farmer Network taking direct action to prevent sediment and prevent soil erosion.
8. ***Barrhill-Chertsey Irrigation Scheme, Mid Canterbury, New Zealand*** Page 21
Farmer owned irrigation company holds a collective resource consent, to coordinate environmental performance. *A Service Provider*

Chapter 6 - Adaptation

9. ***Incentivising Coastal Farmers, Santa Cruz County, California*** Page 24
Horticultural leaders initiated a new dialogue about water, giving rise to a range of innovations.
10. ***Water Sustainability in Andalucía, Spain*** Page 26
Supply chain partnerships enabling adaptive management and response to shared water challenges.
11. ***Synlait, Lead with Pride, Mid Canterbury, New Zealand*** Page 29
Processor led incentive programme for high quality and sustainable milk production.
12. ***Te Hono, New Zealand*** Page 30
Executive education programme enabling primary production sectors to build sustainable value through market orientation.



Chapter 4 The Value of Resilience

This chapter presents four case studies where water resilience⁷ has created business value through providing production security, brand recognition and improved environmental performance.

Case Study 1: Benziger Family Winery, California

The Benziger Family has a strong brand identity built around the fact that their wines are certified sustainable, organic or biodynamic. During their public facing farm visits they explain a wide range of farm practices from using cover crops and compost for soil condition; to enhancing on farm biodiversity as part of an IPM strategy; through to educating their staff and supplier growers by running a series of sustainability seminars.



Most visible to anyone visiting the vineyard is their constructed wetlands, recycling winery wastewater for irrigation. In this process, filtered wastewater flows through a series of lagoons where reeds and aquatic plants provide the conditions for microbial processing of nutrients, fine sediments and other contaminants. This wetland recycling process is reported to supply around half of the irrigation needs for their 85-acre site (approximately 8,000m³ per year).

In addition to their sustainability measures, my lasting impression of the estate was the visitor experience it provided. As is the case for many wineries, the estate provides the shop front for their product. The visitor feels very much as if they are *buying in* to the premium experience. This personal engagement has been noted as a core part of their success in being amongst the vanguard of Direct

⁷ Defined as “*capacity building*” enhancing system tolerance to unexpected change



to Consumer marketing⁸, where they now sell around 35,000 cases priced \$25-\$80 per bottle through their wine club, approximately 20% of their volume of sales (and possibly 40% of the value). My belief is that the sustainability credentials of this vineyard drive the personal affiliation of their customer base (as well as the fact that the wine is great).

The Benziger story dates back to the 1980's, when the family created the Glen Ellen retail brand, which sold commodity wines at an entry level price. This became a formidable success ultimately purchased by a major drinks company for a reported \$70 million⁹. With a significant cash injection this provided the means to build a premium brand focussed on sustainable and environmentally friendly farming practices. Where, to complete the story, in 2015 the family then sold the Benziger Family Winery brand for an estimated \$90-100 million¹⁰ to The Wine Group, a significant retail supplier. Volume commodity production re-orientated to a high value premium product.

A spokesperson of the Wine Group is reported to have said *"We have been thoughtful in our search for a winery that produces exceptional wines while sharing our values of integrity, social responsibility and innovation"*. In my view, their sustainability position has made a significant contribution to the commercial value of the company.

Case Study 2: Westview Jersey Dairy, California

Just a few miles away but in a completely different part of the industry, Westview is a 180-acre dairy farm. Water for the farm was historically sourced from a shallow well installed next to a creek known to support populations of the endangered Coho Salmon. As the creek dries out during May to October, water withdrawals had previously impacted on salmon survival.

To improve survival, the farm installed a large rainwater harvesting reservoir, which collects 8,800 m³ during the wetter winter months. In a normal year, they use 5,300m³ during the dry season for cattle drinking and washing. This facility allows for six months of storage plus contingency, removing farm demand during the critical dry period.

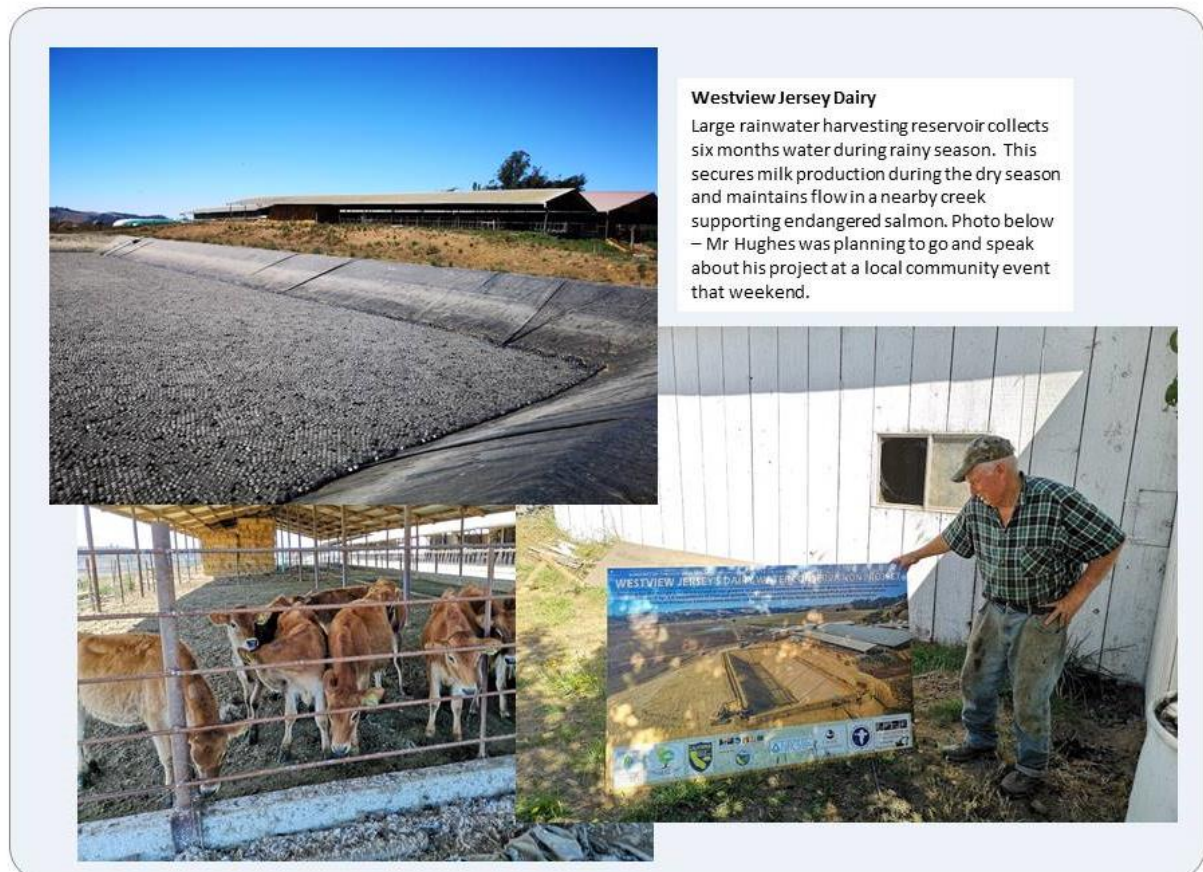
The project was a voluntary partnership between the farm and Gold Ridge Resource Conservation District, a partnership building agency working with farms on a wide range of resource conservation projects. Total cost was \$900,000 (£700,000), 90% of which came from public sources, whilst the farm provided a 10% "payment in kind" accounted through labour inputs. The farm also signed a "non-forbearance agreement" not to take water from the creek unless the storage pond has been exhausted.

In my view the project is interesting as it secures production through a measure designed specifically for environmental benefit. It is this dual value both to the farm and to the wider catchment that I think makes the project so interesting.

⁸ Direct to Consumer US sales have doubled for the US industry as a whole since 2012 to a record \$3bn in 2018 see www.decanter.com/wine-news/direct-consumer-wine-sales-2018-408542-408542/

⁹ Reported at www.kenwoodpress.com/pub/a/8387

¹⁰ www.winespectator.com/articles/the-wine-group-buys-sonoma-s-benziger-winery-51696#



Westview Jersey Dairy

Large rainwater harvesting reservoir collects six months water during rainy season. This secures milk production during the dry season and maintains flow in a nearby creek supporting endangered salmon. Photo below – Mr Hughes was planning to go and speak about his project at a local community event that weekend.

Case Study 3: Grasslands Bypass Project, Central Valley California

The Grasslands Bypass Project sustains the productivity of 97,000 acres of farmland in the Central Valley California, estimated to produce \$113 million of annual crops such as almonds, tomatoes, cotton, wheat, asparagus, pistachios and alfalfa plus \$126 million of further benefit to the economy¹¹. The project originates from a group of farmers and associated agricultural water districts, who formed a regional drainage entity in the late 1990's following significant regulatory restriction¹² by the authorities.

One of the major projects initiated by the group was to construct a bypass channel to remove agricultural drain water containing high levels of selenium, salts and boron away from 160,000 acres of wetlands in the San Joaquin River. All of the drainage water from the 97,000 acres is now diverted to a 6,000 acre area of marginal land where salt tolerant wheatgrass is grown to uptake and filter the water. The wheatgrass is then blended and sold as a fodder crop to nearby dairy farms, with profits reinvested in the scheme.

¹¹ Grasslands Bypass Project Annual Report 2006-07 www.sfei.org

¹² Environmental Impact Statement for the GBP www.usbr.gov/mp/grassland/docs/eis-eir-rpt-overview.pdf



Grasslands Bypass Project, Central Valley CA
Engineered system for collecting all contaminated drainage water from 97,000 acres of high value farmland, protecting a significant complex of wetland habitats in the San Joaquin River. Drainage water is used to grow salt tolerant wheatgrass (top right) on 6,000 acres of marginal land, used as a fodder crop for nearby dairy farms.

The project has benefitted from public funding, which enabled design and construction. However further administration and *selenium exceedance* fees are now paid by farmers on an acreage basis in order to keep the scheme running. A fee schedule has been designed to incentivise the phased reduction of selenium, where an oversight committee determines the loads, fees and actions to be funded¹³. One person I spoke to suggested total fees could be in excess of \$60 (£50) per acre/ year, which is clearly a substantial cost for continuing to farm in this area.

In summary, this case study demonstrates the creation of an economically viable product (wheatgrass) using a prohibited waste arising (contaminated water), which through the coordination and contributions from farmers has protected a large area of wetland habitat whilst securing high value production in the district. This seems a very positive example, where a circular economic model has secured food production alongside natural capital through responding to a regulatory prohibition.

Case Study 4: Dinteloord Aquifer Storage and Recovery, The Netherlands

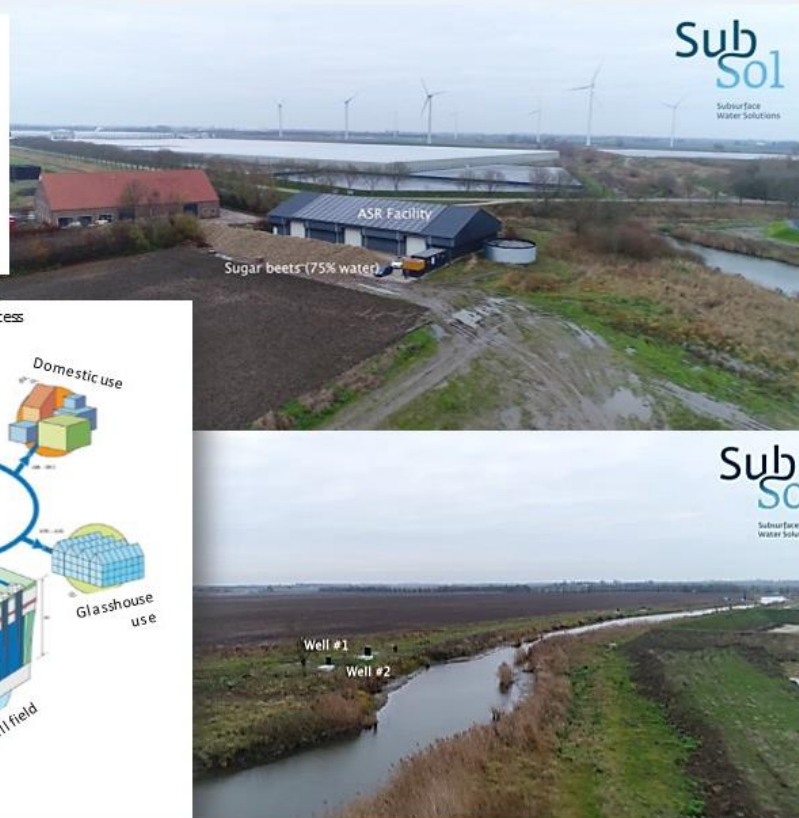
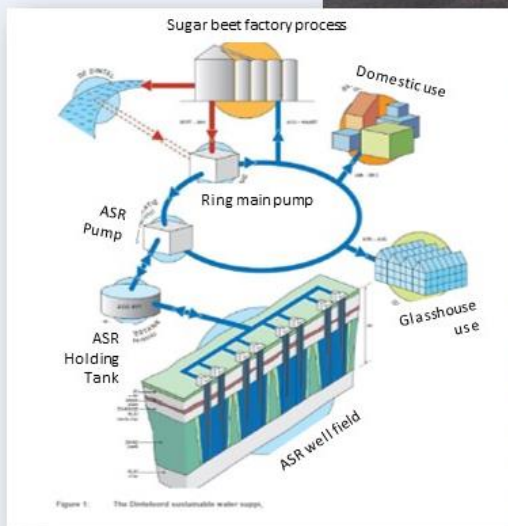
The final case study in this chapter concerns an aquifer storage and recovery (ASR) project owned and fully funded by a glasshouse cooperative in the Netherlands, built in a saline coastal environment where accessing fresh water is a challenge. The scheme takes wastewater from a sugar beet processing facility during autumn-winter and injects this into a brackish aquifer via a series of boreholes linked to a pumping station. Water is then abstracted during spring-summer for glasshouse irrigation.

¹³ California Agriculture 52(5):12-18.



Dinteloord Aquifer Storage and Recovery (ASR), Netherlands

Glasshouse cooperative development pumps waste water from sugar beet processing into brackish aquifer during autumn/ winter. Retrieved for irrigation during spring/ summer allowing continued production during drought conditions



The project has already proved its worth during the 2018 drought, when 70,000m³ was recovered. Whilst others were subject to drought restrictions, these growers were able to keep irrigating during the long dry summer.

The facility is designed to store a maximum of 200,000 m³ with unit costs estimated at 0.37 euro/m³, which is less than half the cost of reservoir storage (estimated at 0.99 euro/m³). The lower costs relate to the very small footprint, comprising a series of boreholes, pipework and a small building. All lessees of glasshouse space are required to use water provided by the system so that revenue income is secured, allowing the facility to service loans for construction. The business case for the project was therefore extremely robust.

The project secures a very high level of resilience for growers, which in turn is likely to be rewarded by the supply chain relationships available to them. Their resilience has a market value whilst at the same time securing growth in production without adversely affecting the environment.

Summary of Chapter 4 – Creating Resilience Value

In this chapter I've outlined four farm business-friendly approaches. These have secured water resilience and productive capacity for farmers at the same time as delivering catchment scale environmental priorities. The business-friendly measures described have all secured catchment improvements, but in the process have also delivered market value and supply chain security.



Chapter 5 Farmer Coordination

Securing coordination is rarely straightforward, so in response this chapter describes four examples where farmer groups have collaborated successfully. These have been selected because they characterise four distinct coordination options.

Case Study 5: Third Party Programmes, California

California law allows Conditional Waiver programmes to be administered by third parties on behalf of farmers. These are official schemes offered by Regional Boards¹⁴ to protect water quality, allowing farmers to work collectively¹⁵. The regulator favours this approach as it reduces public costs but still provides advantages to farmers. This case study outlines two such programmes in Ventura and Sonoma Counties respectively.

Ventura County Agricultural Irrigated Lands Group (VCAILG) program

Run by the Ventura County Farm Bureau¹⁶, VCAILG has enrolled over 83,000 acres representing 90% of irrigated acreage in the County. This typically costs the farmer \$20-50 per acre (£10-£25/ acre) depending on the amount of monitoring and mitigation required to meet statutory water quality targets¹⁷. In return the Farm Bureau is responsible for a five-year management plan, providing water quality testing, auditing and reporting as well as free consultation and funding advice.

Monitoring results are bench-marked allowing farms to rate their own performance against others. Furthermore, all farms are required to attend two hours of training per year alongside an annual survey of “best management practice” (BMP) uptake¹⁸.

Farmers who don’t join the scheme are required to comply with regulations individually, subject to more frequent inspections and have their records made public. By comparison, programme participants have less frequent inspection, lower costs and remain anonymous making it advantageous to join.

Sonoma County- Sustainable Sonoma

A slightly different approach applies in Sonoma where the Regional Board specifies targets according to crop type and geographic location¹⁹. There are currently four independently run third-party programs in the County, assisting vineyards with development, monitoring and verification of farm plans. Two of these are administered by Resource Conservation Districts²⁰ and one by an industry body, the California Wine Institute.

¹⁴ Equivalent to the Environment Agency in England

¹⁵ See www.farmbureauvc.com/issues/water-issues/water-quality/vcailg

¹⁶ Equivalent to the NFU in England and Wales

¹⁷ These statutory targets are referred to as ‘Total Maximum Daily Limits’ (TMDL), which is a quantitative water quality standard set for specified pollutants on a catchment by catchment basis (see <https://fas.org/sgp/crs/misc/R42752.pdf>)

¹⁸ Best Management Practice (BMPs) is a term used across the United States to describe a wide range of on-farm resource conservation practices. A BMP is defined by the USDA as “any program, process, design criteria, operating method or device, which controls, prevents, removes or reduces pollution”

¹⁹ See www.waterboards.ca.gov/northcoast/water_issues/programs/agricultural_lands

²⁰ **RCD’s** are local public organizations that support voluntary and scientifically sound natural resource stewardship, somewhat equivalent to Catchment Sensitive Farming in the UK but underpinned by local legislation, receiving funding through competitive grants, local property tax, consultancy fees and private donation.



These work according to a three-tiered system²¹:

- *Tier 1 (Stewardship)* – Low risk tier where a farm plan has been formally verified and fully implemented. A third-party authorisation letter only needs updating every five years and annual submission of photos provides “qualitative indication of performance”.
- *Tier 2 (Intermediate)* – Requires a verified farm plan or working with an approved third party to develop the plan. Subject to annual monitoring and reporting but costs are reduced.
- *Tier 3 (Highest Risk)* – Dischargers who elect to develop a farm plan independently make direct submissions to the Regional Board. This can incur significant delay and higher costs.

There are two further advantages of being involved in a third-party programme:



Brand Identity - As of December 2018, 89% of the vineyard acreage in Sonoma County has been certified through a sustainability programme²². Where certified this entitles growers to use the Sonoma County Sustainable Wine logo administered by the Sonoma Winegrape Commission (SWC)²³.

Their target is to become the nation’s first 100% sustainable winegrowing region (this year) and to that end have been offering to pay the cost of farm plans and audits for the first year of

certification. When I contacted SWC they explained that whilst not directly involved in the certification process, their role is “to promote the preservation of Sonoma County agriculture to trade, media and consumers... We feel that encouraging growers to pursue sustainability certification programs helps increase the value, quality, and longevity of grape growing in this region”.

Funding Eligibility - In some districts, whole farm plans provide a gateway to funding. For example, through the Carbon Farm Plan process, several farms identified compost application as a soil conservation measure, where the farmer pays 10% but 90% is covered by the State Healthy Soils Initiative funded through the California Cap and Trade Scheme²⁴.

Case Study 6: Watershed Agricultural Council (WAC) New York State – An Enabling Partnership

The WAC is a farmer run institution established to develop and implement BMPs on farms through voluntary participation. Its mission is “to promote the economic viability of agriculture and forestry, the protection of water quality and the conservation of working landscapes through strong local leadership and sustainable public private partnerships”.

²¹ See www.waterboards.ca.gov/sanfranciscobay/board_decisions/adopted_orders/2017/R2-2017-0033.pdf

²² sonomawinegrape.org/sustainability/certification

²³ A “marketing and educational organisation dedicated to the promotion and preservation of Sonoma County as one of the world’s premier grape growing regions... SCW has oversight by California Department of Food and Agriculture which supports producer regions”

²⁴ See www.caff.org/programs/policy/climatechange



Fully funded by New York as an ecosystem service investment in the catchments that supply drinking water for the city, over 96% of farms within the Catskills/ Delaware catchments now participate: 320 farms over 160,000 acres²⁵.

Whole Farm Planning is the principle means by which water supply risks are identified and addressed, where a qualified adviser produces a bespoke structural plan “to reduce or avoid the transport of agricultural runoff into farm streams”. These are open ended agreements, reviewed annually.

Appendix A provides summary details of a Whole Farm Plan. Using data from this alongside accompanying Nutrient Management Plan and Annual Status Reviews, a farm ranking score is calculated based upon the risk of off-farm movement of nutrients and pathogens. This score is used to prioritise budget allocations to each proposed BMP project where riparian buffer and CREP practices²⁶ are given highest priority, after which ranking is related to pollutant category²⁷.

It was evident travelling around the catchment that WAC funds a wide range of improvements, from covered feeding areas, calf housing, soil survey and mapping to precision feed management. For example, I met with researchers from the Cornell Cooperative Extension Service who explained to me about the detailed services offered, including monitoring cow nutrient intake or forage quality which assists farmers, for example, in achieving better milk yields or better maize establishment.

WAC also offers a ‘Nutrient Management Credit program’ helping to spread manures on fields where nutrient uptake will be most valuable. When farms spread their manures in accordance with their agreed plan, they earn credits towards the purchase of machinery involved in manure handling operations. In one year, WAC also subsidised the purchase of fuel for slurry spreading in order to avoid a build-up when fuel prices spiked.

The key point is that their approach is geared towards more productive, efficient and economic farming outcomes, rather than just a focus on limiting impacts. It’s also important to note WAC’s activity in promoting food production through the *Pure Catskills* brand. This involves having a presence in NYC to market and distribute food, producing a guide about the products grown and developing partnerships with restaurants and retail outlets.

Taken in its entirety WAC is a model example of how food production can be underpinned and made viable by the wider ecosystem services that farmers and farmland provide. Given a reliable budget and healthy incentives, this farmer led enabling partnership has been able to secure substantial environmental performance, whilst also developing value added market opportunities.

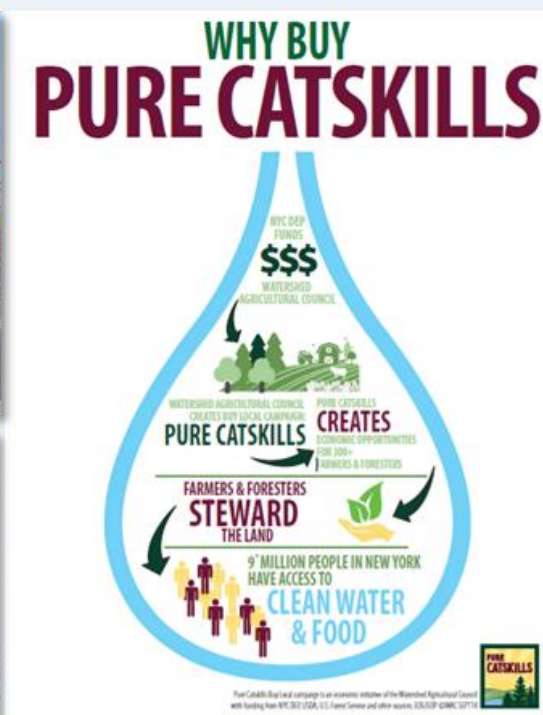
²⁵ Just 10% of the catchment is farmed and nearly 80% is forest. To put this in context the farmed area is slightly larger than the New Forest (143,000 acres), slightly smaller than Exmoor (171,000 acres) or almost twice as big as the Isle of Wight (95,000 acres), dispersed within a much larger area dominated by forest.

²⁶ ‘**Conservation Reserve Enhancement Program**’ projects include exclusion fencing, water crossings and water systems. CREP “benefits a wide range of farm operations and gives the landowner a rental payment for excluding animals from watercourses”

²⁷ Pollutant categories I to XI: I. Parasites and phosphorus: Animal Waste Storage II. Pesticides: Mixing/ Loading Areas III. Phosphorus: Fertilizer Storage IV. Parasites: Animal and Manure Management V. Nutrient Management: CREP & Nutrient Management Plans VI. Nutrients: Concentrated Sources VII. Sediment: Diffuse VIII. Sediment: Concentrated IX. Pesticides: Field and Animal Application X. Fuel Storage XI. Other: Toxic Materials



The Watershed Agricultural Council New York State



Top left: Machinery and feed storage constructed as a BMP for a farm in the Catskills-Delaware catchment. Middle left: Precision monitoring of maize establishment to improve farm productivity and nutrient efficiency. Bottom left: New cattle shed constructed as BMP. Bottom right: Diesel wagon purchased using Nutrient Management Credits obtained through compliance with Nutrient Management Plan.



Case Study 7: Pomahaka Water Care Group, New Zealand – A Farmer Network

The Pomahaka Water Care Group is a collective formed after a one-year project undertaken by the Landcare Trust in Central Otago, New Zealand. This initially involved the formation of a representative farmer stakeholder group, bringing together their knowledge and experience to consider how to improve water quality whilst optimising profitability.

By May 2015 the group had evolved into a more formal farmer led structure with 30 members paying an annual fee of \$150. They began holding regular meetings and a year later became an incorporated society. Now with 160 members, this accounts for approximately 45% of all farms in the 2,000km² catchment. The money raised from membership is used to monitor water quality on each participating farm. Individual results are kept confidential but collated, to benchmark performance.

The group runs regular field days where schools and the public can learn about stream biodiversity. They also encourage visitors to assist in their initiative, planting native species to filter water and prevent bank erosion.

With a focus on securing change, the group is also researching the effectiveness of four on-farm constructed wetland areas, four sediment traps and four grass filter strips. They've also set up a "good management response team" where a telephone hotline can be used by the public to notify of any water quality issues. The group then engages at a non-confrontational, farmer to farmer level, helping them to identify and work towards solutions. This was explained to me as *"about going to see someone before they get a call from the council"* a mechanism to *"help farmers act voluntarily, which should enable them to farm profitably without the regulatory requirements of a resource consent"*. It is a largely self-funded and self-perpetuating initiative aiming to avoid the burden of any more extensive regulation.

The farmers recognise that sediment and phosphorus are their main challenges, primarily associated with tile drains and over-winter grazing. However they explain to me that the benefit of all the water testing is that they now have a personal understanding of the issues, providing the impetus to work on "critical source areas" where the risks are most pronounced. They're also developing shared knowledge about directional grazing (towards watercourses) to reduce sediment load.

The sediment traps appear to be working, for example the group has harvested over 1 tonne of soil from one installation in the last 15 months. But whilst these farmers are proactively working towards fencing off all watercourses and installing sediment traps on as many drain outlets as possible, unlike the previous case study there is no public funding available for these works. This means that the measures must be easy to install and affordable. To this end the group has worked with an expert, creating a design template and general advice for sediment traps that can easily be installed and maintained by a farmer. They're also attempting to install ponds "little and often" to avoid the costs and permitting required for large scale installations.



The Farmer Led Pomahaka Water Care Group



"Our aim is to have Profitable, sustainable agriculture thriving together alongside local business, recreation and tourism, and for the Pomahaka River to be recognised as having the absolute highest water quality so that future generations can enjoy the river as we have."



Case Study 8: Barrhill-Chertsey Irrigation Scheme (BCI), New Zealand – A Service Provider

The final case study in this chapter is an irrigation scheme serving approximately 24,000 ha (180 farms, mostly dairy) between the Rakaia and Rangitata Rivers, Mid-Canterbury.

BCI is a relatively new irrigation development that became fully operational in 2015, where a crucial factor in helping to build the project was the creation of a joint venture company with a power distribution cooperative. The scheme uses existing hydro-electricity infrastructure to pump water uphill to a pipe network that serves irrigation customers. A 40 ha reservoir above the river intake also augments flows during peak demand. The joint venture helped to support upfront costs, however in 2017 shareholders²⁸ were able to secure full control by raising a \$120 million loan served by the revenue income of the irrigation company²⁹.

Environmental Services

Development of the project coincided with the 2014 National Policy Statement for Freshwater Quality (NPSFW), which sets out a tighter regulatory approach, introducing a strict permitting regime that required a complete change in the way farms managed their day to day operations.

In the early stages, BCI representatives tell me how most were unprepared. *“All of our shareholders were in breach of the regulations. The reality is if we didn’t do something, it would have been forced upon them”* [at substantial cost]. Considering the already high costs of the scheme, they decided to offer an environmental service as part of their overall package.

Taking this step enabled BCI to become the first scheme in New Zealand to be issued a Resource Consent covering their whole supply area³⁰ preparing the way for shareholders to *“transition from individual farmers to collective nutrient managers”*³¹. This consent requires the company to ensure that nitrogen discharges to groundwater remain below 3,000 tonnes N/year across their supply area by:

- Delivering an Audited Self-Management (ASM) programme and Scheme Management Plan *“to co-ordinate farmers to change their current on-farm management practices to minimise nutrient losses”*; where
- All farmers are required to prepare and implement a Farm Environment Plan (FEP’s) to achieve Good Management Practice (supported by BCI);
- All FEP’s are to be audited by an independent third party (coordinated by BCI); and
- Total scheme nutrient losses are to be reported annually by the company to determine compliance with consented nitrogen limits³².

²⁸ BCI is now an entirely farmer owned cooperative, where farmers own shares in the company. The farmers who benefit from the scheme also own the scheme. A large proportion of farmers benefiting from the scheme are both shareholders (owners) and customers, although there are some exceptions.

²⁹ For a more complete description of the project see www.bciwater.co.nz/about-us

³⁰ The consent also covers an adjacent supply area, the Acton Farmers Irrigation Co-Op, which is one of five companies that share administration costs within the IrriGo umbrella group see irrigo.co.nz

³¹ Eva Harris (2017) *Strategies for Creating and Implementing Sustainable Change Programmes* Kellogg Rural Leadership Programme Project Report

³² The overseer modelling costs for this activity amount to \$500,000 per annum. It is a resource intensive process.



Barrhill Chertsey Irrigation Ltd



BCI is a farmer owned irrigation company, which has a contractual relationship with Trustpower Energy to pump water from penstocks on the Rakaia River using pre-existing hydro-electricity infrastructure. The scheme also uses a 40 ha irrigation reservoir to augment flows during periods of peak demand. The company also holds a Resource Consent for their whole supply area, requiring that they “co-ordinate shareholders to change their current on-farm management practices to minimise nutrient losses”

By the end of 2018, BCI had completed 183 FEP’s on behalf of their shareholder-customers, where over 90% of audits achieved an “A” or “B” grade. This is a significant improvement from the start of the programme where 2015/16 saw an average of 12% compliance. Each farm receiving a low grade has had follow up visits from the BCI environment team who then work proactively to improve the next audit.



BCI also provides support by running workshops on a wide range of issues and requiring basic minimum standards from their farmers. For example, they've introduced reporting requirements to demonstrate irrigation is only taking place according to need and that irrigation equipment is regularly calibrated. In reality this is a saving to the farmer as overall water use is reduced. This exemplifies the general approach BCI are adopting, to seek sustainable change by working with the commercial interests of their shareholders, rather than simply taking a hard line by restricting water delivery.

Summary of Chapter 5 – Models of Collective Action

In this chapter I've presented four alternative models of farmer coordination, achieving environmental improvements by working with commercial farming priorities.

In these examples, farmers have been able to operate as part of a structured body, providing capacity for knowledge exchange, cost sharing, wider public engagement and longer-term business planning. Each has also minimised regulatory burden and helped to draw in external funding.

The way in which these organisations are structured provides a useful reference point for responding to coordination challenges in a British context. The differing structures of these groups and their value to the UK industry, is discussed in more detail in Chapter 7.



Chapter 6 Adaptive Management

This final chapter of case studies considers the factors that influence change in terms of wider supply chain relationships, market incentives, leadership and the role of capacity building organisations.

The key theme running through this is *Adaptive Management*, defined as “A flexible decision-making process for ongoing knowledge acquisition... leading to continuous improvements”³³. Each of the following case studies is an insight into how management change and adaptation has been coordinated within a commercial farming context.

Case Study 9: Incentivising Coastal Farmers, California

The Pajaro Valley Santa Cruz is a significant farming area producing field grown fruit, vegetables and ornamentals. The valley has suffered groundwater over-exploitation for many decades, causing major saltwater intrusion.

Following a series of droughts, in 2010 a group of high-profile growers decided to take action. This initially involved publishing a letter of commitment in a local newspaper, signed by company executives wishing to see the valley “continue as a vibrant and valuable agricultural resource”.

Recognising the impossibility of building a major pipeline, the letter sets out their desire to “make significant changes to business as usual” calling for farmers to pursue “diverse strategies, which entail costs and sacrifices, to bring our aquifer into balance”.

The *Community Water Dialogue* therefore began through high level leadership as “a solutions based approach to collaborative action” where 50-60 farmers and associated bodies participated. High profile leadership combined with the severity of risk were crucial in developing momentum, although latterly the project was mainly run by the Santa Cruz Resource Conservation District (RCD)³⁴ with input from Suscon³⁵ in developing:

- *Wireless irrigation monitoring network* – a network of communication towers to relay soil moisture data, reducing the cost of monitoring for participating farms³⁶.
- *Managed aquifer recharge* – construction of small-scale pilot projects to enhance water percolation.
- *Cover crop cost benefit* – development of an income foregone model to integrate fallow land into crop rotations, reducing water demand and improving moisture retention³⁷.

The RCD has also developed a voluntary programme, helping growers to confidentially track their total water and nitrogen use efficiency relative to crop demand. Named PICA (Performance-based Incentives for Conservation in Agriculture), the trial achieved significant water consumption

³³ Wiens et al. (2017) *Facilitating Adaptive Management in California’s Sacramento–San Joaquin Delta* San Francisco Estuary & Watershed Science Volume 15, Issue 2 Article 3 doi.org/10.15447/sfews.2017v15iss2art3

³⁴ RCD’s are statutory bodies who coordinate local advice, delivery and funding opportunities under the governance of local landowners. For further information see www.rcdsantacruz.org/mission

³⁵ Suscon is an organisation funded by private and public grants specifically focussed on resource stewardship and farm business practice

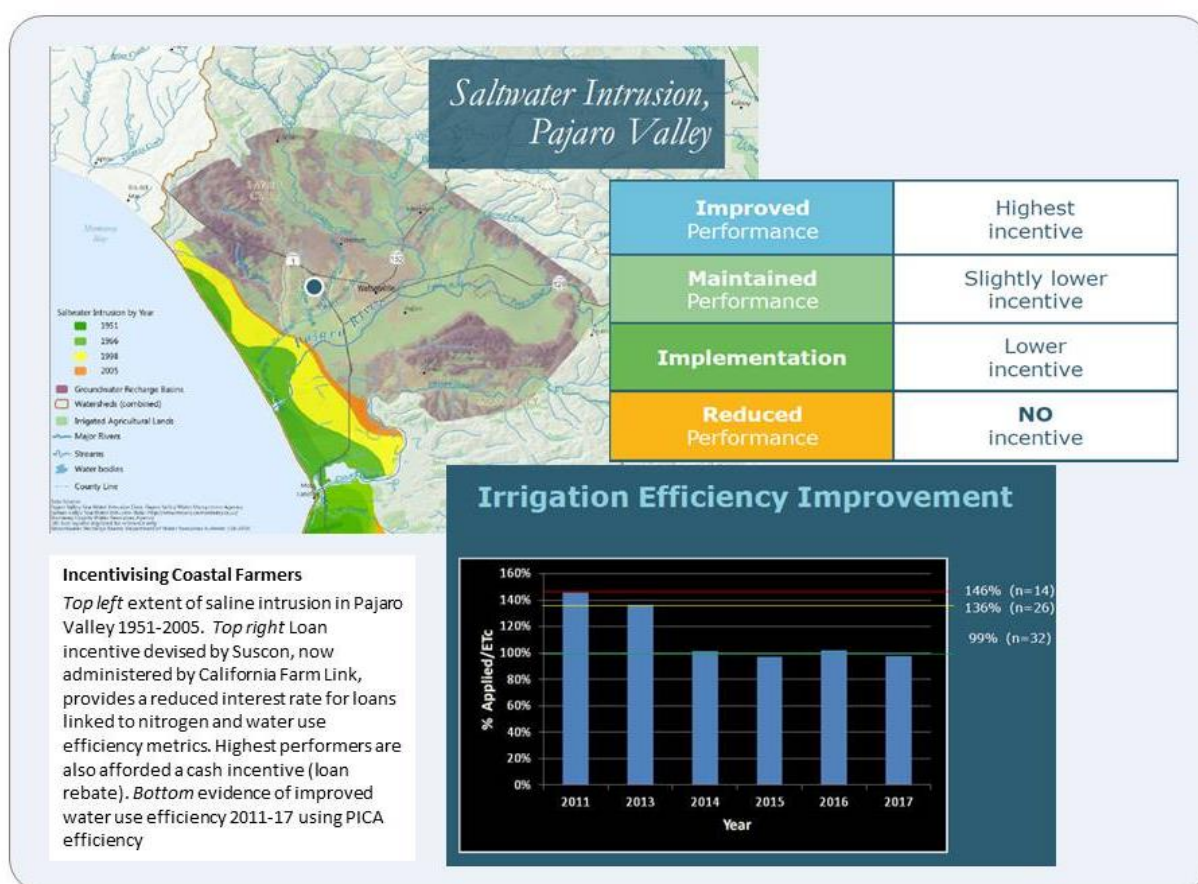
³⁶ Unfortunately this achievement was undermined by improvements in smart phone technology, making the telemetry towers unnecessary. Nonetheless the collective effort displayed in delivering this project was a very positive step forward for the farmers involved.

³⁷ See www.communitywaterdialogue.org



reductions (see graph in figure below). Alongside this, Suscon developed a tiered discount incentive for farm loan interest rates, providing a mechanism to reduce the cost of borrowing for efficient irrigators.

This lending vehicle is similar to the revolving credit facility used to finance capital projects delivered by Olam International, which links loan interest rates to the company's audited sustainability performance (See **Appendix B** for further details). Having met with one of Olam's lenders they explain this is simply a calculation of commercial risk. There's significantly less chance of the company defaulting on its loans if the resources used in their processes are managed sustainably. This is thought provoking for the UK farming sector. Sustainability performance is increasingly being used by lenders as a direct indicator of financial risk and is likely to be used in a wider array of lending options in future.





Case Study 10: Water Sustainability in Andalucía, Spain

This case study considers two projects that have a strong supply chain influence:

- *Ferdoñana* is a farmer engagement project funded by a consortium of supply chain organisations as part of the Doñana Berry Initiative.
- *Iberesparragal* is the first Alliance for Water Stewardship (AWS) certified farm in Europe, developed in partnership with Edeka the largest supermarket chain in Germany.

Both are associated with the Guadalquivir River and the Doñana National Park, one of the largest wetland areas in Europe. Water supply in the region is in major deficit with irrigation demand for berry production estimated at 45ML but groundwater recharge only 30ML per year. Supply to the wetland is now critically low, affecting the area and quality of wetland habitats³⁸.

Doñana Berry Project - *Ferdoñana*

The Doñana region produces 70% of all strawberries grown in Spain generating significant export revenue. Around half of the groundwater used for irrigation is taken without a permit and one third of farms are using land illegally³⁹.

Spanish authorities created a land use plan to address these problems, involving the closure of 3,000 hectares of illegal farms. Although approved in 2014, the plan hasn't been implemented due to political opposition from cooperatives and irrigation communities⁴⁰. This came to a head in 2016 when the Plan was nearly withdrawn; however a consortium of major retailers, food companies and processing companies⁴¹ buying 20% of the strawberries produced in Doñana released a public statement strongly supporting the plan⁴². The economic risk of losing these customers was sufficiently large that the authorities decided not to withdraw it.

Prior to the public statement, the Doñana Berry Project was in pilot phase through the work of WWF and the SAI Platform⁴³. But from 2016 it entered a more active phase, initiating *"a program involving producer organisations, irrigation communities and practitioners, and research institutes to stimulate and support the scaling of [water efficiency] practices across the farming region"*. This entails three key delivery areas:

- Working with government to promote legal use;
- Industry alignment; and
- The *Ferdoñana* farmer engagement project, administered by local farming consultancy Optiriego.

The initial intention of *Ferdoñana* was to work at a high level and large scale however it suffered a complete rejection in the early stages due to perceptions that the project was too strongly linked with

³⁸ [www.europarl.europa.eu/RegData/etudes/BRIE/2018/604981/IPOL_BRI\(2018\)604981_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2018/604981/IPOL_BRI(2018)604981_EN.pdf)

³⁹ WWF (2016) *Saving Doñana From Danger to Prosperity*

⁴⁰ In January 2019 the European Commission has now confirmed that intends to take the Spanish Government to Court for failure to protect the Doñana Wetlands see europa.eu/rapid/press-release_IP-19-466_en.htm

⁴¹ Albert Heijn, Coop, Edeka, innocent, The Coca-Cola Company, Marks & Spencer, Migros, Sainsbury, SVZ and Unilever

⁴² saipatform.org/uploads/Statement-of-support-Donana_Land_Use_Plan-final_10_March_2016.pdf

⁴³ *"The SAI Platform provides the pre-competitive framework to allow companies to work together to support the implementation of sustainable farming practices, which brings long-term benefits to the whole value chain"*.



wildlife conservation interests. After this they followed a more gradual approach working more intensively with a smaller group of farmers.



For participating growers the project now:

- Makes an initial site visit to review irrigation practice and install a flow meter allowing remote monitoring of water use.
- Creates a Personalised Irrigation Efficiency Roadmap (PIER) in a simple one page document.
- Asks participants to attend at least two out of eight Ambassador Farm visits (where best practice measures have been set up with participating specialists).
- Makes a further field visit later in the growing season to review irrigation performance and assess if farms have used their monitoring data. After this Optiriego will use the data to benchmark performance.

The project aims to achieve 20% reduction in water use by 2020 from the 77 growers now participating. This is ambitious given that many have only signed up within the last year (2017/18), but given the existing range, the worst performers should easily benefit from the practices implemented by the best, so they consider the targets within reach.



Iberesparragal – Alliance for Water Stewardship Certification

Iberesparragal is a citrus farm in Seville owned by fruit distribution company Iberhanse, the first European farm to achieve AWS Gold Standard certification, which is an adaptive management auditing process⁴⁴. During my meeting with the farm manager, he explains that the company's Managing Director was a key driving force and how environmental research already taking place in partnership with Edeka (the 'Zitrus Project') laid the ground for considering certification. With this already close relationship, Edeka and Iberhanse mutually agreed to use AWS to manage catchment water risk.

To aid this process Edeka supported costs for assessment, training, advice and the purchase of a humidity sensor. The farm provided staff resource to complete the required administration, training and management adaptation. In general it seems the required changes were minimal, mainly focussing on growing vegetated strips between trees, better administration of irrigation scheduling and setting actions to promote an understanding of shared water risk in the catchment. However AWS is an iterative process, so approaches are likely to evolve over time.

After this first certification Edeka has now invited a further ten farms to become certificated, offering to:

- Support facilitator costs and specialist advice
- Commit to a purchasing arrangement for all graded fruit; and
- Provide a small premium price for certified produce.

The growers have responded positively, also believing this will provide representative identity in ongoing negotiations with regulators. Their concerns relate to existing regulatory practices where mandatory percentage reductions are applied to water allocations during droughts, which has a greater impact on the most efficient irrigators. Growers believe that group AWS certification in partnership with Edeka and WWF will provide a valuable position in future negotiations.

Local growers also see this as a sign of long-term commitment for sourcing oranges from the region. The farm manager mentions how they recognise the marketplace is changing. German consumers are becoming more sustainability conscious, so certification is seen as a long-term insurance policy. But he's also keen to improve the reputation of the whole region, recognising that Spanish farms are increasingly less able to compete on price to places like Morocco, meaning that they need to seek a point of difference on quality and reputation.

⁴⁴ "The AWS Standard is intended to drive social, environmental and economic benefits at the scale of a catchment. It achieves this by engaging water-using sites in understanding and addressing shared catchment water challenges as well as site water risks and opportunities. It asks water-using sites to address these challenges in a way that progressively moves them to best practice" see a4ws.org



Case Study 11: Synlait - Lead with Pride, New Zealand

Synlait was formed by farmers and processed their first milk in 2008. A decade later they're now valued at NZ\$2 billion (approx. £1 billion) since becoming the exclusive manufacturer of canned infant formula for milk marketer the a2 company. a2 has seen high demand from Chinese families, marketed as easier to digest than conventional milk due to its lack of the A1 casein protein. Chinese consumers have also shown a preference for imports after various domestic food safety scares. In the words of their co-founder and former chief executive *"It shows that if you identify a high-value market opportunity and build the business back to a production base in New Zealand that meets consumer needs, there is tremendous opportunity to create value."*⁴⁵

In terms of sustainability, just three months prior to their stock exchange listing, Synlait launched flagship programme *Lead with Pride*. This financially rewards suppliers through an auditing system linked to four pillars: *Environment, Animal Health and Welfare, Milk Quality and Social Responsibility*. Certification is subject to independent third-party audit and is worth up to \$0.25/kg milk solids above base milk price, an average of \$65,000 per year to each supplier. One farmer told me it is worth approximately \$200,000 (£100,000) per year, allowing employment of a dedicated member of staff.

This seems to create a virtuous circle where incentives linked directly to production provide the basis for driving continuous improvement. In this model, farm operations are influenced on a daily basis by the revenue opportunity of sustainability performance. This fits with Synlait's 'business to business'

⁴⁵ See www.stuff.co.nz/business/farming/106064933/synlait-milks-2b-man-john-penno-only-wanted-to-be-a-farmer



approach focussing on selling product to customers with a brand reputation to uphold. By “marketing to marketers” their core proposition is quality, reliability and transparency where *Lead with Pride* provides the quality assurance needed to occupy this position.

John Penno, the former Chief Executive of Synlait also now chairs the New Zealand Ministry for the Environment Freshwater Leaders Group, which *“brings together expertise and input from leaders across the primary sector and agribusiness, environmental non-government organisations and other voices from the community... [to] provide a sounding board for policy, input ideas, challenge analysis and lead discussions”* on the water management agenda⁴⁶. I believe the creation of this independent advisory group by government is symptomatic of the collegiate and proactive approach to water management constraints in New Zealand. It is something that could be easily replicated by the equivalent government agencies and departments in England and Wales.

Case Study 12: Te Hono⁴⁷ - From Volume to Value

The final case study in this report is a market oriented, enabling programme for New Zealand’s primary producers to move *“from volume to value”*. It focusses on helping businesses move away from *“commodity sales and traditional agribusiness practice to become global producers of high value, consumer-centric products and services”*⁴⁸.

Whilst not directly a sustainability measure, the initiative has at its core the ethical, cultural and environmental values that provide New Zealand’s exports with a point of difference on the global stage. This is done by curating events to connect New Zealand’s primary production leadership to learn from the best in the world.

“New Zealand must challenge the status quo, blow apart the traditional price-taker mentality and move to a market-shaping model... Forget the idea of feeding the world. We’re too small to be a big producer. We don’t have an environment that can sustain that strategy and also live up to the clean, green brand on which so much of our economy relies”.

Te Hono aspires for New Zealand’s primary industries to be a global exemplar of economic, environmental and social performance, brokering cultural change, helping companies to shift towards *“more sophisticated”* value creation opportunities⁴⁹.

The programme has funding and proactive support from New Zealand Trade and Enterprise, KPMG, ASB Bank and AgMARDT⁵⁰ but has a steering committee with strong industry representation. As such the programme is a business led, but government enabled executive education programme.

⁴⁶ www.mfe.govt.nz/fresh-water/freshwater-leaders-group

⁴⁷ Maori phrase meaning “To Connect”

⁴⁸ www.tehono.co.nz/our-events

⁴⁹ Interview with John Brakenridge business.scoop.co.nz/2018/02/05/te-hono-says-move-to-value-from-volume-now-accepted/

⁵⁰ The Agricultural and Marketing Research and Development Trust *“Encourages and supports industry sectors and businesses to develop and implement innovative solutions to assist with transformational change within agribusiness value chains, with focus on the agricultural, horticultural and forestry sectors”* It was established by Government in 1987 in the process of deregulation (withdrawing subsidy) from the primary sector. Initial funds of \$32 million from the wind-up of the British, Christmas Island and New Zealand Phosphate Commissions have now grown to around \$80 million, giving capability to provide grants and funding to agribusiness sector of over \$65 million since inception. Clearly worth taking note as the UK embarks upon withdrawing direct support to the farming sector, in the 1980’s New Zealand took steps to continue enabling farm business development and innovation in their post-subsidy era (see agmardt.org.nz).



Originally the idea of New Zealand Merino chief executive John Brakenridge, Te Hono began with a one-off boot camp in 2012, where a group of 23 primary producer chief executives spent a week at Stanford University, California working together to improve sector performance. Shortly after this a Maori Leaders workshop went through the same process adding a cultural overlay to the approach. This is explained on the Te Hono website as *“Strengthening relationships by linking to the land and connecting to the world”*.

Boot-camps are now held annually alongside other events and the group now includes more than 220 members representing a combined turnover of more than 80 percent of the country’s primary sector exports. The collaboration has spawned more than 300 projects including the creation of a hub for New Zealand primary producers in Shanghai, the development of new sustainable products such as woollen surfboards and merino wool shoes through to developing new ways of working with environmental regulators, using farm water quality improvements as a value proposition.

“A common factor amongst the group is the control over the supply chain right back to the orchard, farm, seafood quota or vineyard and this control guarantees supply for the international markets.”

Te Hono itself could simply be seen as an executive education and networking programme, but in doing so it serves to introduce cultural change. Speaking to a representative from the organisation she explained to me how *“consumer preference is changing and the ways of serving those customers is also changing. Commodity production is becoming less and less relevant as there are so many steps in the value chain – how on earth are you to compete with products developed going direct to market?”*

In my view the programme recalibrates business thinking, where sustainability is cast as a core component, seeking out the markets that reward the kinds of economic activity that create high environmental quality. It is an approach that I believe could be relevant to the UK. *“Forget the idea of feeding the world”* but concentrate on market value and provide the leadership and institutional capability that helps to embed this as a core component of the agricultural economy.

Summary of Chapter 6 – Incentivising Adaptive Management

In this chapter I’ve presented a series of coordinated attempts to influence and enable primary producers as they embed sustainability within production systems. In different ways these adaptive management approaches have promoted the commercial value of sustainability and water efficiency, identifying the value of leadership, capacity building through partnership, market signalling, data transparency and benchmarking as key areas for enabling change.



Chapter 7 Discussion

My scholarship has explored positive approaches to sustainable water management in a farm business context where three main themes were considered: resilience, coordination and adaptive management.

Theme 1 - The Value of Resilience

Chapter Four considers the advantages of on-farm water resilience by working to secure the efficient management of local water networks. This serves a dual purpose, both to the farm from a commercial perspective and to the wider catchment by improving the condition of environmental systems.

The case studies illustrate how resilience can add brand value (e.g. *Benziger*), support production continuity (*Westview*) and secure more reliable supply chain relationships (*Dinteloord*). At the same time, the same approaches also provide environmental resilience, safeguarding wetlands, protected species and swimmable rivers (e.g. the *Grasslands Bypass Project*). In this respect water resilience has delivered a range of societal priorities as a direct outcome of commercial positioning on risk reduction and market access. In effect market-based solutions have delivered non-market public goods (and vice versa).

This is a relevant distinction in a British context, where environmental value is often considered separately to commercial activity. Future opportunities to restructure policy and supply chain relationships would benefit from promoting a cross cutting approach. By incentivising commercial reward for resilience this would help the industry become more oriented towards sustainability.

Theme 2 - Models of Coordination

Chapter 5 describes four coordination models.

Farmer Network (Case Study 7 - Pomahaka)

The Farmer Network (or Farmer Cluster) will be most familiar to British farmers. The strength of this approach is that it is farmer led and focuses on peer to peer interaction with actions genuinely owned by people on the ground. These kinds of initiative tend to originate from a targeted project or a public funded facilitator but in many cases, there is no direct or regular source of funding. Farmers report they enjoy being part of a network. They have pride in their local community, and it is a point of social contact (see Case Study 7). However, the network tends not have a commercial function and tends not to improve market access. Nonetheless their visible actions demonstrate to the wider public that resource issues are being considered. This reduces the risk of inspections but doesn't necessarily provide an auditable standard of management.

Third-Party Intermediary (Case Study 5)

Third-party programmes involve a collective organisation acting on behalf of a group of farmers with shared commercial interests. In the United States these tend to be farmer representative groups (e.g. the equivalent of NFU), farmer led *Resource Conservation Districts* (RCDs) or industry associations. They provide an extension and aggregation function, communicating and coordinating farmer responses to regulatory requirements. They also provide a feedback mechanism allowing groups of farmers to collectively negotiate with the regulator⁵¹.

⁵¹ This concept of the third-party group acting as the interface between regulator and farmer is discussed in the context of UK Abstraction Groups by Rey et al. (2017) *Developing drought resilience in irrigated agriculture in the face of increasing water scarcity* Reg Environ Change (2017) 17:1527–1540 DOI 10.1007/s10113-017-1116-6



In Case Study 5 this was formalised into a tiered system where the lowest risk tier (Stewardship/earned recognition) required no active intervention from the regulator because the farm has an audit trail demonstrating high levels of compliance, usually in the form of a whole farm plan completed in partnership with the programme. By comparison the highest risk tier signifies the need for full regulation oversight. This helps the regulator as they can reach more farmers without committing as much public expenditure.

The third-party programme tends to be funded by subscribing farmers. In return the farmer receives reduced cost services, including access to technical advice, permit and contract negotiations, collective risk mitigation, collective investment and access to grant funding. Furthermore, the service can also provide a commercial opportunity, providing farmers with a unique selling point built around their combined sustainability credentials.

Enabling Partnership (Case Study 6 - WAC)

An Enabling Partnership, such as the Watershed Agricultural Council (WAC) acts in a similar way to a third-party programme, however the key differences are:

- a. That the partnership is specifically farmer led, where executive decisions are made by a representative board of local farmers;
- b. The partnership acts as a gateway for the purchase of services from other interested parties. For example, in the case of WAC (Case Study 6) they procure management interventions to secure clean water for the City of New York. In this manner the partnership becomes a gateway for inward investment, used to secure a wide range of beneficial outcomes for farmers. As such the partnership tends not to require funding by participating farmers;
- c. Lastly the partnership goes beyond a regulatory baseline, securing high levels of environmental performance according to the requirements of the client.

Service Provider (Case Study 8 - BCI)

The final model considered is the Service Provider (Case Study 8), where the provision of a service to farmers is used to drive behavioural change. In this model part of the income received for an essential service (in this case water supply) is hypothecated to provide advisory services and administration to deliver a collective, catchment scale environmental performance change. It works in the context of a private irrigation company, where all farmers need to purchase water, but the condition of sale requires the purchaser to meet basic standards⁵².

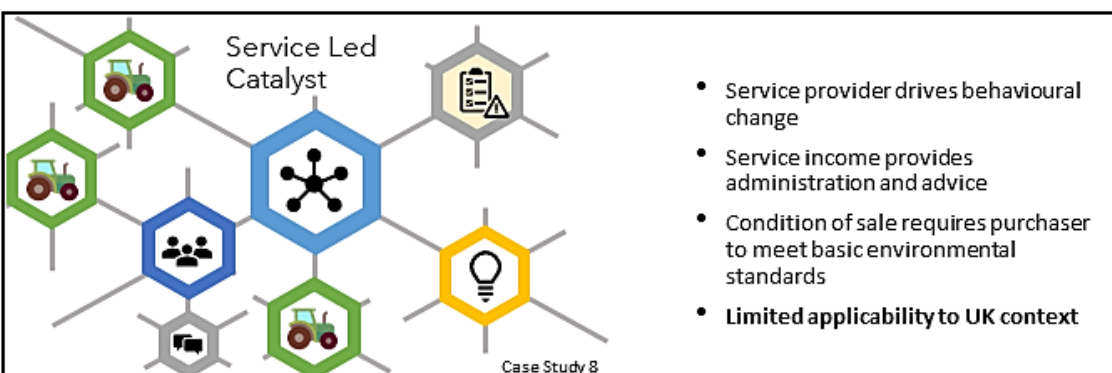
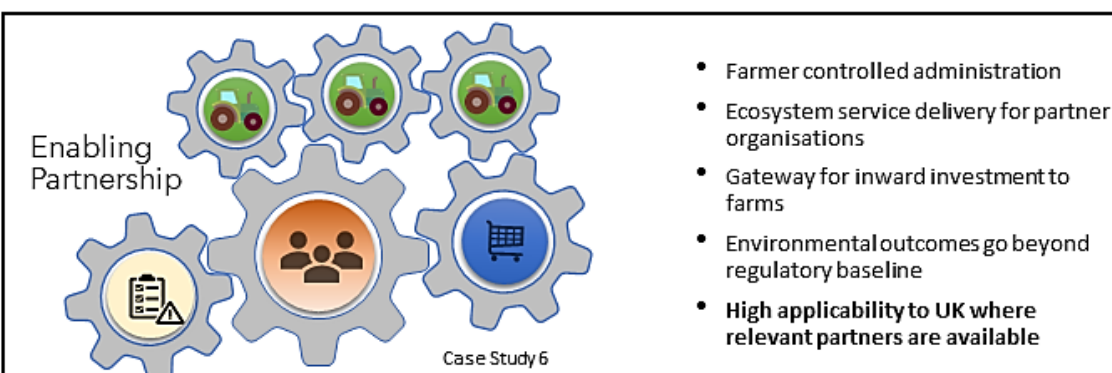
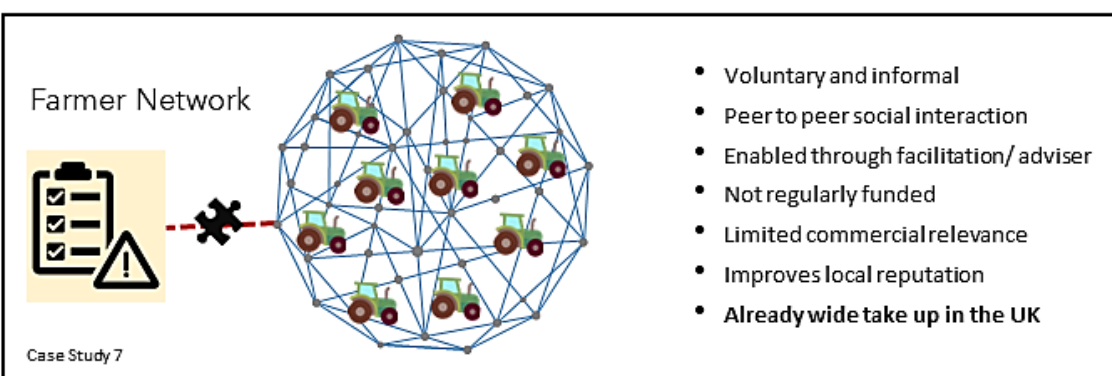
In a UK context it could be relevant in a circumstance where an independent body is mandated to provide a catchment system operator function. For example, if a single entity licensed the water rights for an entire catchment, or if an IDB attaches basic performance criteria before offering drainage services to a rate payer. However, in general the Service Provider model has limited applicability to the UK as the relevant circumstances mostly do not apply.

The diagrams below on the next page illustrate the case for each model.

⁵² The Service Provider Model could be described as a “sellers’ market” in comparison to the enabling partnership which is a “buyers’ market”.



Models of Coordination





Theme 3 – Adaptive Management

Finally, Chapter 6 considered a series of case studies where farmers were engaged in a process of behavioural change and management adaptation. There are three consistent factors linking these studies together:

- *Communication and Dialogue*: The process of change is one that is negotiated through continuous dialogue allowing for ongoing knowledge acquisition and consensus building. Case Study 10 offers a classic example where the *Ferdoñana* programme initially struggled to gain acceptance with local growers who viewed it as being too heavily influenced by outside interests. It was only after the project reconfigured around a farmer steering group that it gained momentum.
- *Supply Chain Partnership*: Supply chain partnership is an accelerating factor, building *critical mass*⁵³ around resource management concerns. For *Iberasparragal* ten farmers associated with a packing and distribution company have been able to secure a close working relationship and long-term supply agreement with the largest retailer in Germany through working together on water stewardship certification. Farmers report how the reputational value of this partnership is equally important to the commercial opportunity. In this example an accreditation programme has been used as a means of providing a collective profile around the sustainable performance of the group.
- *Enabling Organisations*: In nearly all case studies, a crucial role was played by supporting organisations offering technical insight and creative energy to find solutions to resource management challenges. A recurring feature in many US examples was the *Resource Conservation District*, local public organisations that support voluntary and scientifically sound natural resource stewardship through proactive planning, investment, decision support and project management. It was through the action of these local facilitators that some of the more innovative approaches were achieved; and it is this enabling function which is central to my recommendations.

By way of comparison, these three considerations have been brought to bear in a UK context within the Greater Lincolnshire Local Enterprise Partnership (LEP) Water Management Plan⁵⁴. Defined as “*locally owned partnerships between local authorities and businesses*” in England, LEPs currently play a central role in deciding local priorities for economic growth and job creation. In Greater Lincolnshire the LEP has recognised the core relationship between water sustainability and improved competitiveness where they see the development of an integrated approach to water management as a means of providing security for inward investment. This is closely linked with their Agri-Food Plan, which has a vision to double sector performance by 2030 by focussing on high value manufacturing and increased productivity within three Food Enterprise Zones⁵⁵. This combination of partnership and proactive spatial planning correlates with the international examples I’ve witnessed where a strategic approach delivers *sustainable* growth.

⁵³ See Skerratt, S. (2018) Recharging Rural, Report to The Prince’s Countryside Fund, London: The Prince’s Countryside Fund

⁵⁴ www.greaterlincolnshirelep.co.uk/priorities-and-plans/priorities/water

⁵⁵ See www.greaterlincolnshirelep.co.uk/priorities-and-plans/sectors/agri-food-sector

Farmer Coordination and Water Stewardship Tom Ormesher 2020

A Nuffield Farming Scholarships Trust report generously sponsored by the John Oldacre Foundation



Chapter 8 Conclusions

The Need for an Enabling Framework

1. Environmentally sustainable water management requires strategic planning and investment at a farm and catchment scale, and this goes hand in hand with broader question of rural economic development. In the UK there is a tendency to consider water and other natural resources separately from the rural economy, but there is a significant opportunity for economic growth if more enabling programmes link natural capital with market-based opportunities.
2. Sustainable development in the rural economy will not be achieved without a supporting framework, enabling farmers and other rural businesses to understand how to implement commercially relevant sustainability processes at a scale which is relevant to them. More focus is needed around knowledge transfer alongside technical research and development: a *diffusion infrastructure* enabling measures to be implemented by farmers at a meaningful level.
3. This scholarship has focussed on mechanisms of capacity building within commercial farming systems, so that farmers can secure more reliable access to critical resources such as water. The key conclusion I've reached concerns the social context in which opportunities are understood, farm business decisions are made, and outcomes incentivised. In other words, there needs to be an *Enabling Framework* providing critical mass around new approaches, defining economic development priorities and communicating outcomes.
4. It is the need for this framework, which is the core conclusion of this report and after having reviewed a range of options, I believe that the *Third-Party Partnership* offers the greatest potential for a British context. This offers the opportunity for groups of farmers to operate with a corporate identity and to take advantage of the commercial opportunities available through sustainability, for example in terms of collective profiling and resource resilience. In addition, the formal farmer-led partnership also helps to develop more strategic resource management and economic development priorities, whilst also providing a streamlined mechanism for farmers to engage with their regulator.
5. The main conclusion of this report is that the development and expansion of commercial coordination should be supported by regulatory agencies (such as Defra and the Environment Agency) in partnership with economic development bodies (such as Local Economic Partnerships, UKRI, AHDB), with programme oversight provided by an industry leadership group, following the model of the *New Zealand Water Leaders Group* discussed in Chapter 6 (Case Study 12).



Chapter 9 Recommendations

Recommendation 1 - Third Party Programmes

The principal recommendation of this report is that a pathfinder project should be undertaken to investigate the relevant scope and context for encouraging farmer led third-party organisations in England and Wales. These organisations could become the backbone of a new and effective working relationship with the regulator and provide the opportunity for coordinated commercial positioning. The project should consider the statutory mechanisms by which they can be constituted and the revenue mechanisms allowing them to operate. The project should also consider the status and operation of existing third-party mechanisms in England and Wales such as Producer Organisations⁵⁶ and Abstractor Groups to identify opportunities for the further growth, expansion and support of these bodies.

Recommendation 2 – Resource Management Advisory Services

Defra should undertake a review of the structure and function of resource management advisory services in England and Wales. There is a complex and fragmented array of private, public and third-sector organisations with overlapping objectives. Not only is this inefficient but has made it difficult to track industry progress and set multi-annual objectives. There has been an extremely wide variation in direct engagement with the farming industry where there are many interested parties (such as Catchment Partnerships and Rivers Trusts) seeking behavioural change from farmers, but little way of tracking whether there has been any meaningful communication, discourse or partnership working. The review should consider the model of *Resource Conservation Districts* in California and other similar statutory organisations across the United States. They offer the opportunity to streamline existing resource conservation programmes and to secure genuine farmer led decision making at an appropriate geographic scale.

Recommendation 3 – On-Farm Resilience Planning

UK farmland has a significant opportunity to offer a range of resilience services to the wider public in terms of soil erosion control, flood risk management, the provision of local water networks for water security and other climate change adaptation opportunities. In many cases catchment modelling has already investigated this potential but the options remain theoretical and without a clear delivery pathway. Decision support tools are needed to give landowners the capability to assess and decide the market service offerings that their land could provide. In order to achieve this, a tailored suite of maps and metrics needs to be made available to landowners and managers, facilitating the creation of a portfolio of potential service offerings to be presented in a farm plan as a way of drawing in external investment⁵⁷.

⁵⁶ See **Appendix C** for overview on Producer Organisations

⁵⁷ See **Appendix D** for example US NRCS Resource Conservation Plan. Farmers in the United States are required to have this basic resource conservation risk assessment such as this in place in order to be eligible for federal loans, insurances and disaster relief payments.



Recommendation 4 – Training for Strategic Decision Making

The final recommendation relates to the dual opportunity for farm businesses to deliver both commercial and environmental enhancement. Many sectors of the UK economy require *diffusion infrastructure* where companies need support and technical know-how to secure better commercial positioning. The farming sector is no different and needs better supporting services alongside mid-career training and business development advice. In this context, Local Authorities, Local Enterprise Partnerships and other interested parties should consider packages of measures targeted at the farming sector such as:

- Company Mentoring - enabling sharing of skills and knowledge
- Training - “mini-MBAs” to help close the skills gap; and
- Formal networks – systematic institutional means of enabling skills transfer.



Chapter 10 After My Study Tour

Following my study there are several relevant areas that I'm now working on, including:

- Developing a trial of the new Defra Environmental Land Management Scheme, which is to replace the Basic Payment Scheme in England and Wales after the UK exits the EU. The trial is focussed on enabling a coordinated approach to whole farm planning, which incorporates risk resilience as a public good, in line with the observations of Chapter 4.
- Developing a regional profile for the farming industry in South East England. This work is intended as a prospectus for inward investment in food and farming through profiling the positive credentials of the sector. This profiling work is inspired by several case studies in the report.
- Further promotion and development of:
 - A farming sector focussed water resource strategy for South East England, linking observed demand trends and realistic economic growth projections. The sector needs a plan which is aligned with sector specific economic development priorities and this can only be achieved through further partnership and collaboration projects;
 - A strategic approach to rural economic development in the region, including the development of technical extension partnerships (similar for example to Agri-Tech East) and better business administration skills in the sector;
 - An industry focussed freshwater leaders group, which brings together recognised industry leaders from the food and farming sector to address industry specific water sustainability challenges; and
 - The creation of more formal local company structures to enable farmers to secure better commercial outcomes within the context of sustainable water management. Over recent months this has been an area of active work within the context of the Arun Valley Vision Group⁵⁸ where our stakeholder group is advancing an adaptive management approach to flood risk mitigation in West Sussex.

⁵⁸ See www.avvg.co.uk



Acknowledgements

A great many people have shown me incredible kindness and support over the course of my scholarship, for which I am extremely grateful. I would like to express my thanks to all of the interviewees and hosts that have made this experience of global farming so warm and personable. A few key mentions need to be made. First to William White, who as my line manager at the NFU has made this experience possible; and to my partner Jen for the patience and ongoing support I've needed. Also, to Alison Blackburn, for giving her time in reviewing this report. Finally, to Rob Webb, Nuffield Australia scholar and GFP buddy. There was a moment swimming in the Sea of Galilee, overlooked by the Yarmouk Hills. He mentioned his enthusiasm for the concept of 'PIP' – personal intellectual property. The moment and the concept have been a source of inspiration over the past year, which has been as much of a personal journey as it has a professional and academic one.

Appendix A – Watershed Agricultural Council Whole Farm Plan

WHOLE FARM PLAN SUMMARY and WFP-2: BMP BUDGET & PROJECTED IMPLEMENTATION														
WFP-2 Revision 14										Easement Applicant		Supplemental (1)		
Landowner Participant:					Agreement No.:			County:		Date:				
Best Management Practice (BMP)					NRCS / WAC Code	Units Planned	Prior Planning Estimate	Planning Estimate	Other Funding Source	Units Completed	Date Completed	Funds Expended to Date	Workload Group	Revision Description
#	Code	Location	Tax ID	Name (Life Span)										
VII. Sediment - Diffuse					Pastures not properly rotated due to a lack of water.									
07		T761 F1,4,11		Prescribed Grazing (1)	556	71 ac	\$0.00	\$0.00						
7a		T761 F11	174.-1-8 174.-1-28	Spring Development (10)	574	1 proj	\$27,893.00	\$27,893.00	EQUIP \$7,350.00	6 troughs 2400' line 1 proj	10/2/09 12/4/00	\$12,857.00 \$15,036.00		complete
VIII. Sediment - Concentrated					Erosion on cattle lane near stream. Erosion on stream bank.									
5		T761 F5	174.-1-28	Animal Trail & Walkway (10)	575	300'	\$0.00	\$0.00			see BMP 3			complete
11		T761 F5	174.-1-42 174.-1-43	Stream bank Stabilization (10)	580	100'	\$24,300.00	\$24,300.00		155'	9/5/08	\$24,300.00		complete
IX. Pesticides - Field & Animal Application					No pesticides used on the farm.									
X. Fuel Storage					Storage is currently adequate.									
XI. Other Materials					No other issues.									
Sub Total (DiBenedetto)					\$363,413.80	\$605,794.80	\$7,350.00			Total Paid	\$388,313.80	Last Approval Date: Junr 12, 2018		
WAP CREP Funding														
V. Nutrient Management					Cattle have free access to Vly Creek and tributaries.									
6a		F5 Beaver Dam	174.-1-40 174.-1-41 174.-1-42 174.-1-43 174.-1-44	Riparian Forest Buffer	391a	6.5 ac.	\$0.00	\$0.00	\$0.00	6.5 ac	8/27/00	\$0.00		Complete
6a1		F5 Beaver Dam	174.-1-40 174.-1-41 174.-1-42 174.-1-43 174.-1-44	Fence	382	3,500'	\$5,186.00	\$2,593.00	FSA \$2,593.00	3,448'	8/19/99	\$2,593.00		Complete
6a1	FR	F5 Beaver Dam	174.-1-40 174.-1-41 174.-1-42 174.-1-43 174.-1-44	Fence - Flood Repair	382	3,500'	\$1,490.00	\$745.00	FSA \$745.00	3,500'	5/22/12	\$745.00		complete
6a2		F5 Beaver Dam	174.-1-37 174.-1-38 174.-1-39 174.-1-40	Spring Development	574	1 proj	\$14,140.00	\$7,070.00	FSA \$7,070.00	1 proj	1/27/00	\$7,070.00		Complete
6a3		F5 Beaver Dam	174.-1-40 174.-1-41 174.-1-42 174.-1-43 174.-1-44	Tree & Shrub Planting	612	3 ac	\$1,476.00	\$738.00	FSA \$738.00	3 ac	8/10/01	\$738.00		Complete
6b		F5 Elk Creek	174.-1-37 174.-1-38	Riparian Forest Buffer	391a	1 ac	\$0.00	\$0.00	\$0.00	1 ac	8/99	\$0.00		Complete
6b1		F5 Elk Creek	174.-1-37 174.-1-38	Fence	382	1,052'	\$1,560.00	\$780.00	FSA \$780.00	1,052'	8/19/99	\$780.00		Complete
6b1	FR	F5 Elk Creek	174.-1-37 174.-1-38	Fence - Flood Repair	382	1,052'	\$388.00	\$194.00	FSA \$194.00	1,052'	5/22/12	\$194.00		complete
6b2		F5 Elk Creek	174.-1-37 174.-1-38	Tree & Shrub Planting	612	1 ac	\$308.00	\$154.00	FSA \$154.00	1 ac	10/2/02	\$154.00		Complete

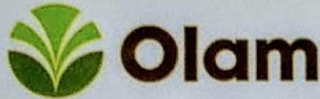
WHOLE FARM PLAN SUMMARY and WFP-2: BMP BUDGET & PROJECTED IMPLEMENTATION														
WFP-2 Revision 14				Easement Applicant						Supplemental (1)				
Landowner Participant: Chris & Judy DiBenedetto					Agreement No.:		GRP-003		County: Greene		Date: June 2018			
Best Management Practice (BMP)					NRCS / WAC Code	Units Planned	Prior Planning Estimate	Planning Estimate	Other Funding Source	Units Completed	Date Completed	Funds Expended to Date	Workload Group	Revision Description
#	Code	Location	Tax ID	Name (Life Span)										
					2014 Re-enrollment BMPs for # 6a and 6b series. As Per the NYC CREP MOU: Livestock Water System includes: Well, 1000' Pipeline, and 2 Water Facilities									
06a	C RE1	T761 F2	174.-1-40 174.-1-41 174.-1-42 174.-1-43 174.-1-44	Riparian Forest Buffer	391a	5.9 ac	\$0.00	\$0.00					1	
PH01	C RE1	T761 F2	174.-1-40 174.-1-41 174.-1-42 174.-1-43 174.-1-44	Fence - Re-enrollment	382	3,448'	\$0.00	\$0.00						
6a2	RE	T761 F5	174.-1-37 174.-1-38 174.-1-39 174.-1-40	Livestock Water System - Spring Development (Shallow Water Well/Solar Pump) - Re-enrollment	642	1 proj	\$16,000.00	\$8,000.00	FSA CAP	1 proj	10/13/15	FSA \$8000 \$8,000.00		complete
06b	C RE1	T761 F3	174.-1-37 174.-1-38	Riparian Forest Buffer	391a	2.3 ac	\$0.00	\$0.00					1	
PH02	C RE1	T761 F3	174.-1-37 174.-1-38	Fence - Re-enrollment	382	1,052'	\$0.00	\$0.00						
Total for CREP (DiBenedetto)							\$40,548.00	\$20,274.00	\$20,274.00	CREP Total Paid		\$20,274.00		
Total (DiBenedetto)							\$403,961.80	\$626,068.80	\$27,624.00	Grand Total Paid		\$408,587.80		

WFP-2 Revision 14														WHOLE FARM PLAN SUMMARY and WFP-2: BMP BUDGET & PROJECTED IMPLEMENTATION														Supplemental (1)			
Landowner Participant: Chris & Judy DiDonato														Agreement No.:		GRP-003		County: Greene		Date: June 2018											
Best Management Practice (BMP)					NRCS / WAC Code	Units Planned	Prior Planning Estimate	Planning Estimate	Other Funding Source	Units Completed	Date Completed	Funds Expended to Date	Workload Group	Revision Description																	
#	Code	Location	Tax ID	Name (Life Span)																											
Identified Resource Concern (IRC)																															
IV. Parasites - Animal & Manure Management					Calves raised in barn have inadequate space and poor ventilation. Calves raised outside in hutches located in H.S.A																										
IRC 06		T761 FS	174.-1-28	Calf Greenhouse - Solar (with covered manure pad) (10)	WAC 3110	45'x65'	\$0.00	\$145,000.00					0																		
V. Nutrient Management					Lack of infrastrcture for grazing lands limits pasture availability and ability to rotational graze, leading to poor nutrient distribution on the farm.																										
IRC 03RR1		T761 F7	174.-1-28	Animal Trail and Walkway (10)	575	250 ft.	\$0.00	\$10,000.00					4																		
					Livestock have access to the stream																										
IRC 02		T761 F4	174.-1-28	Fence - High Tensile - Exclusion (20)	382	2555 ft.	\$0.00	\$ 8,950.00					2																		
IRC 05RR1		T761 F5A	174.-1-28	Animal Trail and Walkway (10)	575	100 ft.	\$0.00	\$ 8,000.00					4																		
VI. Nutrients - Concentrated Sources					Concentrated runoff from heifer winter feeding area reaches an H.S.A																										
IRC 06		T761 FS	174.-1-28	Manure Storage/HUAP Covered - Concrete (15)	WAC 3060	50'x70'	\$0.00	\$165,000.00					6																		
IRC 07		T761 F1B,F7	174.-1-28	Fence - High Tensile(20)	382	580 ft.	\$0.00	\$2,030.00					6																		
V.2 Nutrient Management (CREP)					Livestock have access to the stream																										
IRC 01a	C	T761 P	174.-1-28	Riparian Forest Buffer	391	3.13 ac	\$0.00	\$0.00					3																		
IRC 01b	C	T761 P	174.-1-28	Tree and Shrub Establishment	612	1.2 ac	\$0.00	\$ 2,700.00					3																		
IRC 01c	C	T761 P	174.-1-28	Herbicide Weed Control	612	1.2 ac	\$0.00	\$ 600.00					0																		
IRC 01d	C	T761 P	174.-1-28	Natural Regeneration	612	1.9 ac	\$0.00	\$0.00					3																		
IRC 01e	C	T761 P	174.-1-28	Fence	382	2300 ft.	\$0.00	\$ 8,050.00					2																		
IRC 01f	C	T761 P	174.-1-28	Pipeline and Facilities	516	625 ft. 2 ea.	\$0.00	\$ 6,100.00					2																		
IRC 01g	C	T761 P	174.-1-28	Livestock Crossing	578	1 ea.	\$0.00	\$ 16,000.00					2																		
Total for IRC							\$0.00	\$155,000.00	\$0.00			\$0.00																			

Appendix B – Olam Revolving Finance Agreement

OLAM INTERNATIONAL USD\$500M SUSTAINABILITY LOAN


USD 500,000,000



Olam

Olam International Limited

Green Loan



Joint Lead Manager

26 March 2018

DEAL HIGHLIGHTS

- ✓ Olam is the first company in Asia and the agri-sector to secure a sustainability-linked club loan that links the interest rate on the loan to achieving clear sustainability targets.
- ✓ 3-Year Revolving Credit Facility with the potential of achieving more favourable pricing compared to similar facilities on the market, should improvement targets be met.

TRANSACTION OVERVIEW

Background

- ✓ Olam International Limited ("Olam") is a leading agri-business operating across the value chain in 66 countries. The company supplies food and industrial raw materials worldwide.
- ✓ Its main business segments include agri-products such as edible nuts, cocoa, spices and vegetable ingredients, coffee and cotton.
- ✓ Olam is headquartered in Singapore and listed on the SGX-ST. Olam has a market capitalisation of SGD\$7.3 billion, and 2017 EBITDA of SGD\$1.5 billion. Annual revenues were SGD\$27.4 billion in 2017.

Asia's first sustainability-linked club loan

- ✓ Within Asia's financial landscape, green bonds have been the primary sustainable financing tool deployed.
- ✓ Olam's three-year sustainability-linked revolving credit facility is Asia's first sustainability-linked club loan – one that has multiple banks issuing the loan together and in collaboration with the borrower on achieving sustainability targets.
- ✓ Under the Facility, Olam is committed to meeting improvement targets for a comprehensive range of environmental, social and governance (ESG) metrics, as assessed by Sustainalytics – a global leader in ESG and corporate governance research and ratings.
- ✓ Olam will be evaluated on more than 50 criteria including carbon intensity, responsible sourcing and marketing and board diversity and independence.
- ✓ The metrics are tested on an annual basis. Should the pre-set improvement targets be achieved, then the interest rate on the Facility will be subsequently reduced.

ANZ'S VALUE ADD

- ✓ The transaction was well aligned with ANZ's approach towards sustainability which is about ensuring our business is managed to take account of social, environmental and economic risks and opportunities.
- ✓ The alignment on sustainability, together with ANZ's agri-business domain, green financing expertise and the depth of relationship with Olam helped in executing the transaction in an efficient manner.

SUMMARY TERMS

Borrower:	Olam International Limited
Margin	Linked to sustainability targets
Tenor:	3 Years
Size:	USD 500 million
ANZ's Role:	Joint Lead Manager

Slide shared during meeting with ANZ as part of GFP visit in Singapore



Appendix C – Producer Organisations⁵⁹

This Appendix has been included to provide a brief outline of the existing Producer Organisation model. Most of this is taken from *Producer Organisations after Brexit (July 2017)* produced by the British Growers Association and Savills. It is of note that organisations such as the Green Alliance and National Trust have identified the PO model as one which could be adapted to make privately funded environmental enhancement schemes eligible for match funding⁶⁰.

What is a Producer Organisation?

There are 33 PO's currently operating in the UK under the EU Fresh Fruit and Vegetables Aid Scheme. They are formed on the initiative of farmers who are growers of one or more approved products and must have:

- at least 5 individual grower members all of whom are separate legal entities
- an annual turnover of €1 million marketable production; and
- a democratic structure that gives members an equal say.

POs develop three to five-year Operating Plans with a balance of objectives concerning production planning, product quality, boosting commercial value, market promotion, environmental measures and crisis prevention/ risk management.

A PO must also set up an operational fund to finance its programme. Members of the PO finance the operational fund, which may qualify for EU financial assistance, under the Fruit and Vegetable Regime. Where *"The match funded grant aid provided through the network of POs plays a vital role in supporting the UKs innovative growers to plan and continually develop their activities. It helps to maintain investment whilst reducing the risk of that investment. This in turn generates improved productivity and efficiency, higher rates of return, great customer value and maintains grower confidence"*.

They aid participant growers through better market positioning, cost reduction and increasing the *"overall viability of all members and achieve a more sustainable balance in the supply chain"*.

Producer Organisations and Sustainability

The PO model encourages the use of environmentally sound cultivation, production and waste management, to protect the quality of water, soil, landscape and biodiversity.

According to Rural Payments Agency Guidance (2018⁶¹):

- *"POs must include at least two environmental actions in their operational programme or, such actions must account for at least 10% of the operational programme expenditure"* and
- *"In the case of environmental investments aimed at achieving a reduction in the current use of production inputs, emission of pollutants or waste from the production process, the PO must provide an attestation from an independent body of the reduction to be made as a result of the investment"*

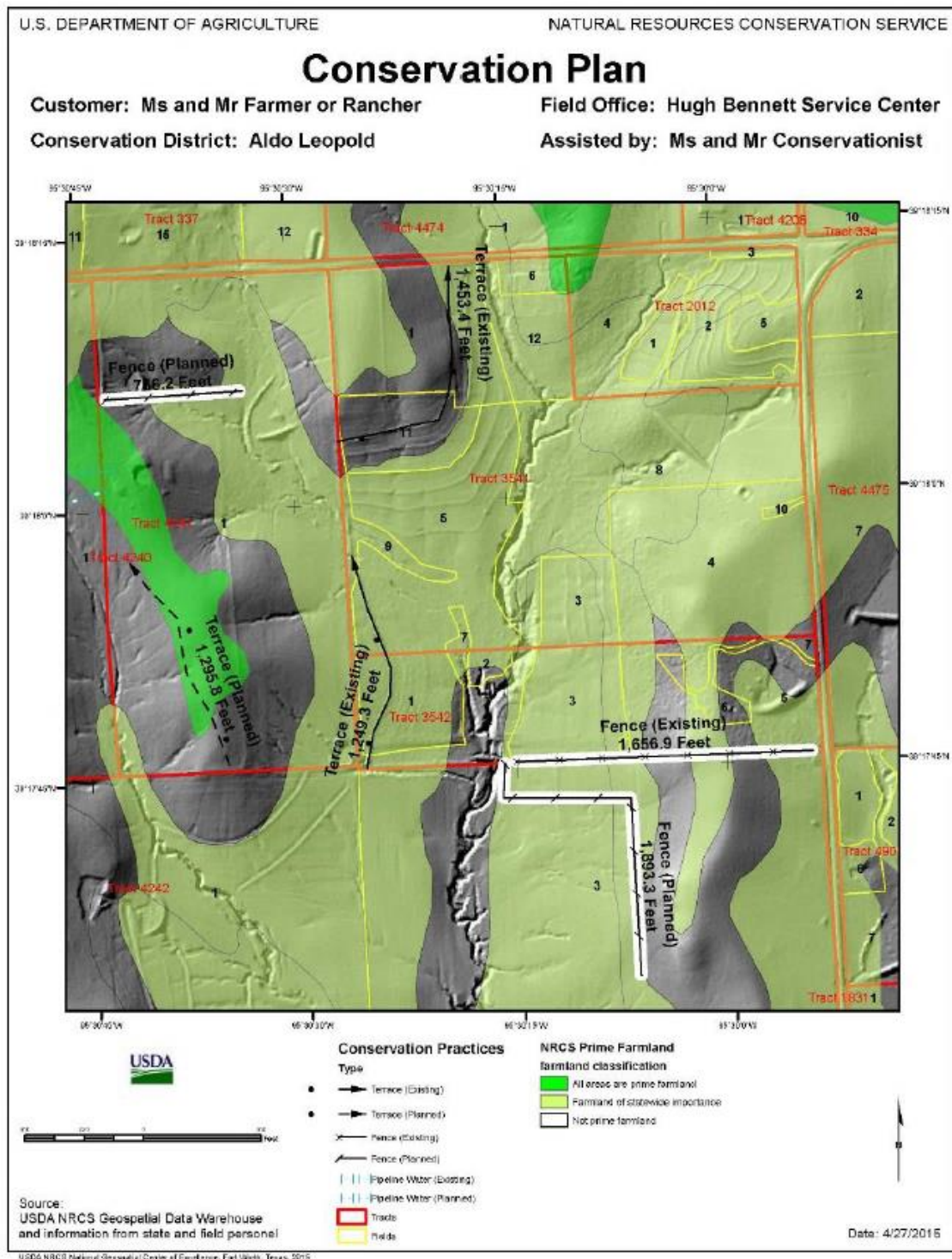
⁵⁹ The information in this section is taken from www.gov.uk and *Producer Organisations after Brexit (July 2017)* The British Growers Association

⁶⁰ See Green Alliance Policy Insight (November 2018) *Funding Natures Recovery – How New Public Spending Can Unlock Private Investment* www.green-alliance.org.uk

⁶¹ See www.gov.uk/guidance/introduction-to-producer-organisations-for-growers



Appendix D –Example NRCS Resource Conservation Plan





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