FACCEJPI

Agriculture Food Security and Climate Change

Report on Cluster 3 Workshop- Increasing resilience of food value chains under climate change

4th February 2015

London, UK

AGRICULTURE, FOOD SECURITY & CLIMATE CHANGE

The sectors of agriculture and forestry are highly exposed to climate change, since they directly depend on climatic conditions, while emissions from agriculture in the Union account for 14% of global greenhouse gas emissions. Climate change is also one of the main challenges to agriculture in feeding the world's population, which is expected to reach 9 billion by2050. Global demand for food is expected to have increased by 50% by 2030 and to have doubled by 2050, at a time when demand for biomass for non-food purposes is predicted to grow strongly. Concerted actions are needed to prevent these combined risks from leading to irreversible damage, and to achieve sustainable food supply under changing climate conditions. The Joint Programming Initiative on Agriculture, Food Security and Climate Change (FACCE-JPI) brings together 21 countries and aims to improve the collaboration in research policies and research effort of its member countries to tackle these global challenges for Europe by aligning research programmes among Member States

February 2015

Report by BBSRC:

This report could not have been conceived without all efforts and dedication of all the participants in the workshop of the Cluster on Increasing resilience of food value chains under climate change.

Contents

1) Executive Summary

The Joint Programming Initiative on Agriculture, Food Security and Climate Change (FACCE-JPI) brings together 21 countries that are committed to building an integrated European Research Area addressing the interconnected challenges of sustainable agriculture, food security and impacts of climate change. Its **Strategic Research Agenda** (SRA, Dec. 2012) describes the scope of the JPI and its five core research themes (CTs). The implementation roadmap of the SRA is set out in biannual **Implementation Plans** (IP). The first IP (Dec 2013) covers the 2014-2015 period and describes the topics considered as the highest priorities and the joint actions to be undertaken in this period. This IP states that joint programmes can be developed around **clusters** that integrate priority topics belonging to different CTs.

The Biotechnology and Biological Sciences Research Council (BBSRC) is taking forward Cluster 3- **Increasing resilience of food value chains under climate change**. Increasing resilience of food value chains under climate change is the core of what FACCE-JPI is trying to achieve, with resilience embedded in each of the Core Themes. Cluster 3 therefore interfaces with all Core Themes and is presented as both primary production-oriented and consumer/demand-oriented.

As a first step in developing Cluster 3, a workshop was held on 4th February 2015 in London to provide a framework for strategic discussions between funders and scientific experts towards programme alignment and activities for three or more countries to work together on agreed alignment actions.

A total of ten countries participated in the workshop: Denmark, Estonia, Finland, France, Germany, Ireland, Netherlands, New Zealand, Romania and the United Kingdom.

The first part of the workshop gave an overview on the different levels of the food value chain (farm to fork), highlighting their scope, strengths and weaknesses, and how they affect and are affected by other levels in the chain. The second part of the workshop took on the form of a breakout session where both experts and funders were able to consider key messages from the talks and discuss scope for alignment of activities at a European level.

The breakout session gave much for the FACCE- JPI to consider. Key messages included:

- Fragmentation between relevant research communities therefore there needs to be a more integrative way of working between the food chain levels;
- Access to the right data and integrated data would help develop a holistic understanding of the resilience of food value chains under climate change;
- There are various instruments available to facilitate joined up working across Europe and potential thematic areas which can help focus efforts.

For developing next steps, the UK delegation in FACCE-JPI will discuss workshop messages at the Governing Board level where a decision will be made on how to proceed in developing Cluster 3.

2) Background

Context

In June 2013, a Broad-Based Concluding Meeting was held, which summarised the outcomes of five mapping meetings and highlighted the need for greater effort in trans-thematic areas identified in FACCE-JPI SRA as clusters. Mapping meeting reports can be found here: https://www.faccejpi.com/layout/set/print/Document-library/Mapping-meeting-reports.

The aim of the cluster is to provide an integrative approach that will facilitate a broad policy support and use of different lines of action that are available to funders. It is expected that joint programmes and activities can be developed as a result, realising a higher level of integration of identified priorities. These clusters are:

- Cluster 1 (Organised by Spain): Land and water management (including soil systems) for climate adaptation and mitigation.

- Cluster 2 (owner tbc): Climate change challenges to farming systems (efficiency and ecosystem services)

- **Cluster 3 (Organised by the United Kingdom): Increasing resilience of food value chains under climate change:** increasing resilience of food value chains under climate change under Core Theme 1 (see diagram below) is the core of what FACCE-JPI is trying to achieve, with resilience embedded in each of the Core Themes. Cluster 3 therefore interfaces with all Core Themes and is presented as both primary production-oriented and consumer/demand-oriented.

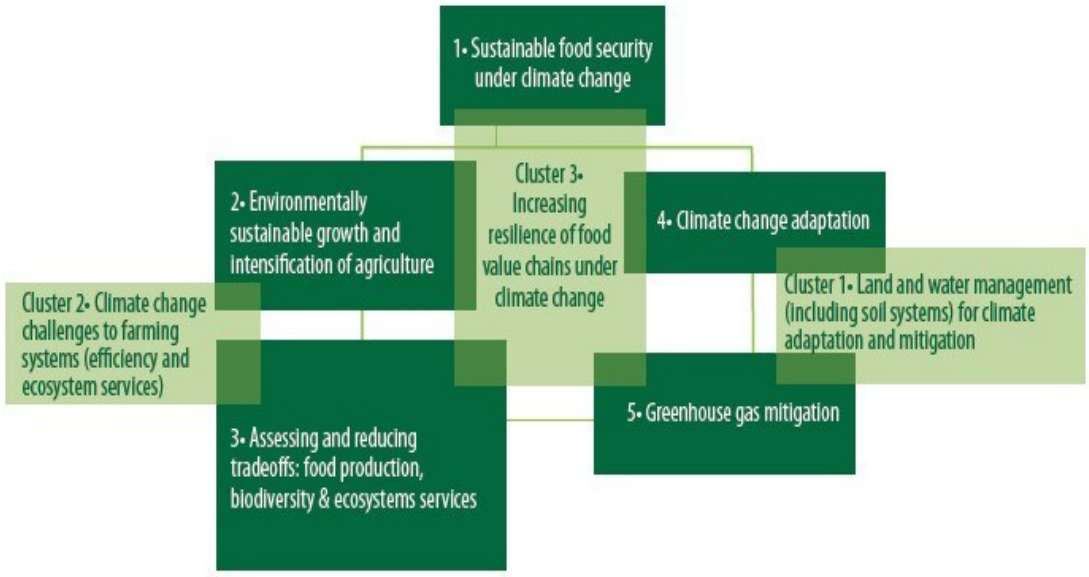

Figure 3: Clusters of the IP 2014-2015

Workshop objectives and desired outcomes

Provide a framework for strategic discussions between funders and experts towards programme alignment in dialogue with scientific experts: a balance between top-down and bottom-up approaches is necessary. The view of the scientific community towards how and on what subjects to take forward should be taken into consideration.

Identify activities or programmes where 3 or more member states agree to align their efforts: activities include a wide spectrum of mechanisms and instruments from informal agreements for countries to work together on a joint programme or funding a call. Actions could be short, medium or long-terms or even a 'forward look'.

Ensure national priorities are fed into FACCE- JPI and the JPI is embedded better in future thinking of national priorities: FACCE-JPI has published a Strategic Research Agenda and a Biennial Implementation Plan which will be refreshed for 2016 onwards. Outcomes from this workshop will feed into the next implementation plan and will help priorities to be identified at a national level.

Matching instruments for collaboration to ideas: there is a range of instruments identified by FACCE-JPI. Some examples (non-exhaustive list) may include networking, joint calls, workshops, sandpits, knowledge exchange, training, data sharing, innovative technologies and infrastructure to name a few which can be used to initiate joint activity.

3) Workshop

3a) Morning Session Introduction

During the first part of the workshop, there was an overview of the different levels of the food value chain (farm to fork), highlighting their scope, strengths and weaknesses, and how they affect and are affected by other levels in the chain. During the second part of the workshop, there will be an opportunity for both experts and funders to consider key messages from the talks/ discussion at different levels of the food chain and discuss scope to increase resilience of the food chain at a European level. Considerations may include:

- What activities are already being done at a member state/collaborative level (including integration of the food value chains);
- Is there scope for actions that will enable a holistic view of the food chain and how certain aspects can be integrated to help made the food chain more resilient;
- What gaps exist in terms of research and/or activity to understand the different aspects of the food chains;
- Are there opportunities to identify activities or programmes where 3 or more member states agree to align their efforts;
- Barriers in the linear food value chains and how they affect the flow. Gap areas in e.g. data, modelling (climatic and economic models), expertise etc.;
- New and emerging research areas under each theme that need further investigation and could provide transformative science in the long-term;
- Potential for learning e.g. mutual exchange of best practice, methodologies;
- Interlinking between science and policy; are all policies in place to allow integration in the food value chain?

Presentations overview

Farm

To promote resilience, it is important to identify the risks of food production. The UK Climate Change Risk Assessment (CCRA) published the first assessment in 2012 which highlighted the inter-connectedness of sectors (water supply, transport, energy, ecosystem resources etc.) in the food chain. It also highlighted that the impacts on the food supply chain will affect the agriculture sector and vice versa. It is therefore important to take an integrated approach of the food value chain.

The food supply chain, in most cases, is driven by commercial activity (standards, prices, a secure market and a long term relationship). It is the main influence on farmers' behaviour for adoption of practices rather than sustainability drivers. The issues of sustainability and resilience of food chains therefore needs to be embedded through a relationship with buyers in addition to effective policy instruments and their regulation. There is a need to develop effective policies that seek to integrate this into food chain objectives.

It should be noted that policymakers are consistent in their objectives for sustainability and

resilience of food supply chains, however, there is a lack of policy coherence and effective instruments to encourage adoption by farmers and industries. Coherence among policies is of vital importance and will help achieve the objectives.

Climate change mitigation measures at the farm level are usually based on efficiency gains that are likely to increase productivity and production. E.g. improving livestock health affects GHG abatement in terms of scale and cost-effectiveness. However, this efficiency gains are likely to lead to increased production, an overall price fall and increased consumption jeopardizing the objective of mitigation. Reduction of product waste at the farm level also helps improve resilience by reducing carbon foot prints. Progressive supply chains can realise significant improvements in sustainability and resilience through setting targets and working with producers to make changes. Implementation of effective policy can come into play here.

Harvest/Processing – Systems approach to food waste

Food is wasted throughout the supply chain. Most debate on food value chain circles around increasing production and lacks debate around reducing and/or limiting waste. Reducing waste is a more tractable problem than increasing production in the short to medium term, as its solution is not limited by availability of land and water resources.

Data is required to assess food supply chain from primary production at farm level to consumption. The data on waste is poor. It is necessary to understand the supply of food, the demand, consumption and people's eating habit, consumer choice etc. to analyse how this feeds into issues surrounding wastes and primary production and reliable data is required for the purpose. Methodology for measuring wastes is not very clear, and how the data was derived is also not very clear. Retails hold a lot of data and opportunity lies in sharing these valuable data.

There is a need to bridge across the pre-harvest/postharvest/processing continuum. Integrating from the field to storage and reducing waste in all these levels is important. Pre-harvest stress has major effect on post-harvest life and very little work is in done in terms of underlying causes and mechanism. Here, it is important to integrate disciplines, work on each level of pre-harvest/postharvest/processing continuum is being done in isolation and it is important to bring disciplines together. It is also necessary to harmonize decisions and policies that are put in place that affects the post-harvest storage. With climate change a lot of focus has been put on primary production. However climate change will also have altered post-harvest risk. This should be taken into account.

According to data from supermarket and retailers, selection of traits for breeding (commercial produce) is reliant on what is perceived as consumer demand. In most cases, this is not in line with making our food system more resilient. Primary traits include yield and resistant primarily in the field. One way to limit waste is to breed for longer post-harvest life, but often this has trade-offs with taste, nutritional profiles etc. As such, in looking at trying to minimize the degree of waste, the genetic pool is getting narrower. Integrating supply chain management with technology could also help with food waste. Currently, the government policies are primarily based on family food surveys. With the growing need and demand for choice and the food system being largely driven by consumer choice, the food system is being made less resilient. Develop policies that match and take into account the supply chain management will help address the issues in food chain resilience in the long term.

Logistics – Food Waste: Supply chain management, distribution and logistics

An opportunity here is to link different areas to take an interdisciplinary approach encompassing science, technology and socio-economics and other areas in different context. There is a lack of reliable data on food as well as non-food waste. In the primary sector, lack of data is deterring further research into the cause of waste. Tertiary sector (retail, restaurant etc.) has good data on food waste and this could be an opportunity for the sectors throughout the chain to work together.

With challenge of overpopulation, urbanization, changing diets, increase in ageing population etc. causes, implication and limitation of food waste is of growing significance. Wastage of food contributes unnecessarily to climate change. Reducing food waste can also make a significant contribution to tackling climate change. An Oxfam[1] finding indicates that the largest source of big 10 food and beverages companies' emissions is agricultural production of their raw materials, yet these are not covered by the companies' emissions reductions targets. There is a lack of urgency and it is necessary to devise and implement effective policy towards food, to reduce waste, rather than towards just agriculture. Conversely, climate change also poses risk for food production.

Social innovation including raising social awareness of the need to reduce food waste can play an important role in reducing food waste. A public-private partnership with an interdisciplinary approach (including science and technology) can help understand food chain sustainability and dynamics and contribute to reduction and limitation of food waste. Technologies have lots of opportunities, but there is a need for people to work towards solution. Innovative technologies are sold to huge business like automobiles but often not implemented in food business because of the cost associated with it.

An opportunity for addressing resilience lies in tackling surplus food and waste utilisation. A holistic approach of food should be taken to consider how surplus food, resources and waste could be utilised (e.g. use in biorefineries).

Retail – Food Price Volatility: concept, causes and consequences

Interagency report[2] to G20 on price volatility defines that volatility, in a purely descriptive sense, refers to variations in economic variables over time. It is important to understand the concept of price volatility as this is often wrongly used in conjunction with price spikes. The impact of price volatility to that of price spikes differs and the policy measures to deal with both should be tailored accordingly. Rising food prices or price spikes refers to increase in the mean of the food price series whereas 'food price volatility' refers to the variance of the price series i.e. price uncertainty in short runs.

Food price spikes and volatility both can affect economies that are dependent on agriculture e.g. price spikes in international markets can generate domestic shortages; price volatility would generate uncertainty which may affect investments in technology and capacity etc. Price volatility is a complex phenomenon influenced by several factors. There are lots of researches on food price increases but very less on food price volatility. This requires data taking into consideration the various factors that influence this volatility. There is a need of

[1] 186 Oxfam Briefing Paper (2014) Standing on the sidelines – why food and beverage companies must do more to tackle climate change
[2] World Food Programme (2011) Interagency report to the G20 on Food Price Volatility

transparency in food market. Retail hold a lot data that could aid further research into price volatility and its impact. More open data is required with increased transparency of market information.

In order to achieve resilience in the food chain, several factors must be considered, one being food price volatility in response to changes in supply. Several long-run trends in supply and demand affects food price. For e.g. Land allocated to agriculture is being reduced but productions are overcompensated with increases in technologies, in yields etc. Markets are sensitive to climate change and adaptation strategies to these. It is perceivable that changes in other levels of the food chain affect supply and demand and vice-versa. A global perspective should be taken to enhance the understanding of causes and effects of price volatility.

Policies have been implemented in this area but it is necessary to have coherent policy that articulates conflicts several factor influencing food price volatility (e.g. reducing import barriers, domestic support, provisions concerning export restrictions, conflicts between food and fuel, dealing with waste etc.)

Consumer – Food consumption and greenhouse gas emissions: why and how to change?

In the context of food security, there is an increasing demand of food under converging threats of climate change, population growth, changing eating patterns, depletion of natural resources, food price volatility and fossil fuel prices. There is a high contribution of food sector to greenhouse gas emissions. Studies[3] have shown that existing diets that currently have high nutritional quality of food does not necessarily imply low environmental impacts and so more studies are needed to identify ways to reduce the greenhouse gas emission impacts of healthy diets. To increase the resilience of food chain, it is important to integrate the diet level and not limiting it to a food-based approach.

Consumer choices correlate with greenhouse gas emissions and there are certain drivers of choice (e.g. price, taste etc.) and acting on choices (e.g. nutritional and environmental labelling), acting on preferences (awareness, general information) and acting on food stuff quality can help address these drivers of action on consumer choices. On the contrary, certain activities like general population campaign on food choices can strengthen social inequalities, it is therefore important to maintain the balance.

There is a role of policy and regulations that influences and diversifies consumer choice by addressing compatibility of consumer and firm strategies (e.g. substitutions between food categories and substitutions inside food categories). Right scope should be identified for substitution of products, combining consumer preferences and firms strategies. Integrating the socio-economic as well as psychological determinants of consumption will help steer the food system towards sustainable option. Food waste can also be analysed in relation with consumer practices and how it can be limited with consumer behaviour and/or supply. Concurrently, there is a need to understand the trade-off of different challenges of sustainability.

[3] Vieux et al (2012) Greenhouse gas emissions of self-selected individual diets in France. Ecol Econ 75:91-101

Morning session discussion

The presentations provoked much discussion and it became clear that there are common themes between the food value chain levels to further understand increasing resilience of food value chains against climate change.

Data

There is a need for reliable data:

- Existing data has gaps, are not recent and do not provide a full picture;
- Data on waste need to improve as existing data are unclear and it's difficult to rely on consumer surveys as consumers tend to alter behaviour under surveillance;
- Linking to big data will have a huge influence on the future supply chain and the way research is done;
- There is much data held by retailers however a lot of this is not accessible or shared and perhaps there can be a way to create opportunities to increase transparency between the retail and public sector.

Integrated understanding of the food value chain

What happens at one level of the food chain will affect others:

- Farm- there are many factors concerning diversification at farm level. While farmers who diversify generally fair better financially, the perception is that money will not be made and therefore there is a reluctance to diversifying which in turn will impact further down the food chain;
- Harvest and processing- increasing shelf life of food requires more effort and energy to store a product. Sometimes products are stored so they can be sold at a higher price rather than a means to reduce waste. There needs to be an understanding between product demand, storage and when to sell to ensure balance between production, storage, waste and profit;
- Logistics- current traits for breeding are not necessarily well aligned for making food production more resilient. For instance same problems arising with certain food products e.g. diseases or for increasing yield so to produce more products may be pumped with water so while there is more weight, the quality will suffer. Related to this, moving food stuffs with a higher water content costs more and has waste implications such as omission of Green House Gases and energy being used;
- Retail- while there is a large gene pool selection the use is narrowed to only a few breeds. Genetic selection is driven by consumer driven factors e.g. longevity, look and taste. There are limits to what can be done for breeding to reduced waste and is particularly the case where retail price is playing an important factor. Considering food nutrition security rather than food security may help this but this may be something which needs to be driven by policy to improve diversity;
- Consumer- While it seems the whole food system is driven by consumer choice, it poses a risk to deliver this demand level on a long-term basis. The consumer ultimately pays for the management of domestic waste so buying surplus to their requirements is the consumers' prerogative. If there is a trend in waste reduction, this will directly impact the farm level as there will be a demand to produce less.

- There is a lack of human capital working in area many areas of the food value chain to drive issues forward e.g. harvest and processing, including food waste; logistics and consumer and therefore needs to be an increase in expertise;

- Horizon 2020 is providing opportunities for universities to engage in this area which in turn should help develop expertise however there needs to be more happening for researchers to tap into to address wider food value chain issues;

- Many questions around increasing resilience of food value chains under climate change are unable to be answered as either papers have not been written or published in a certain area or there has been no work done so the knowledge is not there.

3b) Afternoon Session

Breakout Session Introduction

Presentations given during the morning session introduced the different levels of the food value chain (farm to fork) and highlighted scope, strengths, weaknesses, and how they affect and are affected by other levels in the chain.

The breakout session provided an opportunity for both experts and funders to consider key messages from the talks and discussion and to identify scope and alignment activities to address increasing resilience of the food chain against climate change at a European level. Participants were asked to consider the following points to guide discussions:

- What activities are already being done at a member state/collaborative level (including integration of the food value chains);
- Is there scope for actions that will enable a holistic view of the food chain and how certain aspects can be integrated to help made the food chain more resilient;
- What gaps exist in terms of research and/or activity to understand the different aspects of the food chains;
- Are there opportunities to identify activities or programmes where 3 or more member states agree to align their efforts;
- Barriers in the linear food value chains and how they affect the flow. Gap areas in e.g. data, modelling (climatic and economic models), expertise etc.;
- New and emerging research areas under each theme that need further investigation and could provide transformative science in the long-term;
- Potential for learning e.g. mutual exchange of best practice, methodologies;
- Interlinking between science and policy; are all policies in place to allow integration in the food value chain?

Breakout sessions and feedback

Two breakout groups were organised beforehand so both groups would consist of a range of expertise, country representation and affiliation. Each group nominated and rapporteur who would present the feedback. The breakout groups were given one hour for discussion and 15 minutes per group to present feedback.

Issues

While there are some integrated initiatives as a result of European funding, more of a multidisciplinary approach to research merging of relevant government departments/institutes and intersect between environmental projects, the fragmentation between academia, funding and government still remains.

There are several factors why there is not much aligned activity such as different focus and approaches in different countries which as a result do not present an opportunity for alignment. Due to the varied activity across Europe, it is clear that efforts need to be made in order to fill the vast gaps not only at each level of the food chain but across the food chain. This might involve understanding gaps in specific areas in specific countries first and building on the knowledge with the aim to identify what information in required, to understand priorities in terms of filling gaps, and to understand the resilience of the food chain under climate change e.g. focus on a particular area of the food chain or a common theme throughout each level of the food chain.

It was thought that there is a potential to reduce research gaps if there was more integration between the food value chains. Integration would allow a more holistic perspective and could therefore enable a better understanding to issues like resilience of food value chains under climate as well as develop harmonisation methods and common food chain metrics.

One of the main issues which would allow a more integrative understanding is the data. There are barriers in access to data e.g. data are not available, come at a cost, existing data are old, inaccurate and full of gaps. In particular there is difficulty obtaining data from the retail sector which could help research at all levels of the food chain.

Opportunities and possible activities

FACCE-JPI could link with existing networks/ERA-Nets in this area to:

- Help map information gathered and identified to contribute to help understand increasing resilience of the food chain under climate change;
- This could be achieved by getting relevant EU projects together though it is unclear whether this is a role for the European Commission.

Compilation of data around at all levels of the food chain which may include the need to identify:

- Issues around ownership, data validation, data management and distribution;
- Ways to gather data and understand wider issues that may affect data gathering e.g. consumer behaviour;
- What models (integrated) may be required which in turn may help determine data demands. Integration of models may include combining biophysical and socio-economic research;
- Economic models to simulate price volatility;

- Link to other models down the supply chain.

Explore the role of instruments available with FACCE-JPI and the EU:

- A Knowledge Hub
- A new ERA-Net e.g. fostering resilience and diversity across the supply chain;
- European Innovation Partnerships

A thematic approach could include research in a certain area, keeping the main aim of integration of the food value chain and increasing its resilience, such as:

- Large scale impacts of single climate events (extreme events) and how will/can food supply chain anticipate such impacts;
- What are the drivers of consumption (consumer behaviour) and the impacts on resilience;
- Risk to resilience due to standardisation of food chain processes and a uniformed view of this;
- Clarify sustainability vs. resilience which may include clarification of consumption and how it relates to the supply chain;
- Identify most sensitive (to climate change) supply chains and what options might be available to change these. Could include involvement from all relevant stakeholders and provide the opportunity to showcase possible changes in the food chains.

In order for the scientific community to progress actions, there needs to be the skills to achieve this therefore in working on any future actions, while there should be promotion of working in an interdisciplinary nature, there also needs to be a balance between specialist and generalist skills.

3c) Key conclusions and next steps

From the breakout session feedback and information learnt in the morning session, it was clear though progress being made in understanding the resilience of food value chains under climate change, there is still much that needs to be done at a national and European level. The key to this is a more integrative way of working to build a holistic understanding.

While there doesn't appear to be much alignment of activity at a European level, this provides FACCE-JPI a real opportunity to take forward any appropriate activities which will help increase understanding, build knowledge and disseminate outputs at an academic and policy level and lead to the co-design of new priorities and programmes.

Participants unanimously agreed that the workshop was useful to help develop a picture of current activities being done in the area at a European level and understand what needs to be done.

The workshop will be presented to the FACCE-JPI Governing Board in due course where there will be a discussion on how to proceed with next steps.

4) Annexes

Agenda

Time	Item	Subject	Speaker(s)
09:00 **09:15**		***Registration (tea and coffee)***	
09:15 - 09:30	**1)**	**Welcome and Introduction** • Workshop Background • Workshop Objectives and desired outcomes • Outcomes from Sustainable Intensification workshop from 3rd February	Tim Benton (Workshop Chair, Global Food Security Programme)
09:30 **10:05**	**2)**	**Farm** • Systems approach: technological issues, socio-economic and policy aspects at farm level • Diversification at farm level • Farming systems	John Elliot ADAS (UK)
10:05 **10:40**	**3)**	**Harvest/Processing** • Systems approach: technological issues, socio-economic and policy aspects at landscape level • Assessment/reduction of food waste	Leon Terry Cranfield University (UK)
10:40 ***11:00***	***Coffee Break***		
11:00 **11:35**	**4)**	**Logistics** • Assessment/reduction of food waste	Dr Toine Timmermans Wageningen UR (Netherlands)
11:35 **12:10**	**5)**	**Retail** • Food market price volatility and its relation with climate change • Reduction of food waste	José M. Gil IRTA- Research Centre for Agri-Food Economy & Development (Spain)
12:10 **12 :45**	**6)**	**Consumer** • Consumer behaviour	Catherine Esnouf INRA (France)
12:45 **13:30**	***Lunch***		
13:30 **13:45**	**7)**	**Introduction to breakout session**	Tim Benton
13:45 **14:45**	**8)**	**Breakout Session** • 2 x groups (group allocations will be made available on the day) *Refreshments will be available around 14:30*	
14:45 **15:15**	**9)**	**Breakout Session feedback** • Rapporteur from each breakout group to provide feedback from discussions	TBC on the day TBC on the day
15:15 **16:00**	**10)**	**Plenary discussion and Next Steps** • Discussion of breakout session feedback • Next steps • Closing remarks	Tim Benton All
	End of Workshop		

Participants list

Aston, Steve	DEFRA	UK
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Kelly, Raymond	Teagasc	IE
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