Further economic evidence to support LNPs in the Southwest:

The LNPs in the Southwest have asked for further evidence on a range of topics. The most common requests were regarding:

1. Water quality
2. Carbon
3. 'Green attractions'
4. Grass fed beef
5. Marine /Coastal

Below is a collection of evidence on these 5 topics. Please bear in mind that this work was based on a quick scan across existing research, and is not an exhaustive list of references.
(Number of days commissioned for this work: 3 days).

1. Water quality

The quality of water will affect a range of market benefits for particular sectors and groups, such as:

- those which abstract and use water, such as water companies,
- those providing recreation and tourism services (inc bathing, angling, boating, canoeing)
- those involved in commercial fisheries, including shellfisheries (see section 5 'Marine')

Water companies - cost savings on water treatment:

Ecosystems contribute to water quality through natural processes. Numerous natural habitats such as upland and peatland areas are sources of our drinking water. If damaged (e.g. through drainage, erosion, burning), this leads to deterioration of water quality.

Household drinking water supplies are routinely treated to bring them up to potable standards, and hence result in to the costs accruing to water users. Avoided cost calculations can be made for peat restoration, but they will vary on a catchment-to-catchment basis and are not known at a national level. However, one study showed benefits from avoided costs of treatment were around £5 million over 10 years.[1]

South West Water is investing £9.1m in Upstream Thinking between 2010 and 2015, aiming to deliver better quality raw water, by influencing landmanagers to improve moorland/farmland management. This would avoid the need for capital investment to upgrade treatment works and the operational expense of using large amounts of energy and chemicals to treat water. The benefit: cost ratio of this project has been calculated at 65:1 over 30 years (i.e. if they invest £1 in prevention, then they save £65 in treatment costs), at a cost of just 65p per customer over five years.[2]

"Substantial financial income can come from benefits to water provision and increased water quality. This involves quantifying benefits from, for example, more reliable base flows in dry weather, a possible improvement in peak flow control to prevent downstream flooding, improved water quality with consequent water treatment savings, but also a reduced demand for reservoir releases and cost savings from a reduced need for pumped storage. An estimate of the cost of restoration and operating water treatment works in SW England suggests that delaying the upgrade of major treatment works by 10 years would offer a benefit to cost ratio of 65 : 1 over 30 years (M. Ross, unpublished data)."[3] (see also benefits of carbon sequestration in Section 2 on Carbon)

[1] Morris & Camino, UK NEA Economics Analysis Report Freshwaters,2011
[2] http://www.sww-cr-report-2012.com/environmental-sustainability/upstream-thinking/
[3] Emilie Grand-Clement, Karen Anderson, David Smith, David Luscombe, Naomi Gatis, Martin Ross and Richard E. Brazier, Journal of Applied Ecology Evaluating ecosystem goods and services after restoration of marginal upland peatlands in South-West England Journal of Applied Ecology 2013, 50, 324–334

Tourism industry - benefits of clean bathing waters to local people and visitors

Pollution from farming and sewage can cause significant diffuse microbiological pollution of bathing waters[4].

South West Water's 'CleanSweep' programme invested £1.5 billion in upgrading the sewage system, successfully improving the water quality of the region's bathing areas, with all 144 bathing sites achieving 100% compliance with the EU mandatory standard in 2006 (compared to 51% in 1996). Improvement in bathing water quality has played an important role in the growth of the surfing industry in the Southwest.[5]

Tourism is a major economic driver in the South West, generating approximately £9.4 billion of spend per year and supporting an estimated 268,000 FTE jobs (11% of total employment). [6]

Total number of trips (Day & staying visits)	118,014,000
Total visitor related spend	£9.4 billion
Total employment (FTE's)	198,457
Total employment (Estimated actual)	268,894
Proportion of total regional employment	11%

Detailed tourism figures for each county can be found on:
http://www.swtourismalliance.org.uk/documents/q/category/finance-facts-figures-documents/value-of-tourism-archive/value-of-tourism-2008/

78% of holiday trips are motivated by the South West's conserved landscape. 87% of respondents rate 'cleanliness of the sea' as an important factor when deciding to visit the beach, reflecting the significance of water quality to the region's reputation.[7]

The 2005 Wellbeing@Work survey found that workers and bosses in the Southwest region enjoy higher levels of well-being at work than anywhere else in the UK. "The benefits are clear – 95% of people feel that a visit to the beach has a positive impact on their health and happiness. The fresh sea air and exercise make people feel calmer, happier, healthier and less stressed."

Willingness to pay for improvements in water quality

Various studies have been carried out to establish the value of people's Willingness to Pay (WTP) for different water quality improvements. The WTP values vary considerably, depending on the questions asked and the setup of the study. Below are 3 examples:

- In 2008, South West Water (SWW) did a study, which measured a WTP (Willingness to Pay) of another £2.60 per household for additional environmental improvement (this is on top of the already highest water bills in the country).
- A study by Nera/Accent to establish the Willingness to Pay for the WFD (Water Framework Directive) improvements showed this was very likely to lie in the range between £44.5 to £167.9 per household per year for the 95% package for England and Wales. Aggregate estimates of the values of six alternative WFD improvement scenarios ranges from £18bn to £29bn, for England and Wales.[8]

[4] DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL concerning the quality of bathing water, 2002
[5] THE NEW SOUTH WEST – CLEAN SWEEP AND BEYOND, South West Water, 2007
[6] The Value of Tourism 2008
[7] The South West Bathing Waters Study, South West Tourism, 2005
[8] The Benefits of Water Framework Directive Programmes of Measures in England and Wales, Nera/Accent, 2007

- The Environment Agency used WTP figures to calculate the average benefit (per £/km/year) of improvements of river water quality in England and Wales River basin district. The table below shows the average benefit (£ per km per year) of increments in river water quality by change in status.[9] (for more details, see the UK NEA of Freshwater ecosystem services)

Table 1: average benefits (£/km/year) of change in river quality status

Change in status	Low to Medium	Medium to High	Low to High
South West	10.2	11.9	22.1

Below is an example of a case study that looked at the value of water provided by the hills of West Penwith which provides drinking water to the local population (and visitors). It also looked at the value of improvements to water quality, and the value of improvements in the environment (biodiversity and heritage).

Case Study: The value of drinking water in West Penwith[10]

The hills of West Penwith provide the primary source of drinking water for the population of Penwith. The Drift Reservoir in Penwith is a supply sub-system of the Colliford strategic supply system of South West Water. The Drift Reservoir is fed by two rivers:

- Newlyn River to the North, which finds its origins around Lanyon; and
- Sancreed Brook to the West, which has its source at Bosence

The Drift Reservoir collects and treats the drinking water to a resident population of 50,752 people (which increases dramatically during tourist season), including the conurbation of Penzance. Drift Reservoir holds a capacity of 1,200 megaliters (i.e. 1,200 million liters). Drift Reservoir supplies 3,137 megaliters per year, which is equal to 3,137,000m^3. The supplies of the Drift reservoir can be supplemented by the 'Cornwall spine main', which connects to Stithians Reservoir.

The economic value of this water supply can be calculated by multiplying this figure with the Long Run Marginal Cost (LRMC), which is the cost of sourcing the water from a different source. This LRMC includes the cost of 'Resources, Bulk Transport' and 'Treatment'. It excludes the cost of distribution to the households, as this cost would occur regardless of where the water came from. The LRMC of South West Water for 2010/11 is £0.59/m^3. Based on this calculation, the economic value of the water supply for this area equals: £1,850,830 per year.

WTP values for improving water quality

In 2009, South West Water carried out a detailed market research into customer priorities and willingness to pay (WTP) for service improvements. This research found that the average customer WTP for a range of improvements was £13.69. This covered improvements to both the supply (i.e. supply reliability, hosepipe bans), and water quality. For example, it showed that WTP was £3.10 per household per annum to improve the water quality in terms of its chemical content and aesthetics (discolouration and odour).

They also asked customers for their WTP for improvement of sites in terms biodiversity and heritage, which found a WTP of £0.77 per household per annum. Based on an average number of people per household in Cornwall of 2.2, this would equal a total WTP of £17,000 per year. When people were

[9] Source: Environment Agency (2009) Benefits Review June 09

[10] Kieboom, E. 'Evaluating and communicating the value of the ecosystem services provided by the moorland and small field systems in West Penwith, Cornwall', 2011

asked for their WTP to prevent deterioration of the biodiversity and heritage of a site, then there WTP increased to £4.73 per household per annum. Based on this value, the WTP would be £108,000 per annum.

2. Carbon

Carbon is ***stored*** in the vegetation and in the soil. The total amount of carbon held by vegetation in Great Britain is estimated to be 114 Mtonnes. The majority of carbon is held in the soil: the amount of carbon in the soils of Great Britain is estimated to be 9838 Mt (6948 Mt in Scotland and 2890 Mt in England and Wales).[11]

A habitat (e.g. woodland, heathland, peat bog, pasture) can function as a carbon sink, if it 'sequesters' carbon, i.e. if it adds to the carbon store. Whether a particular habitat is able to act as a 'carbon sink' is highly dependent on the management of that habitat, as drainage, grazing, and burning etc will have an effect on the amount of carbon sequestered. For example, an 'intact' peat bog ***sequesters*** 3 tonnes CO2eq/ha/yr, while an 'eroded, severely degraded' peat bog ***emits*** 31 tonnes CO2eq/ha/yr.[12]

Note: an assessment of the *potential for carbon sequestration of any particular habitat is complex, and should be based on a local soil analysis, and take into account the management over time. This paper does not endeavour to provide ballpark carbon sequestration figures.*

Carbon credits
Carbon credits are tradable permits, with one credit representing the right to emit one tonne of carbon dioxide (or another greenhouse gas with a carbon dioxide equivalent (tCO_2e) to one tonne of carbon dioxide).

The Woodland Carbon Code aims to offset carbon emissions. It is a voluntary standard for woodland creation projects in the UK which will make claims about the carbon dioxide they sequester. The Woodland Carbon Code was launched in 2011, and to date, 78 projects have registered which will create almost 3000 hectares of new woodland and sequester 1.37 million tonnes of carbon dioxide over their lifetime (of up to 100 years). 40% of the registered woodland area has already been validated by independent certification bodies. [13] These carbon carbon credits can be bought by organisations (e.g. businesses) to off-set their carbon emissions.

A newly published report[14] commissioned by Defra and NERC identifies 12 opportunities for businesses that value and/or protect nature's services, ranking the opportunities for 'peatland carbon code' (together with 'biodiversity offsets') the highest.

"Development of a peatland carbon code would provide a transparent, verifiable framework for companies to purchase carbon credits to support restoration and rewetting of degraded peatlands. Consequent carbon savings could then be sold on the voluntary carbon market. Should government

[11] R. Milne and T. A. Brown, Carbon in the Vegetation and Soils of Great Britain, *Journal of Environmental Management* (1997) 49, 413–433
[12] Technical appendix: case study on developing the market for carbon storage and sequestration by peatlands, for Defra/Natural England, Crichton Carbon Centre, June 2013
[13] Forestry Commission Great, Britain/England Annual Report and Accounts 2012-13
[14] G Duke, Principal Investigator, I Dickie, T Juniper, K ten Kate, M Pieterse, M Rafiq, M Rayment, S Smith, N Voulvoulis Opportunities for UK Business that value and/or protect nature's services, 14 June 2012

recognise peatland in its greenhouse gas accounting procedures, they could also be presented in company reports as part of their Corporate Responsibility initiatives."

The development of a 'Peatland Carbon Code' is still in progress, and there are no UK-based peatland projects (yet) that sell carbon credits. Any carbon project would need to meet strict criteria, such as:

- 'Additionality': only carbon credits from projects that are "additional to" the business-as-usual scenario represent a net environmental benefit. "*If you rewet for biodiversity, you cannot claim carbon credits*"[15]
- 'Leakage': the activities stopped may not continue elsewhere.
- 'Permanence': the emissions reductions must be forever (or at least a long period of time). There may be risks regarding the ownership, hydrologic connectivity, technical capability, endorsement by local population and authorities.

The economic value of carbon offsets is based on the quantity of ton carbon equivalent sequestered and the price.

Price

The price for carbon credits is established in the market. There are two distinct markets for carbon credits:

- The 'Compliance Market'; certain organisations which emit large amounts of CO_2 have to buy carbon offsets in order to comply with post-Kyoto regulations. The European Emissions Trading Scheme (EU ETS) is the largest and dominates the global carbon markets.
- The 'Voluntary Market'; organisations and individuals can voluntarily choose to purchase offsets called Voluntary Emission Reductions (VERs) to mitigate their own greenhouse gas emissions (e.g. transport, power consumption, etc). The voluntary market is currently smaller than the compliance market, but is expected to grow, as major companies such as Tesco, the Co-op, IKEA, SAS and Marks and Spencer are aiming for carbon neutrality.

EU ETS prices are quoted on the stock market, but VERs are transacted via intermediaries and there is currently not a transparent market price. There is also a 'non-traded price of carbon', which is used for appraising UK policies that reduce or increase emissions in sectors not covered by the EU ETS. Some research on price information shows that:

- There are widely varying prices for carbon credits, with less than €5 per tonne of carbon dioxide equivalent (tCO_2e) for the EU ETS scheme[16]
- Prices for the voluntary market are "below $10, but mostly $2-3" per [$CO_2e$][17], "the average price for VERs increased slightly from $6/tCO2e in 2010 to $6.2/tCO2e in 2011"[18] Climate Care website quotes £7.50/tCO2e[19]
- DECC has calculated a non-traded price of carbon (shadow price of carbon) for 2013 of £29/tCO2e (low) and £86/tCO2e (high), with a central price of £57/tCO2e[20]

In the longer term (2030 onwards) consistent with the development of a more comprehensive global carbon market, the traded and non-traded prices of carbon will converge into a single traded price of carbon.[21]

[15] Joosten, H., The Voluntary Carbon Standard Peatland Rewetting and Conservation
[16] BBC, 16 April 2013
[17] *"Prices are below $10 per ton, but mostly $2-3 per ton* [$CO_2e$]", Pers Comm. Mark Reed, University of Aberdeen at a Conference Payment for Ecosystem Services, 1 May 2012
[18] Developing Dimension: State of the Voluntary Carbon Markets 2012, A Report by Ecosystem Marketplace & Bloomberg New Energy Finance, 31 May 2012
[19] http://www.communitygateway.co.uk/news/item.aspx?section=14&item=17
[20] A brief guide to the carbon valuation methodology for UK policy appraisal, DECC, October 2011

It is difficult to arrive at an accurate cost-benefit analysis of peatland restoration, as there is much uncertainty regarding:

- the amount of carbon sequestered over time (under different management and climatic conditions, etc)
- the cost of peatland restoration varies the level of degradation of the peat, whether land has to be purchased or not, and the techniques used (which is dependent upon local conditions, e.g. peat depth, drain size, slope, vegetation, erosion status and access to the site), and therefore would need to be made on a case-by-case basis.
- the price that can be obtained in the market (voluntary markets are not transparent)

Below is an extract from a recent research paper on peatland restoration in Exmoor, illustrating the value of carbon reduction through restoration based on the shadow price of carbon: [22]

Table 3. C reduction and mitigation costs for current and future restoration areas on Exmoor, based on emission rate in degraded peatlands of 2.9 tCO_2e $year^{-1}$, and actual C reduction achieved through restoration of 2.6 tCO_2e ha^{-1} yr^{-1} from Moxey (2011)

	Monitoring	Area restored (ha)	Overall cost (£)	Cost/ha (£ha^{-1})	Emissions avoided (tCO_2e $year^{-1}$)	Total reduction over 20 years (tCO_2e)	Mitigation cost (£ tCO_2e)
Recent restored area	No	390	191k	490	1131	20 280	9.4
Future area	Yes	2000	2400k	1200	5800	104 000	23.8

Table 4. Potential saving from C emissions reduction due to peatland restoration (C shadow price from DECC 2011)

Timescale	Cumulated restored area (ha)	Shadow C price (£ tCO_2e)	Cumulated shadow C price (£)
Year 1 (2012)	400	56	58 731
Year 5 (2016)	2000	60	311 672
Year 20 (2031)	2000	81	421 767

If, however, the valuation in the table above was based on prices in the Voluntary Market, the economic value would currently be significantly lower. For example, if the voluntary price is currently between £1 and £5/tCO2e, the offset in Year 1 would generate only £1,048-5,244 (and unlikely to cover the ongoing cost of monitoring).

Any carbon credits would need to be verified by an accredited organisation. If these credits were to be marketed under the Voluntary Carbon Standard, a long term monitoring programme of CO_2, CH_4 and N_2O emissions would be required to verify the estimates for carbon sequestration and greenhouse gas emissions. This can be a time consuming and expensive bureaucratic process with an uncertain outcome.

[21] Carbon Valuation in UK Policy Appraisal: A Revised Approach**,** Climate Change Economics, Department of Energy and Climate Change, July 2009

[22] Emilie Grand-Clement, Karen Anderson, David Smith, David Luscombe, Naomi Gatis, Martin Ross and Richard E. Brazier, Journal of Applied Ecology Evaluating ecosystem goods and services after restoration of marginal upland peatlands in South-West England Journal of Applied Ecology 2013, 50, 324–334

3. 'Green attractions'

Below are some useful sources, based on research of RSPB reserves, the Southwest Coast Path, and the NNR reserves:

RSPB Reserves and Local Economies 2011: This report estimates the impacts had by 10 RSPB nature reserves in 2009, looking into 5 main drivers of economic activity:

- direct employment;
- local spending by employees and volunteers;
- local reserve expenditure; other land uses on the reserves;
- visitor spending.

Finally using aggregate RSPB data and information gathered from the 10 case study reserves, estimates are made of the total local impacts of the reserve network. These figures are then compared with the results from an initial study performed in 2002, to ascertain how the levels of local spending and employment have changed in recent years.

Table 55: Summary of RSPB reserve case studies

Reserve	Direct employment	Employee spend	Reserve expenditure	Grazing lets	Visitor spend	Total
Arne	7.5	1	1.15	2.21	25.54	**37.40**
Bempton	7.7	0.86	2.63	0	40	**51.19**
Frampton	4.5	0.47	2.32	2.31	6.51	**16.11**
Lakenheath	4.8	0.53	2.01	0.33	8.48	**16.15**
Minsmere	23.4	2.59	9.93	0.96	65.99	**102.87**
MoG	0.9	0.12	0.04	0.07	12.41	**13.54**
Rathlin	2.8	0.38	0.34	0.41	5.27	**9.20**
Saltholme	17.6	2.08	14.06	1.72	3.35	**38.81**
South Stack	3.6	0.41	0.40	0.21	12.91	**17.53**
Titchwell	15.4	1.66	10.97	0	104	**132.03**
Total	**88.2**	**10.1**	**43.9**	**8.2**	**284.5**	**434.83**
% of total	**20%**	**2%**	**10%**	**2%**	**65%**	**100%**

These 10 reserves supported around 435 FTE jobs in local communities across the UK in 2009. The most important economic impact that the samples as a whole had upon their local communities was the attraction of tourism to the area, with visitor spending accounting for around 285 FTE jobs, 66% of the total employment supported.

Table 56: Total local economic impacts of the RSPB reserve network across the UK in 2009.

Economic impact	FTE Jobs supported	Expenditure supported (£m)
Direct employment	553	11.1
Employee spend	61	2.7
Reserve spend	110	7.9
Grazing lets	143	-
RSPB and farming activities	**867**	**21.7**
Visitor spend	1,005	44.2
Total	**1,872**	**65.9**

THE ECONOMIC VALUE OF THE SOUTH WEST COAST PATH, 2003

Research commissioned by the SW Coast Path Team in 2003 estimated the value of tourism related expenditure that can be attributed to the Coast Path as £307 million per year, which equates to 3.1% of the total value of tourism in the region (SW Tourism data). This is likely to be an underestimate, as it was based on accommodation providers within 1 mile of the SW Coast Path.[23]

Key South West Coast Path Facts & Figures (updated November 2012)
The majority of visitors to the South West are motivated by the coast and countryside according to a profile of potential visitors drawn up by South West Tourism. In addition, the latest Visitor Survey (2009) cites walking as the best activity on offer (37%), while the beach and coast came second (18%) on their list of things to do in the region. Combining the two, the South West Coast Path is the jewel in the region's crown, providing a continuous trail around the South West peninsula and giving access to some of the best coastal viewpoints in the country.

Key facts about the South West Coast Path – one of the world's greatest walks The South West Coast Path is the UK's most popular National Trail and is listed as one of the world's greatest walks by Lonely Planet Best in travel 2009. In 2012 it was the only UK walk featured in their book of Great Adventures, alongside 11 of hikes spread across the globe including the New Zealand's Milford Track, Chile's Torres del Paine and Alaska's Chilcott Trail. In 2011 readers of the Ramblers Walk magazine voted the SW Coast Path as the 'Best British walking route', and in 2012 Coast magazine crowned the SW Coast Path as the 'Best Coastal Path'.

[23] THE ECONOMIC VALUE OF THE SOUTH WEST COAST PATH, Tourism Associates and South West Tourism, 2003

The economic value of NNRs – see Natural England report. [24]

Total NNR impacts

Total NNR impacts have been estimated by adding the impacts of visitor expenditures to the impacts of the NNR operations and expenditures. Overall, the 143 NNRs managed by Natural England are estimated to have supported 679 FTE jobs and £23 million of GVA in their respective local economies in 2011/12, after taking account of all direct, indirect and induced effects. The largest impacts are associated with the visitors to the NNRs, who spend money on-site and in the local economy, while the impacts associated with managing and maintaining the reserves are relatively small in comparison.

Table 2.4 Total impacts of NNRs managed by Natural England on their local economies

TOTAL IMPACT	Employment (FTE)	GVA (£m)
Direct employment	148	£5.1m
NNR expenditures in the local economy	25	£2.6m
Other economic activity supported on the NNR	106	£2.3m
Indirect & induced effects from above	56	£2.0m
Visitor expenditures in the local economy	344	£10.8m
Volunteer expenditures	Minimal	Minimal
TOTAL IMPACT	**679**	**£22.8m**

Source: ICF GHK analysis of Natural England data, 2013

4. The case for grass-fed beef in the Southwest

In the UK, more than two-thirds of our farmed area is grassland. Of this, nearly half is rough grazing or commons, as opposed to agriculturally improved swards.[25] The South West is predominantly a grass growing region, with 75% of the land being grass or rough grazing. The South West has nearly a third of the nation's cattle and over 20% of its sheep and has less intensive livestock than the national average.[26]

Benefits to society:
Grasslands and grass-based habitats provide a range of important functions for society, so-called ecosystem services, including[27]:

- **Food;** Many agricultural grasslands and grass-based habitats are not suitable or capable of growing arable crops for direct human consumption. Grazing livestock play a unique role in food production because of their ability to turn non-human food into edible protein and nutrients. [28]

[24] The economic impact of Natural England's National Nature Reserves, by ICF GHK, 2013
[25] Defra (2005) *Agriculture in the United Kingdom*
[26] Agriculture in the South West of England 2011/2012, Farm Business Survey, Rural Business Research, 2013
[27] 'What's your beef?', National Trust, 2013
[28] All Party Parliamentary Group on Beef and Lamb, The carbon footprint of the beef cattle and sheep sector, May 2013

- **Water**; Grassland management plays an important part in the management and protection of water resources. Grasslands have an important part to play for flood control
- **Carbon**; Soils have a huge potential to store carbon. Recent research by the National Trust shows that it is possible that extensive grassland based beef rearing systems may be carbon neutral or positive, compared to more intensive (grain-based) systems.
- **Access**; grasslands meet the need for access to the countryside. Physical exercise outdoors is known to generate positive health benefits on blood pressure, self-esteem and mood.
- **Landscape**; many of UK prized landscapes are pastoral in character, and depend on agriculture and grazing animals to maintain their special qualities.
- **Biodiversity;** certain grasslands are of particularly high biodiversity value. "Landscapes that contain a significant proportion of farmland in a semi-natural condition, such as unimproved pastures and hay-meadows or traditional orchards, are inherently of high biological richness, and have become known as High Nature Value (HNV) farmland".[29]

High Nature Value (HNV) farming

HNV farmland harbours valuable habitats and wildlife species (in the UK and across the EU), and provides a range of ecosystem services. These farmlands often face economic and practical challenges, putting them at risk of either intensification or abandonment, and resulting in a loss of their high biodiversity value. Public policies for farming and rural development are aimed at preventing their on-going decline. Identifying, supporting and monitoring HNV farmland and farming systems have been priorities for EU rural development policy since 2005.

The challenge for the South West is whether the meat from extensive grass based systems can be better marketed as premium product, in order to obtain better returns for the ***producers***? How can the benefits provided by HNV farming be translated into a premium brand? In addition to the benefits to the environment as described above, there are also the health benefits of grass-fed beef that could be highlighted.

Health benefits of grass-fed beef:

It is widely accepted that meat (in moderate quantities) plays an important part in a healthy balanced diet. It provides essential nutrients such as protein, omega-3 fatty acids, iron, zinc, selenium, and vitamins A, B, D and E. There is also evidence that some of these nutrients are more easily assimilated from meat than from other sources.[30]

The health benefits of 'grass-fed beef' (as opposed to meat from cattle reared on grains) include:[31]

- Lower in total fat, and lower in the saturated fat associated with heart disease
- Higher in beta carotene, vitamin E, B vitamins thiamin and riboflavin
- Higher in the minerals calcium, magnesium, and potassium
- Higher in total omega-3 fatty acids, and a healthier ratio of omega-6 to omega-3 fatty
- acids (1.65 vs 4.84)
- Higher in conjugated linoleic acid (CLA), a potential cancer fighter, and higher in vaccenic acid (which is transformed into CLA)

The current supply chain is not set up to market HNV farming product as a premium product

The structure of supply chain of the UK meat industry is dominated by a small number of large retailers (and processors).[32] The majority of the meat is still treated as a commodity, regardless of its

[29] Beaufoy, G., Jones, G., HNV farming in England and Wales –findings from three local projects, 2012
[30] Wyness, L. et al. (2011) *Red meat in the diet: an update,* Nutrition Bulletin 36, 1, pp. 34–77
[31] Duckett, S.K et al. (2009) *Effects of winter stocker growth rate and finishing system on: III. Tissue proximate, fatty acid, vitamin, and cholesterol content* J ANIM SCI published online
[32] Jie, F. & Parton, K. (2009). Analysing beef supply chain strategy in Australia, the United States and the United Kingdom.

'provenance'. Consumers are currently given little information about the beef they buy, although this is changing. Retail marketing messages are starting to include origin, breed types, maturing time post slaughter (e.g. 21-day hung). However, there is rarely, if ever, a mention of the cattle's own diet. Most beef systems could claim that grass and conserved forage (silage, haylage and hay) forms part of the diet during the life of the animal, but this could obscure any dependence on cereals, soya or other feeds.

The producers do not receive a fair return for the meat produced

The South West has a higher percentage of 'Grazing Livestock' farms, which produce lower income than any other type of farming. The farms in the South West are generally smaller and less profitable, resulting in lower Farm Business Income per farm in the South West. According to Defra, there are 7,015 grazing livestock farms in the Southwest, of which 62% are livestock for beef (and 38% are dairy). There are about 1134 livestock grazing farms in the LFA (Less Favourable Area). [33]

The producers (i.e. individual farms) have little market power, and returns on grazing livestock are low, as is illustrated in the table below. The data is based on Farm Business Survey Data 2011/12 on agriculture. Average Farm Business Income per farm is the financial return to the farmer and his spouse (and any other unpaid partners in the business) for their labour, and the return on the capital that they have invested in the farm business, including land and buildings.

Average Farm Business Income per farm - in South West	
2011/2012	**Farm Business Income**
LFA Grazing Livestock	*3,363*
Lowland Grazing Livestock	*4,418*
Mixed farming	*29,264*
Dairy	*24,987*

Please note that 'Farm Business Income' does not include the income from Single Farm Payment and Agri-environment Schemes; without these payments, most farms would not be economically viable. This is not a sustainable situation in the long term.

In summary:

- Grazing livestock plays a unique role in food production because of their ability to turn non-human food into edible protein and nutrients. Meat plays an important part in a healthy balanced diet, and grass-fed beef has particular health benefits
- HNV farming produces a range of valuable ecosystem services
- The meat supply chain is dominated by the UK supermarkets; much of the meat is treated as a commodity, and consumers have limited information about the provenance of the meat they buy.
- Individual producers have little power. The prices they obtain for their animals are low, and do not cover the cost of their labour and investment.
- Farmers rely on EU subsidies to support their income. This is not sustainable in the long term.

The challenge for the South West is whether the meat from HNV farmland can be better marketed as a high quality product, in order to obtain better returns for the ***producers***?

[33] Agriculture in the South West of England 2011/2012

5. Marine / Coastal

(note: info below is mainly based on UK, rather than Southwest)

Marine ecosystems provide a wide range of resources and services that contribute to human well-being and life on Earth (UNEP, 2006). A report for the Wildlife Trust[34] demonstrates the economic value of individual beneficial ecosystem services and beneficial ecosystem processes from UK and international examples. Values for the beneficial ecosystem services are expressed as either 'turnover', which represents the income that is generated by an industry in relation to the ecosystem service, and/or 'Gross Value Added' (GVA). Examples with references include:

- Waste assimilation (removal of contaminants from the ecosystem); £364m GVA 2005 waste breakdown and detoxification
- Biogeochemical Cycling (Modification of matter through biogeochemical processes) £800-2320bn cost of treating UK waters once, replacement cost
- Climate Regulation (Modulation of regional/local climate, e.g. temperature, precipitation): £0.4-8.47bn yr-1 2002 values, avoidance cost £6.74bn yr-1 marine C-sequestration 2004 value, avoidance cost
- Formation of structures that attenuate the energy of/block water or wind flow; £0.3bn per year in addition to 17-32 billion capital costs, avoidance cost (also includes erosion control)
- Water Purification (Quality) Removal of contaminants from water flowing through an ecosystem; £1,245m yr-1 water quality improvement coastal wetlands 2010 prices
- Fisheries; £645m turnover 2007, £204m GVA 2007. £2,567m turnover 2007 fish processing. £385m GVA 2007 fish processing
- Other Wild Harvesting (E.g. commercial exploitation of rocky shore species, incl. kelp, seaweed, edible crabs, mussels and winkles) £95m yr-1 2010 market value marine biotic raw materials
- Aquaculture (Farming and cultivation of fish and shellfish); £350m turnover 2007, £193m GVA 2007. £105m GVA 2007 fish processing
- Fertiliser/Feed (Bait); £25-90m yr-1 est. market value bait, £89.41m turnover 2008 fertiliser/feed, £270,000-450,000 est. gross income 1994 seaweed
- Nature watching; £3.5m yr-1 income bird watching, £36m income 1996 seal watching, £1.8m expenditure 2008 whale watching
- Sport/Recreation/tourism; £2.74bn turnover marine leisure sector between 1998 and 2007, £1.29bn GVA marine leisure sector between 1998 and 2007, £4.8bn est. tourism income 2005 coastal towns , £2.26bn GVA accommodation and food in coastal towns 2005
- Research and Education; £478m GVA 2006 education, research and development; £67m marine research funding 2006/071 , £76m GVA income 2006-08 key research, £132m est. turnover 2008 related to education, £95m GVA 2008 related to education
- Salt; £4m est. turnover 2008 for sea salt extraction industry

[34] Fletcher, S., Rees, S., Gall, S. Jackson, E., Friedrich, L., and Rodwell L. (2012) Securing the benefits of the Marine Conservation Zone Network. A report to The Wildlife Trusts by the Centre for Marine and Coastal Policy Research, Plymouth University.

Shellfish industry:
In the Southwest, 38,823 tonnes of fish and shellfish worth over £53 million were landed into major ports in the South West by UK vessels in 2008.[35] This regional catch consisted of 23,396 tonnes of fish (60%) and 15,427 tonnes (40%) of shellfish. The major fishing ports in the South West used in this data are Brixham, Newlyn, Plymouth, Looe, Weymouth, Exmouth, Teignbridge, Poole, Salcombe and Dartmouth. Brixham had the highest tonnage of Shellfish landed in the South West ports with 34% (4,796 tonnes), followed by Weymouth with 17% (2,422 tonnes), then Plymouth with 14% (2,011 tonnes). In terms of value Brixham had the highest value of shellfish landed with 41% (just over £7.5 million), followed by Plymouth with 15% (£2.8 million) and Newlyn with 14% (£2.5 million).[36]

TABLE 1.1 Landings by UK vessels into key ports: 2011

	Quantity ('000 tonnes)				Value (£ million)			
	Demersal	Pelagic	Shellfish	**Total**	Demersal	Pelagic	Shellfish	**Total**
England								
Plymouth	2.3	9.7	2.2	**14.3**	6.3	3.5	4.5	**14.2**
Brixham	4.2	2.1	7.4	**13.7**	11.9	0.7	13.5	**26.1**
Newlyn	5.8	2.2	2.3	**10.3**	16.4	0.8	4.9	**22.0**

Along the South West Coast, there are many small fishing harbours from where local fishermen are hand-lining fish, lobster potting, etc in a sustainable manner. No data available.

The value of potential marine protected areas in the UK to divers and sea anglers, July 2013
Study done by UK NEA, mainly about value of divers and anglers. Below follows an extract:
"The English MCZ impact assessment estimated aggregate costs at present value over a 20 year time scale for all 127 recommended MCZs at £227 - 821 million including costs to the renewable energy sector, the fisheries sector, oil and gas, commercial shipping, recreation, and implementation, management and enforcement costs. The baseline, one-off *non-use value of protecting the sites* to divers and anglers alone would be worth £730 – 1,310 million, i.e. this is the minimum amount that designation of 127 sites is worth to divers and anglers.

Comparing the impact assessment best estimate costs scenario (£331 million) to a central estimate of the minimum benefits expected (£957 million) leads to a benefit - cost ratio of 3.1. Although these figures come with a number of limitations, designation of 127 sites is most likely efficient, even without accounting for the benefits of restrictions on others to divers and anglers, potential increases in use values resulting from designation, or the values of other user groups and the non-use values of the general public."

[35] http://www.swenvo.org.uk/themes/biodiversity/marine-fish/
[36] Source:Defra / Marine and Fisheries Agency, 2009

Below is an extract from a report published by The Crown Estate[37] showing baseline values for a range of ecosystem service benefits provided by the UK seas, including data from PSEG = Productive Seas Evidence Group. See also http://chartingprogress.defra.gov.uk/executive-summary

BENEFITS		Example measures	Example baseline values	Spatial allocation	Source
Food	Fisheries	Market values – fisheries needs bioeconomic modeling to take account of stock externalities	Direct: £510m turnover in 2007 Upstream: Fleet capacity 213,000 T, 6763 vessels (2007) Downstream: Fish processing - £385m GVA in 2007	Based on a combining VMS data with ICES landings data.	PSEG, in press; Dunstone 2009
	Aquaculture	Market values (NET of the costs of inputs, including the fish food below)	Direct: £350m turnover in 2007 Downstream: Fish processing - £105m GVA in 2007	Based on linking market reports for specific species with the distribution of farms and their annual biomass outputs	PSEG, in press; ABPmer 2009
	Fertiliser / Feed	Market values	Unknown	Unknown	
Raw materials	Cooling water	Market values in most cases although some values may be hard to source. Replacement costs for cooling water	£150m annually	Based on the distribution of coastal power stations	PSEG, in press
	Marine aggregates		Direct: £116m turnover in 2008, £54m GVA Downstream: £303m in 2005	Based on the tonnage sourced annually within marine aggregate regions and assumptions surrounding current landed value	PSEG, in press
	Salt		Direct: £4m turnover in 2008	Based on location of activity and estimated output	PSEG, in press
	Ornamental materials (shells)		Unknown	Unknown	
Energy	Biofuels	Market values	In development	In development	
	Oil and Gas		Direct: £25,000m GVA in 2007 Upstream supply chain: £43bn GVA I 2008 Downstream: E.g. petrochemicals £50bn turnover 2008	Based on the location of and annual outputs from each oil and gas well	PSEG, in press
	Renewable energy		£43m GVA 2007	Based on the location and capacity of renewable energy projects	PSEG, in press
Space and waterways	Property	Market value from rental	£102 million from licence and rental in 2007		PSEG, in press
	Maritime transport	Replacement costs	Direct: £4,700m GVA in 2007		PSEG, in press
	Space for activities/structures		Pipelines – unknown Telecom cables - £1,459m GVA from international telephone calls Naval defence - £468m GVA	Based on the location and capacity of cables / pipelines. Military defence unknown due to classified information	PSEG, in press
Physical wellbeing	Medicines	Market values	Future seaweed harvesting for alginates	In development	
	Natural hazard protection	Avoidance methods	£358m investment in coastal defence structures in 2007		Beaumont et al, 2008
	Avoidance of contamination	Avoidance methods			
	Avoidance of pollution	Avoidance methods			
Psychological/ Social wellbeing	Tourism	Expenditure and/or participation rates	£4.8 billion in 2005	Based on the location of major seaside resorts	PSEG, in press
	Recreation / Sport		£1,289 GVA in 2007	Based on location of beaches etc., mapped sailing routes	PSEG, in press
	Nature watching		No recent data		PSEG, in press
	Aquariums	Turnover from the sale of marine pets	Unknown		
	Spiritual/cultural wellbeing	Hedonic values or Stated preference methods	Unknown		
	Aesthetic benefits		Unknown		
Knowledge	Research	Investment	Cognitive values are suggested of £453m	Based on the location of research trips	Beaumont et al, 2008
	Education	Investment			
	Inspiration - art	Market values	Unknown		

[37] Marine Estate Research Report - Valuing the Marine Estate and UK Seas: An Ecosystem Services Framework, 2010