



10 MARCH 2016

SUSTAINABLE FOOD, FARMING AND WATER

UK Water Partnership workshop

Hilton Hotel, Reading

Event Report

Disclaimer: this is a report of what was recorded on the day and does not necessarily represent the views of the organisations involved.

Report published by the UK Water Partnership, visit www.theukwaterpartnership.org or contact Weihao Zhong (weizho@nerc.ac.uk) for more information.



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Summary

A diverse audience of around 120 people from industry, government, civil society organisations and the research community attended this NERC-sponsored UK Water Partnership event, which explored recommendations made in the UKWP reports on water and farming, led by Global Food Security champion Professor Tim Benton. . The aims of the workshop were to: explore new ways of working across sustainable food, farming and water; showcase good practice with case studies and identify remaining barriers to action and how to overcome these.

A lively video featuring a Suffolk farmer experiencing water stress, Sainsbury's Director of Brand Judith Batchelar discussing water usage in Kenyan bean production, and a catchment liaison officer from Scottish Water working with farmers on water quality issues, kicked off the workshop on 10 March 2016.

Plenary sessions introduced the audience to some of the issues underpinning the reports and the complexity of the land-food and farming- water landscape, whilst others presented examples of projects that were already underway and successfully making progress in addressing some of the issues- often through very effective collaborations. Breakout sessions allowed participants to consider how five goals, based on the report's recommendations could be achieved.

The workshop was successful in meeting its aims of starting to bring the water, food and farming communities together and in identifying some of the barriers that still remain preventing more progress from being made in both securing and effective use of water for agriculture and food processing.

Key messages/opportunities and actions arising from the workshop:

Partnerships

- Collaborations and partnerships are key to successfully delivering sustainable food, farming and water in the UK.
- There is a need for long- term catchment based partnerships, covering both drought and flooding. The opportunity provided by a demonstrator in Cumbria could be used to bring current learning, evidence and good practice together to shape such a partnership and act as a model of other geographical areas.
- There is potential for sub-catchment partnerships, for example between a drainage board, groundwater and surface water recharge and storage agencies and recharge users (irrigators, water utilities etc).

- Food companies need to come together to develop and accelerate a shared approach to sustainable water use in food production and processing that is good for all.

Evidence

- The Committee on Climate Change would like to hear of examples of effective adaptation measures in agri-water to inform the next National Adaptation Plan.
- There is still further work to be done to breakdown barriers between Research Councils to get real interdisciplinary research in agri-water and for academics to work together better to address these complex nexus problems.
- Research is needed to understand the potential for using managed aquifer recharge, at a range of scales, in the UK to contribute to water resilience for both utility and farming applications. This may include non-potable water, wastewater reuse and slightly saline waters suitable for different end uses. Demonstration projects may be needed too.
- Common standards for integrated modelling need to be established and used, together with standardised use of data sets and improved metadata.
- There is a need to protect the legacy of previous research and knowledge exchange investments e.g. Demonstration Test Catchments, current integrated modelling programme etc to ensure that they can continue to inform best practice.

Soils

- Soils are critical for regulating floods and water flows, particularly in future warmer wetter winters and with changes in patterns of precipitation. National monitoring of soils is needed to inform future adaptation measures.

Markets and trading

- Development of a water trading model and the use of bonds established to address water shortage and quality issues, for example by encouraging investment in managed aquifer recharge.
- Encouraging the use of nutrient pricing more widely to deliver integrated solutions to water quality.

Funding

- Need to make it easier for farmers to invest in on-site resilience measures and find different mechanisms for financing these.

Public understanding and communication between water and farming

- A conversation with the public is needed to enhance their understanding of water in food issues, perhaps facilitated by the supermarkets.
- There is a need for a Water Champion to bring together flooding and drought issues and raise the profile of water in food. Simple clear messages need to be developed for the public.
- A common language and terms need to be used by farmers and water utilities, and improved methods of effective communication established, noting limited time for travel and meetings by 24/7/365 farmers.

Better knowledge exchange

- Develop a roadmap of current KE activities and identify trusted advisors to inform and coordinate action by multiple organisations.
- Develop practical demonstration sites to engage on farm and identify clearly the business benefits.
- Identify what success looks like to inform the writing of case studies to capture learning and share best practice so that this can be scaled up.

Possible actions:

The UK Water Partnership will consider its role in helping to address these issues, including what ideas are currently a little too risky for investment and therefore need help- perhaps through the use of demonstrators. A task force will be formed to develop these actions and to take them forward, asking others to join in as appropriate. The aim is to take some of these things forward over the next year or so and we will seek to work in partnership with Defra, EA, NERC, BBSRC and the food and farming community to bring greater focus on key issues and actions required. Progress will be reported via the UK Water Partnership web site.

Workshop overview

The aims of the Sustainable Food, Farming and Water workshop were to: explore new ways of working across sustainable food, farming and water; showcase good practice with case studies and identify remaining barriers to action and how to overcome these. The workshop follows the publication of the UK Water Partnership [Farming and Water Action Group](#) reports in 2015 (see **Annex D**).

The programme for the workshop is given at **Annex A** and a list of participants is at **Annex B**. A [video](#), highlighting some of the main agri-water issues to be discussed at the workshop was shown to participants to set the scene and the role of the UK Water Partnership introduced by Tony Rachwal, Director of the UK Water Partnership.

Plenary sessions were chaired by Sarah Mukherjee, Director of Environment at Water UK and focussed on setting the context for five breakout sessions and showcasing examples of good practice.

Breakouts sessions were run twice on the day, each focussing on a goal derived from the recommendations:

- ⇒ **Goal 1:** Improved Water Security Through Better Planning and Practical Action
- ⇒ **Goal 2:** Improved Integrated Data and Modelling
- ⇒ **Goal 3:** Enhanced Agri-Water Knowledge Exchange
- ⇒ **Goal 4:** Empowering Farmers
- ⇒ **Goal 5:** Increased Water Resilience in the Global Supply Chain

The day ended with an [update on the Climate Change Impact Report Cards](#) on Water and Agriculture and Forestry being developed by the Living With Environmental Change Partnership. The series of Report Cards are available on the [LWEC web site](#).

This report captures the main points made in the plenary sessions and the outputs of the breakout groups. All [presentations](#) were made available after the workshop and tweets captured on [Storify](#).

Participants were encouraged to read the previous reports and a document that introduced the breakout sessions in advance of the workshop. Their expectations for the workshop were captured in the following word cloud:

- Henry Leveson-Gower from Defra gave an overview of thinking on abstraction reform and the need to develop a policy framework to manage the significant future risks. Examples were given of the approach being taken in Valencia, where multiple stakeholders work together to achieve very good management of water, and Kent where there is increased, currently unlicensed, water use by fruit farmers due to changes in growing practice and the work being done on a water re-use system in the Medway that will allow more flexibility in water supplies without additional infrastructure.
- Adam Staines from BBSRC outlined the UK research funding landscape and the need for a joined- up approach to tackle these issues, covering everything from how the public interact with water to soil as a key interface between food and the environment.

Key themes emerging from plenary session 1:

After a lively Q + A session from the participants, some key themes began to emerge:

- The central role of soil for regulating flows and floods, particularly with warmer, wetter winters and changing patterns of precipitation.
- The need to address issues of variability in the new abstraction reforms. Flexibility is one of the main themes in the latter, allowing for a more responsive system.
- The need for integrated funding schemes to deliver integrated management approaches and shared objectives based on a geographical area. This is difficult in practice and early pathfinder projects will work to identify how this can be achieved.
- The continuing need for interdisciplinary research with enhanced co-design of programmes with users.
- The need for changes in farming techniques such as no-till and cover crops to make better use of green water. This is only practiced by a fifth of farmers currently- how do we drive others to do this?
- The role of the supermarkets in improving the public understanding of water in food issues was discussed; more dialogue with the public is needed and the supermarkets have a role in leading this engagement.

Plenary 2: Sustainable food, farming and water: how is this being addressed?

Four presentations highlighted some of the examples of good practice that are already addressing some of the issues identified in the reports:

- Andy Griffiths from Nestle outlined their actions on water and sustainability, including reducing water usage on some crops by 45% and flood mitigation measures at a site in the North East, which have also benefitted the community. Globally they are working directly with 750,000 farmers. Examples were given of reducing diffuse water pollution by working with dairy farmers, including building capacity in the farming community through the Next Generation Farmers initiative, and low cost interventions on the river Eden to reduce flood risk.
- Mark Pettigrew covered the Pepsico '50 in 5' programme which recognises the importance of agriculture to their business, the need to build long term relationships with suppliers and the need for enhancements in sustainable farming built on the 4 pillars of varieties, precision, innovation and low carbon. This has proved to be a good way to engage with farmers and the results of the programme will be published in the summer. Successes have included reduced water usage by potato farmers in East Anglia by improving timing of irrigation and the use of new varieties. They are now working in collaboration with Cranfield University on what to do next- for example, enhancing the water supply by better use of winter water. He finished with the point that collaboration is key to delivering sustainability.
- David Elliott from Wessex Water focussed on the development of catchment trading mechanisms, using the example of the need to remove 40 tonnes of nitrates from Poole Harbour, which is being achieved through working in partnership with farmers, using mechanisms such as the use of cover crops to stop run off. The process of delivering a nutrient reverse auction, trading platform was described. This is being trialled through one catchment over the next 2 years. Engagement of the public in securing and managing water resources through their 'How big is my butt' programme was also covered.
- Ann Humble from the Welsh Government outlined the three new pieces of legislation that are setting the direction of travel in Wales: Well-being and Future Generations Act; Environment Bill; and the Planning Bill. Action under the sustainable management scheme working through area statements to put these policies into practice was described, together

with some collaborative examples of good practice such as First Milk in Pembrokeshire (nutrient trading scheme), use of weed wipers to reduce herbicide use and flood mitigation in the Clwyd and Elwy catchments.

Key themes emerging from plenary session 2:

After a lively Q + A session from the participants, some key themes began to emerge:

- Whether food companies in competition with each other can work together to achieve a sustainable agricultural base?
- How food businesses can make a business case for action and their important role in leading action.
- That the natural capital approach can help to bring relevant stakeholders together.
- Trading platforms need to allow both long and short term interactions as land managers are not necessarily owners of the land.
- Wales were congratulated for their joined- up approach.
- Collaboration is key to sustainability and can deliver multiple benefits.

Plenary 3: Sustainable food, farming and water: how is this being addressed? More examples.

Five presentations highlighted more examples of good practice.

- Mike Jones, Thames Water, said managed aquifer recharge could present an opportunity in some parts of the UK to store floodwater and /or to remove contaminants from water so that it can be reused 'saving for a non-rainy day'. In the US and in Australia it is used for agriculture and was used previously for irrigating potatoes in Nottinghamshire. Research would be needed to understand the potential in the UK and changes to legislation may be needed as what you can put in the ground is restrained. There would be the possibility of virtual trading of water to meet users needs.
- Martin Collison said that the 25- year Greater Lincolnshire agri-food sector plan 'Water for Growth' is a multiagency plan taking a joined up approach to water- addressing water supply and flooding as enablers of growth. More food is needed and to do this more water is required for both growing and processing. Incentives for farmers to invest are needed e.g. tax breaks for reservoir construction, flood prevention measures but these are not always

available. He described how multiple organisations had come together to develop the strategy supported by the Local Enterprise Partnership.

- Hannah Stanley- Jones of Anglian Water described the multi sector Water Resources East Anglia project that brings together the water, farming and energy sectors who were all planning separately. Its purpose is to deliver a reliable, sustainable and affordable system of supply in the Anglian region, which is resilient to the effects of climate change, population growth and multi-season drought. Six case study areas are being used and long -term agricultural demand scenarios developed on which to consider multi-sector options. The strategy will be published by September 2017, allowing Anglian Water to build the findings into its next Water Resource Management Plan.
- Chris Spray of the University of Dundee considered the best ways to encourage farmers to take up land management practices that reduce flood risk and described the work being done in the Eddleston catchment. This is part of wider programme of action and research in Scotland about coordinated delivery of flood risk and catchment management. The Eddleston Water Project aims to restore the river and its whole catchment whilst at the same time promoting livelihoods of those who derive income from the sustainable management of farms, forests and fishery, through improved physical habitat and reduction in flood risk. Key lessons from working with farmers on natural flood management were given.
- Peter Bateson from the Witham Fourth Internal Drainage Board described the history and role of the internal drainage boards. This is primarily one of water conveyance rather than water storage. They work closely in partnership with others to deliver the joint Flood Risk and Drainage Management Strategy for Lincolnshire.

Key themes emerging from plenary session 3:

- The need to understand the scale of water use in agriculture to determine whether managed aquifer recharge could play a significant role. Different language/units are currently being used by water companies and farmers and this barrier needs to be addressed to get a common understanding.
- In working with farmers on the Eddleston project, water quality projects were the ones that farmers most wanted to support. Key lessons had been learnt about how to engage with farmers.

- Consumers need to be engaged more in understanding the issue of water in food in the global supply chain.

Plenary 4: Feedback from breakouts- sustainable food, farming and water into action and next steps

During the final plenary of the day, brief feedback was given for each of the 5 breakout sessions. Further details of the outputs of each breakout are given at **Annex C**. This was followed by questions and comments from the audience.

Goal 1: Improved Water Security Through Better Planning and Practical Action

The breakout focussed on the challenges in the UK for water security, although the ideas and actions could equally be applied to many international scenarios. The UK Water Partnership reports identified, along with many other reports, that society is faced with the challenges of a more extreme climate; for Britain it is likely that the average annual rainfall will remain broadly the same, but with rain falling more infrequently and more intensively.

The group considered what knowledge exchange actions were most effective for three different scenarios (agricultural intensive landscapes; livestock and mixed farming and the populous South East). Two main themes emerged:

1. **Communicating** the complex and inter-related issues of agriculture and water security (including embedded water). It was suggested that there should be a **'water champion'**, a public figure who could start the public conversation regarding the threats and issues, using straight forward, simple messages and managing the risk of 'climate change inertia' where people feel the issue is so large they are powerless to do anything. The water champion would be tasked with developing and communicating a **national vision** for water security. In the plant health arena this type of issue has been successfully addressed through developing a **UK national risk register**, which in turn, has led to the development of a much more joined up approach for the actions to mitigate the risks identified.

2. **Keeping more water on farm.** There are a lot of well- established and understood actions that can be undertaken at a farm level to achieve this. One of the key messages was the need for collaborative working at a number of scales and to achieve different outcomes. Farmers working together are able to support each other in trying new things. Farmers working with water companies and Internal Drainage Boards (IDBs) can address surface water storage, or the potential for aquifer re-charge below farmland. Collaboration is also needed to understand how much water is available and to understand the demands being made on it. This greater

transparency would then enable collaborative groups to develop solutions. IDBs were identified as potential conveners in this area, but their function would need to be broadened by a change in legislation.

A collaborative approach also requires more **innovative funding instruments**, as investment is difficult to attract for collaborations. Other innovations could be the development of trading platforms to allow collective management of a limited resource.

Goal 2: Improved Integrated Data and Modelling

This session covered:

1. Definition of integrated modelling – integrated modelling means different things to different people, it can be the linkage and integration of component models, how people use and interact with models and modelling output, and/or the links between data and models. Depending on the issue to be addressed, different model developers are tackling the model integration from alternate starting points, such as including human behaviours in models through agent based approaches or looking to consider multiple nutrient cycles or ecosystem services.

2. A web-based data and modelling platform, that includes model linking to address issues of agriculture and water quality at a range of spatial scales (e.g. farm level measures to national level response in terms of water quality) was described and discussed. The overall concept and implementation was well received and the following suggestions for enhancements were made:

- Need for moderation in model evaluations;
- Standards needed to simplify data ingestion into models and visualisation tools, and also the transfer of data between models;
- Useful to standardise data sets used in applications of multiple models to enable comparison between these applications at different locations;
- Web-based platform navigation system – consider a query based approach or different entry options based on user background/existing modelling experience;
- Look to ensure metadata for data and models is of a high standard and clear (e.g. ensure it is known which model version was used in an application);
- Legacy – it would be useful to have some clarity on what will happen when the initial project ends;
- Include pop-out bubbles that explain modelling jargon that can not be avoided, ideally avoid the jargon in the first place.
- UKWP help to implement standards for data transfer within the water community would be useful.

Goal 3: Enhanced Agri-Water Knowledge Exchange

Enhancing knowledge exchange at a national, regulatory and local level was discussed and similar themes emerged at each scale:

- Trust, evidence and stakeholders are key
- The focus has been on catchments and less on embedded water- awareness raising with the public is needed.
- A roadmap for knowledge exchange is needed to map existing and future activities.
- Demonstration farms and training for farmers are needed.
- The observation was made that no presentation had been made by farmers at the workshop- what would they say?

Goal 4: Empowering Farmers

Farmers are the day-to-day managers of water and food production on their land, but are they being helped or hindered by the plethora of regulations, advisors and market forces? In this session, the mixed group including researchers, farmers and farming organisations looked at the role of farmers and how they can be empowered to deliver for both food and water.

The group split into three and discussed issues around: Empowering farmers to manage water on their land: what works? Empowering farmers: can we scale up for bigger impact? and Empowering farmers: in the regional and national debate (how can farmers work together to influence decisions to ensure that we are all best adapted for future pressures, such as world food prices, climate change, consumer quality demand and a reducing public sector?). People drew on their experiences to give thoughts on what works, what the barriers are and what action is needed and by whom?

A key theme emerging across all the groups was the importance of **trust** and the role of brokers and local connections to create the networks needed between farmers, government agencies, water companies and buyers. Another strong theme was the importance of **good examples and clear measures of success** that are easy to communicate; ‘farmers need feedback that they can touch, feel and see’. The third main theme was the need for **finance**, the potential for water markets; the attractiveness of profits for farmers but also the need to ‘think about profitability not productivity’.

Goal 5: Increased Water Resilience in the Global Supply Chain

The group considered what a resilient food system would look like and the need to consider both resilience and long- term sustainability. The UK is most vulnerable for foods that cannot

be grown in the UK, out-of-season produce and to third party shocks caused by failures and thus increased demand from elsewhere. Increasing resilience is extremely complicated and a range of actions were identified:

- Changing diets so more people eat seasonal food
- Introducing a blue-water tax on food
- Making agriculture production more water efficient
- Reduce losses so that more food is produced from the same amount of water
- Opportunities identified included the Global Challenge Fund and the role supermarkets have to play.

Key themes arising from plenary session 4

- Whether the 1% of all water currently used in the UK for food is enough?
- The need for a national monitoring strategy for soil.
- The need to also address food waste as part of agri-water reduction.

Next Steps

Key conclusions emerging from the day were that:

- More food (and therefore more water/ better water efficiency) is needed for a growing population and we need to find ways to achieve that.
- This is a very complex issue and that both collaboration and regulation will be needed to enable it to happen.
- There is a need to develop a common language and a variety of communication routes tailored to audience in these partnerships that is accessible to water companies, farmers and other audiences.
- There is a huge amount already going on that can be used as a basis for further action.
- There is a need to communicate more widely the value of water and its importance to food production and processing and the need to reduce food waste.
- There is a potential role for new actors such as bond funders and for water trading.
- Academics have a role to play in building better tools and models and sharing best practice.
- There is a need to continue this dialogue and actively bring key players together to share and build on the wealth of best practice available.

Possible actions:

The UK Water Partnership will consider its role in helping to address these issues, including what ideas are currently a little too risky for investment and therefore need help- perhaps through the use of demonstrators. A task force will be formed to develop these actions and to take them forward, asking others to join in as appropriate. The aim is to take some of these things forward over the next year or so and we will seek to work in partnership with Defra, EA, NERC, BBSRC and the food and farming community to bring greater focus on key issues and actions required. Progress will be reported via the UK Water Partnership web site.

9.00	Registration and coffee
10.00	Welcome by the Chair, Sarah Mukherjee, Director of Environment, Water UK Showing of the Food, Farming and Water short film
10.10	Plenary session 1: Defining the challenge
10.10	Sarah Hendry, Defra: The Context & the Food and Farming and Environment 25 year plans
10.20	Tim Benton, Global Food Security Programme: An introduction to the reports and their recommendations
10.30	David Style, Committee on Climate Change: An Update on UK Water Projections and Climate Adaptation
10.40	England Policy Update: Henry Leveson-Gower, Defra: Abstraction Reform and Water Resilience
10.50	Adam Staines, BBSRC: How Can Research and Innovation Help?
11.00	Questions
11.10	Coffee break
11.30	Plenary session 2: Sustainable food, farming and water: how is this being addressed?
11.35	Andy Griffiths: Nestle's actions on water in the UK
11.45	Mark Pettigrew, Pepsico: '50 in 5'
11.55	David Elliott, Wessex Water: Developing a Catchment Based Trading Platform
12.05	Ann Humble, Welsh Government: Ecosystem Enterprise Partnership and other Welsh Actions
12.15	Questions
12.25	Breakout Session 1: Goal 1: Improved water security through better planning and practical action Goal 2: Improved integrated modelling Goal 3: Enhanced agri-water knowledge exchange Goal 4: Empowering farmers Goal 5: Increased water resilience in the global supply chain
13.05	Networking lunch
13.45	Plenary Session 3: Sustainable food, farming and water: how is this being addressed? More examples
13.50	Mike Jones Thames Water: Managed Aquifer Recharge
14.00	Martin Collison, Collison Associates: Greater Lincolnshire Agri-food Sector Plan
14.10	Hannah Stanley-Jones, Anglian Water: Water Resources East Anglia
14.20	Chris Spray, University of Dundee: Working with Farmers on Natural Flood Management
14.30	Peter Bateson, Witham Fourth Internal Drainage Board: Holistic Water Level Management
14.40	Questions
14.50	Breakout Session 2: Goal 1: Improved water security through better planning and practical action Goal 2: Improved integrated modelling Goal 3: Enhanced agri-water knowledge exchange Goal 4: Empowering farmers Goal 5: Increased water resilience in the global supply chain
15.35	Tea break
15.50	Plenary Session 4: Feedback from the breakouts- Sustainable food, farming and water- into action
16.20	Tony Rachwal, Director UK Water Partnership: Next Steps
16.30-17.30	Drinks Reception and an introduction to the Climate Change Impact Report Cards on water, agriculture and forestry

List of Participants

Jonathan	Abra	KTN Ltd
Victor	Aguilera	Defra
Mary	Barkham	Consultant, organising the event for the UK Water Partnership
Jenny	Bashford	AHDB Potatoes
Peter	Bateson	Witham Fourth District IDB
Jason	Beedell	Strutt and Parker
Tim	Benton	Global Food Security
Chris	Binnie	CIWEM
Estel	Blay	Satellite Applications Catapult
Andrew	Blenkiron	Euston Estate
Paul	Bradford	Suffolk Holistic Water Management Project
Richard	Brazier	University of Exeter
Stephen	Briggs	Innovation for Agriculture (RASE)
Mike	Brown	Centre for Ecology and Hydrology
Jerry	Bryan	Albion Water Limited
James	Byrne	Wildlife Trusts Wales
Robert	Caudwell	E.A.
Sarah Jane	Chimbwandira	Surrey Nature Partnership
Joanna	Clark	University of Reading
Matthew	Clegg	Black & Veatch Ltd.
Jen	Colbourne	Surrey University, Robens Centre for Public Health and Environmental Engineering
Adrian	Collins	Rothamsted Research
Alexandra	Collins	Imperial College
Martin	Collison	Collison and Associates Limited
Anthony	Colman	UEA/UCT/EI CU NY
Dean	Cook	Innovate UK
Faith	Culshaw	UK Water Partnership
Tim	Darby	East Suffolk Water Abstractors Ltd.
Paul	Dracott	East Malling Research
David	Elliott	Wessex Water
Bridget	Emmett	Centre for Ecology and Hydrology
Georgia	Farnworth	Soil Association
Emily	Flowers	NERC
Dave	Freeman	Agricultural Industries Confederation
Penny	Gordon	LWEC
John	Gowing	Newcastle University
Mike	Grace	Natural England
Andy	Griffiths	Nestle UK&I

Jilly	Hall	Natural England
Paul	Hammett	NFU
James	Harrison	James Harrison Productions
Philip	Haygarth	Lancaster University
Sarah	Hendry	Defra
Tim	Hess	Cranfield University
Paul	Hill	AHDB Cereals and Oilseeds
Katie	Hoblyn	Amec Foster Wheeler
Joseph	Holden	University of Leeds
Derek	Holliday	CLA
Ann	Humble	Welsh Government
Hans	Jensen	UKWIR
Lewis	Jones	South West Water
Helen	Jones	Scottish Government
Mike	Jones	Thames Water
Melvyn	Kay	UK Irrigation Association
Lola	Rey	Cranfield University
Cate	Lamb	CDP
Henri	Lambert	Apsara Capital LLP
Lucy	Lee	WWF-UK
Henry	Leveson-Gower	Defra
Rob	Lillywhite	University of Warwick
Jannette	MacDonald	CREW, James Hutton Institute
Lorraine	Maltby	Scottish Government
Trevor	Mansfield	Natural England
Scott	McCready	Water Witness International
Simon	Miller	3Keel LLP
Jodie	Mitchell	NERC
Ed	Moorhouse	G's Fresh
James	Morison	Forest Research
Sarah	Mukherjee	Water UK
Rick	Mumford	Fera Science Ltd
Phil	Newton	University of Reading
Andy	Noble	BBSRC
Tom	Ormesher	NFU
Harriet	Orr	Environment Agency
Simon	Pearson	University of Lincoln
Phillippa	Pearson	Dwr Cymru Welsh Water
Mark	Pettigrew	PepsiCo
Vicky	Pope	Met Office
Anne	Priest	Natural Environment Research Council
Hannah	Prior	The Institute for Environmental Analytics
Tony	Rachwal	The UK Water Partnership
Nicola	Randall	Harper Adams University
Jane	Reck	James Harrison Productions
Simon	Reid	Marks and Spencer
Jodie	Retтино	Severn Trent Water

Mark	Robins	RSPB
Elizabeth	Robinson	University of Reading
Sandra	Ryan	Amec Foster Wheeler
Michael	Salter	AB Agri
Matthew	Sharman	Fera Science Ltd
Mark	Barthel	3Keel LLP
Siobhan	Sherry	Defra
Liz	Small	North Yorkshire County Council
Paul	Smith	IRTL Biomation
Kate	Speke-Adams	Wye & Usk Foundation
Chris	Spray	University of Dundee, UNESCO Centre of Water Law, Policy & Science
Chad	Staddon	UWE , Bristol
Adam	Staines	BBSRC
Hannah	Stanley-Jones	Anglian Water Services
Vladimir	Stoiljkovic	Satellite Applications Catapult
Michael	Storey	Agriculture and Horticulture Development Board
David	Style	Committee on Climate Change
Peter	Sutton	Syngenta
Teame	Tewolde-Berhan	Geo-Space Analytical Services (GeoSAS) PLC
Alan	Turner	Kent County Council
Susan	Twining	ADAS UK Ltd
Emilie	Vrain	UEA
Andrew	Wade	University of Reading
Glenn	Watts	Environment Agency
Keith	Weatherhead	Cranfield University
Laurence	Webb	Tesco
Ruth	Welters	UK Water Partnership Research and Innovation group
Jim	Wharfe	UK Water Partnership
Mick	Whelan	University of Leicester
John	Whittall	Innovate UK
Bethan	Williams	Campaign for the Farmed Environment
Richard	Wills	Lincolnshire County Council
Weihaio	Zhong	Natural Environment Research Council

Outputs from the breakout sessions

Goal 1: Improved Water Security Through Better Planning and Practical Action- led by Ann Humble

Top 3 proposals	Suggested Actions
Lobby for a Water Champion	<p>A water champion to inform and increase the public debate around water security.</p> <p>Develop a UK wide risk register for water security to promote a joined up approach to risk mitigation.</p>
Support for Collaborative Working	<p>Encouraging Defra to recognise and reward collaborative action.</p> <p>Members of UK water Partnership to look at ways to promote and support collaborative working.</p> <p>Raise with Defra the possibility of changing the legislation on the function of Internal Drainage Boards (IDBs) to give them the mandate to look at water management at low flow and to develop collaborative water management.</p>
Innovative funding mechanisms	<p>Is there scope for the UK Water Partnership to commission a report to examine possible funding options?</p> <p>What could tax breaks look like? Collaborative funding instruments? E.g. Welsh Government has commissioned such a report on Payment for Ecosystem Services options in Wales.</p>

Goal 2: Improved Integrated Data and Modelling – led by Andrew Wade

<p>Confirmation of the issue and what the goal should be</p>	<ul style="list-style-type: none"> • Enable better access to data and modelling for catchment and water resource management; • More integrated modelling to deliver holistic solutions for multiple water issues, pollutants, services & policies; • Community building to encourage joint working and efficient use of data and models.
<p>Recommendation made in the report</p>	<p>In ‘Agriculture’s impacts on water quality’, Key finding 2 – ‘We need unified predictive models encompassing all key aspects of agriculture and water management that inform future policy and commercial interests’; Key finding 7 – ‘We need greater collaboration between researchers, industry and policy makers with the necessary framework to deliver effective joint working’.</p> <p>Common theme - requirement for sound evidence on which to make informed decisions.</p>
<p>Example(s) of good practice given</p>	<p>In the context of air pollution, desulphurisation of emissions from coal-fired power stations and the introduction of catalytic convertors to vehicles were introduced to reduce emissions of nitrous oxides reduced soil and stream water acidification to comply with Emissions Protocols. The evidence to support these protocols was based on evidence from monitoring, manipulation experiments and modelling. This case provides an example of what can be achieve when the science and practitioner community work together to understand and solve an environmental problem.</p>
<p>What are the barriers to addressing the recommendations in the report/ achieving the agreed goal?</p>	<p>The water community is dispersed and not well-connected. Similarly data and models are also dispersed, with IPR issues limiting access in some cases. This situation has an adverse impact on the efficient use of models and on their integration to solve problems involving multiple pollutants, or floods-droughts, or consideration of multiple stressors, such as climate, land management and population growth, or multiple policies</p>
<p>What research and innovation needs are there?</p>	<p>Web-based platform for catchment management to signposting and access to key datasets and models; a model selection tool; Input and output library from modelling case studies to enable re-use; standards to facilitate model coupling.</p>
<p>What communication/ Knowledge Exchange needs?</p>	<p>Development and testing of web-based platforms by the community, with engagement to update and improve the platform.</p>
<p>What action is required? What should the next steps be? How can the UK Water Partnership help?</p>	<p>Community support of web-based platform, plus help to develop standards, or implement existing standards, to simplify data ingestion into models and data visualisation tools and data transfer between models.</p>

Goal 3: Enhanced Agri-Water Knowledge Exchange- led by Jannette MacDonald

Overall Summary

- Similar themes at each scale
- We have a lot of knowledge
- Key words - trust, evidence, stakeholders – all need planning and targeting
- Main focus on farms and catchment management and less on embedded water.
- Need trusted advisors and demo farms
- Need overarching objective and plan to achieve
- Observation – no presentations from farmers at the event

National

Actions

1. Need a road map of current KE activities (who is doing what, where and at what scale) and identify trusted advisors to inform and coordinate (role for UK Water Partnership, Defra, flooding, water companies, agronomists etc)
2. Practical demonstration sites to engage on farm:
 - Identify what is going on where
 - From case studies to benefits (£s)
3. Champion good stories – what works
 - Share information in a useable form (i.e. simple, place-based messages) and communicate effectively (e.g. The Archers! Social media – who are the key influencers, who is being followed?)

Key points

- In some areas (e.g. diffuse pollution), know what to do and the KE challenge is influencing the right people. In other areas (e.g. natural flood management) need KE activities to identify what works where and why.
- Engaging and involving key ‘multiplier organisations to translate and communicate the evidence base for end users. Needs to work in both directions.
- Coordinate actions by multiple stakeholders
- AgriMetrics – make contact to explore working with agri-data to support KE
- Find effective ways to access, collate and then translate evidence in an appropriate way depending on user

Regional

Actions

1. Define what KE could achieve and what is the incentive to the beneficiary.
2. Co-produce KE programmes encouraging farmers and practitioners to commit to the process (ownership is important)
3. Capture learning and evidence of effectiveness from case studies to improve the way we do KE.

Key points

- Stakeholder mapping - Identify appropriate stakeholders (at scale) and engage early using trusted intermediary.
- Identify and gain commitment of decision makers, good practitioners/leaders
- Target messages for audiences and use a range of options to get the message across using www, videos, apps, etc (be careful not to assume prior knowledge)
- We have a lot of information and good examples of what works well (and some that work less well) – we need to improve the scaling up of good initiatives

Local

Actions

1. Identify and profile who the local key players are for KE.
2. Raise public awareness of agri-water issues.
3. Invest in the KE design, ensuring appropriate communication methods are used and stakeholders are engaged throughout the whole process.

Key points

- Encouraging local ownership of KE is important.
- Evidence needs to be local and communicated with appropriate language and visuals.
- Utilise current networks, leaders, informal groups and social media for KE, ensuring consistent messages.
- CaBa to facilitate KE at the local scale.
- Barriers to successful KE include: the lack of long term investments; inappropriate infrastructure e.g. broadband speed; fragmentation of KE and the need for sign-posting; and the lack of joined up policy e.g. land use demands and mixed priorities.

Goal 4: Empowering Farmers- led by Ruth Welters

What works well/ enablers?	What are the barriers to empowering farmers?	What action is needed & by whom?
<p><i>Strong partnerships</i> Local partnerships and local connections.</p> <p>Trusted advisors.</p> <p>Work with farmer organisations such as NFU and Abstractor groups</p> <p>‘Champion farmers’ – can work well but also can put other people off.</p> <p>A catalyst or key person.</p> <p>Partnership working with funding available e.g. Coca Cola/ WWF work with sugar beet farmers in Norfolk to protect water quality.</p>	<p><i>Partnerships</i> Farmers are busy.</p> <p>How to access the practical knowledge held by farmers?</p> <p>Survey fatigue.</p> <p>Research projects are not fed back to farmers.</p> <p>Pressures of tenure e.g. short-term tenants don’t want to think long term.</p> <p>Need for evidence.</p>	<p><i>Improving partnerships</i> Identify who farmers trust.</p> <p>Understand power relationships in the community.</p> <p>Understand where do farmers go for their information?</p> <p>Make more use of co-operatives to catalyse farmers to work together.</p> <p>Promote successful examples e.g. of farmers working with local authority.</p> <p>Make better use of testimonials.</p> <p>Use more proof of concepts so farmers can assess the risks.</p> <p>Be clear on the role of the supermarkets</p> <p>Move into larger geographical areas. Even to scale of Europe e.g. WaterLife project</p>
<p><i>Useful success indicators</i> Farmers need feedback that they can touch, feel and see.</p> <p>Use successful case studies to inspire others – the art of the possible.</p> <p>Might need much longer timescales for evaluation – 15-20 years to see outcomes at a landscape scale.</p>	<p><i>Legislation</i> Local legislation can easily sink a project.</p> <p>Local policies - how to change them if needed?</p> <p>Regulation.</p> <p>Planning control e.g. siting reservoirs Abstraction licences.</p> <p>Stewardship schemes focus on penalising farmers.</p>	<p><i>Improved success indicators</i> Need wider indicators of success with both technical and informal feedback.</p> <p>Need monitoring and evidence to show that schemes work. E.g. metaldehyde – motivation for farmers to act more carefully. How to incentivise and collaborate with water companies.</p> <p>Need to show benefits of a whole catchment approach.</p> <p>‘Innovative farmers’ (includes Soil Association) – needs scaling up.</p> <p>More top-down influence.</p> <p>Low profit farmers can get involved as providers of ecosystem services.</p>

	<p><i>Lack of finance</i> If not profitable then farmers won't do it.</p> <p>Market pressures.</p> <p>Supply chain pressures for business to be most competitive and economics vs willingness to invest.</p>	<p><i>Finance</i> Need more investment.</p> <p>Tax breaks.</p> <p>Insurance products.</p> <p>Develop nutrient markets.</p> <p>Markets for water management – water seen as low value, therefore no market.</p> <p>Use of private sector auctions.</p> <p>Need longer contracts between farmers and produce buyers.</p> <p>Government funds need to emphasise the collaborative element e.g. HLS and RDP.</p> <p>Government and private sector to take a 'no-regrets' approach to investment.</p> <p>Farmers need better understanding of own business models and how to fit into other schemes.</p> <p>Think about profitability not productivity.</p> <p>Substitute production for environmental management in upland areas.</p>
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Goal 5: Increased Water Resilience in the Global Supply Chain -led by Tim Hess

Context: It takes 2,400 litres/person/per day to feed the UK. Most of this is “green” water from rain fed agriculture, however about 160 litres / person / day of “blue” water (from rivers, lakes and groundwater) is used, 68% of which is associated with imported foods (Hess et al., 2015). Large amounts of blue water are used in water-stressed locations, such as N India (rice), Spain (fruit), South Africa (fruit) and Australia (grapes for wine). Therefore, the UK food system is vulnerable to water risks in these locations.

Scope: The breakout group considered how the UK food system can become more resilient to “blue-water” risks (i.e. not considering impacts of climate change on rain fed cropping) associated with food imports. The groups considered five questions.

1. What do we mean by a “resilient” food system? A resilient food system is one that can recover from shocks, in a short period of time. That is, a water-related shock in a supplying location causes only a short disruption to the supply of food to the UK. It was noted that 1) a resilient system should not only recover to its original situation, but to a “better” situation that is less vulnerable to future shocks, 2) resilience must go hand-in-hand with environmental and social sustainability. Resilience should not be equated to efficiency and the two may be contradictory if, for example, higher efficiency leads to greater overall water consumption (Jeavons’ paradox).

2. Where is the UK food system more exposed to water-related risk? The UK food system is most exposed to water related risks in primary production (growing) as most water is used in this stage, but it should be noted that processing is at risk, and food distribution networks are at risk from water-related risks, for example, flooding. Products sourced from locations with low / erratic rainfall or weak water-governance are most exposed. The UK is also at risk from increased demand in third-party countries (i.e. countries that may import from the same sources as the UK) due to increasing demand or crop failure in those locations diverting exports away from the UK.

3. What current practices increase resilience? A flexible and diverse supply chain (i.e. source from diverse locations to minimise risk of failure) means that produce can be sourced from alternative locations if there is a disruption in one location. However, the extent to which market forces increase or decrease resilience was debated. Good water management, including maximising utilisation of rainfall and adoption of sustainable irrigation practices increase resilience, as does strong water governance. There are several examples of whole value-chain

collaboration / partnerships as well as collective action / water stewardship that increase resilience at the catchment scale.

4. What needs to be done to increase resilience? In order to increase resilience of the current diet, we should source food from where it is produced most efficiently and most sustainably whilst maintaining UK production (although higher UK labour costs may result in increased food prices). In addition, reducing food waste was seen as a way of increasing water productivity (mouthful per drop). In the long-term increased resilience may require dietary change; eating more seasonal UK produce to reduce reliance on food imports from water-stressed locations and eating less blue-water intensive foods. This requires increased “water-consciousness” in the supply chain and consumers (government & retailers).

5. What are the opportunities for increased resilience? Plant breeding of drought-resistant varieties; Making resilience profitable for farmers; Crop yield in many parts of the world are very low compared to potential. Good agricultural practices (fertiliser management, pest control, post-harvest management) could increase production without increasing water consumption. Supermarkets have a role in influencing customer’s purchasing habits and working with the supply chain. This may be considered a pre-competitive area and supermarkets could work together?

UK Water Partnership Farming and Water Action Group Reports

Global challenges in providing sustainable food and water, in the context of a growing population and environmental change, are ever increasing and intensifying. Working with the [Global Food Security programme](#), the [Farming and Water Action Group](#) of the UK Water Partnership published a series of reports in 2015 that explored the links between water and food production and the challenges for delivering both food and water to society in a sustainable way.

This included:

- Agriculture's impacts on water quality. See [agriculture-water-quality-report](#)
- Water availability and efficiency in. See [farming-availability-water-report](#)
- Water use in our food See [water-used-in-imports-report](#)

They identified issues, evidence gaps and potential solutions and made recommendations for policy-makers, industry, practitioners and academia in the [water-synthesis-report](#).

The report recommended that the food-and-water system needed to adapt to meet the demands that will be placed upon it in the future, in a sustainable way, proposed a 10 year vision and made the following recommendations:

Recommendation 1: There is a need to further develop long term planning for changes in water usage and water availability in the future, here and in our overseas supply chain. This needs to involve better predictive ability from academics and Government, better management from land managers and better management strategies for the future along the supply chain. Public policy can provide key incentives to build resilience.

Recommendation 2: A key component of climate change is changes in the incidence and patterning of extreme weather. Managing for extreme weather, and the uncertainties inherent in predicting changes in weather patterns, is arguably a greater issue than planning for the change in average conditions (such as on average drier summers). Greater linkages are needed with the emergent climate services community.

Recommendation 3: Many of the risks associated with food-and- water management can be predicted via using integrated models at local to global scales, and from short to long temporal

scales. Such models can be used to support public and private decision- making. There is therefore a need to improve modelling capacity, allowing choices to be explicitly explored. This requires increased investment (public and private), supporting the development of integrated models for understanding and decision support, data management infrastructure, and human capacity for their development.

Recommendation 4: Many of the challenges involved in managing for the triple outcomes of water and food security and environmental conditions are inherently trans-disciplinary and require expertise in agriculture, soils, water, aquatic systems and biodiversity as well as the allied industries and policy communities. To facilitate knowledge exchange and co-design of research to address knowledge and understanding gaps, a discussion forum or knowledge network should be established. This can also advise and influence the future direction of public and private water policy in relation to agriculture. The network would act as a hub of the best available knowledge and could expand on the ‘community of practice’ approach using the types of approach seen in the Demonstration Test Catchments, Catchment Sensitive Farming and Water Friendly Farming projects, providing a platform for sharing best practice between industries and also feed into Government and extension services.

Recommendation 5: At the farm scale, farmers should be further empowered to make informed decisions about water usage on their land to bring about catchment scale improvements in water quality and availability. Farmer empowerment can come through sharing knowledge and building peer-to-peer networks between farms, within an area, and between farmers and other stakeholders in water and the environment. The knowledge network should help facilitate such local network building and be able to deliver impartial, authoritative and evidence based information to facilitate simultaneous management for food, water and the environment.

Recommendation 6: We therefore recommend that all actors – academia, industry, policy, advisory – work to make water-food- environment science accessible to all.