FACCE MACSUR Joint Workshops 2015

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Revision	Changes	Date
1.0	Internal release	2015-11-18
1.01	Public release (shortened, introduction added)	2015-12-03

Summary

FACCE MACSUR comprises many different groups whose work contribute to improving the European capacity of modelling agriculture with climate change and providing an assessment of these impacts for stakeholders. Some groups work on methodological issues in a single discipline, others work on cross-disciplinary concepts. The meeting provided an opportunity for the members of the groups to meet for intensive discussions and exchange of ideas, which is not as easily done in phone or video conferences. Various groups also met with each other to agree on work plans and common settings for research. Overall, 105 researchers attended the workshops. For coordinating work with the global program AgMIP, AgMIP's principle investigator John Antle attended the meeting and, meeting in a video call, coordination teams of MACSUR and AgMIP agreed to continue the successful collaboration in the future.

Major overarching outcomes of the meetings were agreements on policy and climate scenarios recommended to be used within MACSUR, development of an approach to quantify effects of extreme climatic events on socio-economic indicators, and closer collaboration among several groups at the level of regional case studies.

Contents

For sessions that are not listed, please contact the session leaders:
XC1 – Model comparison and improvement (Marco Bindi)
XC6 – Regional case studies (Pier Paolo Roggero)
XC11 – Feeding livestock: forage produktion, feed quality, efficiency of feed resource use and animal protein produktion (Barbara Amon)
XC14 – Impacts on ecosystem services and rural development (Katharina Helming)
C3 – CropM Methods of scaling and model linking (Frank Ewert)
C4 – CropM Uncertainty and Risk analysis (Reimund Rötter)
L1.3 – Representation of grasslands in farm scale modelling – overview of current approaches (Mats Höglind)
TradeM (Floor Brouwer, Franz Sinabell)

Acknowledgements
Financial and in-kind support of the meeting by the Norwegian Research Council and Thünen Institute are greatly appreciated.

Session XC7 – Impact assessment for Europe

Andrea Zimmermann

Summary, major results, agreements

XC7 will conduct a Europe-wide climate change risk assessment for farming and food security. The assessment will provide projections for the years/periods 2030 and 2050 on:

- Crop and livestock production
- Trade flows
- Producer and consumer prices
- Farm revenues
- Environmental indicators (e.g. GHG emissions, nutrient surpluses)

XC7 has a cross-cutting leadership consisting of people from all three themes: TradeM (Heckelei/Zimmermann), CropM (Ewert) and LiveM (Rolinski).

Within MACSUR XC7 will

1. Summarize the different strands of cross-cutting activities
2. Serve as a reference for describing sore spots in the various scenarios
3. Inform stakeholders in regions outside the case studies about potential future climate impacts
4. Deliver the framing conditions for the regional case studies in XC6.

XC7 consists of six tasks, which are shown in Table 1 below.

Table 1. Tasks in XC7

Task #	Task description	Theme	Lead	Involved
XC7.1	Common baselines for integrated EU-wide impact assessment	TradeM	Heckelei/Zimmermann	Havlík
XC7.2	Providing ensembles of EU-wide/global consistent sets of crop yield changes	CropM	Ewert	Semenov, François, Ponti/Doro, Müller, Rötter, Haas, van Ittersum
XC7.3	Providing ensembles of EU-wide/global consistent sets of grassland yield changes	LiveM	Rolinski	François, Haas, Bellocchi
XC7.4	Integrated EU-wide impact assessment of ensemble runs	TradeM	Zimmermann/Britz	François, Rolinski, Ewert, Mittenzwei, Holman, Helming
XC7.5	Deepening of the EU-wide analysis with regional/national crop, livestock and economic models (cross-checking results with XC7.4)	TradeM	Lehtonen	Ruiz Ramos, François, Dono/Cortignani, Rötter, Mittenzwei, Holman, Amon, Reidsma/van Ittersum, Tiffin, Havlík
XC7.6	Methodology and analysis of impacts that cannot be modelled	TradeM	Helming	Amon, Roggero/Seddaiu

The workshop aims were to

1. Inform each other about the different tasks and perhaps challenges therein. Additional aspects to be considered were the consistency of scenarios across TradeM, CropM and LiveM and the timing of the tasks.

2. Discuss data exchange issues in terms of (1) agreeing on a draft protocol for data exchange between crop, grassland and economic models and (2) clarifying data needs of

the regional case study models involved in XC7 (task XC7.5) and the non-modelling assessment (task XC7.6).

Table 2 depicts the agenda of the workshop. Presentations were given by all task leaders, each followed by discussions along the lines of the workshop aims.

Table 2. XC7 workshop agenda

14:15-14:20	Welcome and introduction Andrea Zimmermann
14:20-14:40	Overview of baseline generation, economic impact assessment and scenarios from XC16 Andrea Zimmermann
14:40-15:00	Overview of crop model impact assessment and scenarios Frank Ewert
15:00-15:20	Overview of livestock model impact assessment and scenarios Susanne Rolinski
15:20-15:45	Discussion: Common scenarios, timeline, common protocol for data exchange between XC7.2, XC7.3 and XC7.4 Andrea Zimmermann, all
15:45-16:15	Coffee break
16:15-16:35	Overview of regional deepening and data needs Heikki Lehtonen
16:35-16:55	Overview of ecosystem services analysis and data needs Katharina Helming
16:55-17:10	Discussion: Common scenarios, timeline, data exchange between XC7.5, XC7.6 and others all
17:10-17:15	Closure

Main results:

- Discussions revealed an inconsistency in the preferred scenarios by crop and economic modelers. This will be clarified as soon as possible.
- Crop and grassland modelers will be able to provide yield changes based on consistent climate scenarios and models and at a resolution suitable for the economic model CAPRI. A common protocol will be used for data exchange.
- XC7.5 will compare the baseline assumptions of CAPRI and the regional case studies based on information provided by XC7.1. Results will be compared based on CAPRI result tables compiled by TradeM.
- XC7.6 will set up an indicator framework for assessing ecosystem services. The indicator framework will be filled with modeling results at different regional scales.

(Person to contact: Andrea Zimmermann, andrea.zimmermann@ilr.uni-bonn.de)

Session XC8 – Extreme climatic events

Summary, major results, agreements

The aim of this cross cutting activity was to develop a better understanding of the impacts of extreme events on food security in Europe.

Our group discussion highlighted that collectively we felt unclear about what food security actually means in a European context. To understand the impact of extreme events, we must first be able to identify when an extreme event in the European food system has occurred. We decided not to focus on quantifying the effect of extreme events on crop production, as this research is still at a very early stage, and there are many possible extreme events to consider.

It was decided that a useful output would be to establish various indicators of food (in)security in Europe. The aim of this work is to develop some simple metrics or indicators, that an extreme event has occurred in the food system. These may then be used to translate outputs from crop- and economic- models (e.g. changes in production, price increases...) to more tangible food security issues in Europe (e.g. use of food banks, farm closures, increased government spending to compensate farmers...).

We identified that many Europeans are unlikely to become food insecure as a result of extreme climatic events. However, some groups, at a range of scales, could be very vulnerable. We hope to explore these, and other, indicators of food (in)security in Europe.

Governments can be vulnerable

> Indicators could include level of government spending to compensate farmers following poor harvests, changes in trade balances, changes in exchange rates.

Consumers across the region can be vulnerable if they spend a high portion of their income on food

> Indicators could include the use of food banks.

Some vulnerable communities exist (for example, Welsh hill farmers, smallholders)

> Indicators could include farm closures.

For more information contact Jacob Bishop, j.bishop@reading.ac.uk

Session XC16 – Overall scenario development

Summary, major results, agreements

In this workshop the state of the art of Representative Agricultural Pathways (RAPs) and relevant characteristics from the perspectives of different communities were presented.

We discussed how Europe specific RAPs can be extended and further specified based on: 1. global SSPs, 2. EU-SSPs 3 (developed e.g. in the FP7-project IMPRESSIONS), global, regional RAPs developed in AgMIP.

We identified and specified the different indicators needed to develop EU RAPs.

For example some goals of the CAP, which are important EU-RAP indicators:

- Income in the farming sector
- Rural development
- Consumer prices (Market stability, food supply)
- Environmental sustainability (Water, GHG, Soil?)
- Productivity in agriculture (Competitiveness)

We developed a rough outline of EU-RAPs:

- EU-RAP1: strong CAP, strong shift on environmental regulation, no producer support, green CAP with strong mititgation component
- EU-RAP2: BAU
- EU-RAP3: Europe breaks up, rich countries support farmers with national subsidies, poor countries do not
- EU-RAP4: Europe is divided in a poor and a rich part. In the rich part green CAP, in the poor part no CAP
- EU-RAP5: free market world, strong institutions, weak on enviromental regulations, low domestic polices? Local green CAP without mitigation

We presented a rough outline of EU-RAPs as well as how the European economic model CAPRI could support the implementation of EU RAPs to the session of the regional pilot studies developed in the XC6 (regional case studies)

(Anne Biewald, Franz Sinabell)

Session C1.1 – Model response to variable site conditions on crop production and ecosystem services

Summary, major results, agreements

The topic of the task session was the introduction to a crop model exercise to evaluate model responses to variable site conditions regarding crop production and ecosystem services. Three data sets were identified to be used by an ensemble of models to test their sensitivity on variable site conditions regarding crop yield, water and nitrogen contents in soil. Data preparation will be finished by January 15th, the exercise will be run by the participating modelers in 3 steps during 2016 and two papers are planned to be drafted by end of 2016/beginning of 2017.

(Christian Kersebaum)

Session C1.3 – Long term effects of management and cropping systems on crop production and ecosystem services

Summary, major results, agreements

The topic of the task session was to evaluate and compare the long term behavior of crop models with a special focus on soil organic matter dynamics. Models will be compared using data of long term experiments against measured variables. Data sets were presented by P.P. Roggero (IT), D. Ventrella (IT), K. C. Kersebaum (DE). J.E. Olesen also suggested to use data sets from a related project. To look at long term behavior of models under climate change scenarios including adaptation options an extension of the ongoing crop rotation and organic matter management study in Czech Republic was envisaged for sites across Europe running models over a period of 120 years using transient climate scenarios.

Person to contact: Jørgen Olesen

Session C1.5 – Modelling Pests & Disease

Summary, major results, agreements

1. Definition of steps (milestones) of activities under C1.5

The following steps were derived from the description of the task:

1. Identify relevant pests and diseases for major crops in Europe
2. Identify what models exist for these pests and diseases
3. Existing data on crop health from variety trials (what is available in terms of field data)
4. Development of models
   a. Address occurrence of pests and diseases
   b. Models for the impact of pests and diseases
5. Regional Applications of case studies

2. Countries represented in Task C1.5

The break-down of participants/counties by **milestones** is as follows.

Milestones	Italy	Norway	UK	France	Sweden	Poland	Germany	Denmark
1. Identify pests and diseases	X	X	X	X	X	x	X	X
2. Available models	X			X	X?	X	?	
3. Available Data	X	X		X?	X	X?	X	X
4. Development of Models	X			X	X	X	X	
5. Regional Application							X	

3. Definition on main crops to address in C1.5

Existing crop models in macsur: Wheat (many models), barley, maize, among others; possibly starting grapevine (VITE model, STICS, Nvino); there is talk in MacSur to model potato growth (CROPSYST, STICS, HERMES), but not a focus.

Based on (1) the importance of crops in Europe, (2) existing P&D research and expertise available among participants of C1.5, and (3) existing models in MacSur, the selectd target crops in C1.5 are: Wheat, Potato, Grapevine

Additional possible crops in C1.5: Maize, Sugarbeet

Breakdown of participants/countries by crops:

	Italy	Norway	UK	France	Sweden	Poland	Germany	Denmark
Wheat	X	X		X	X	X	X	
Grapevine	X			X?			X?	
Sugarbeet	X							
Potato					X			
Maize						X	X	

4. (Multiple) Pathosystems to be considered in C1.5

Wheat pathosystem:

	Yield loss	Quality losses	Impact of current control	Emerging
P. striiformis	X			
P. graminis				X
Powdery mildew	X			
P. triticina	X			
Septoria' blotches	X			
Fusarium head blight		X		
Tan spot	X			
Soil-Borne Viruses				
Wheat dwarf virus				X
BYDV				X

Potato pathosystem:

	Yield loss	Quality losses	Impact of current control	Emerging
P. infestans	X	x	X	
Rhizoctonia		X		
Nematodes	X			
Virus	X			
Early blight	X			
Ralstonia				X
Colorado potato beetle	X			
Erwinia	X	X		

Grapevine pathosystem:

	Yield loss	Quality losses	Impact of current control	Emerging
Powdery mildew	X	X	x	
Downy mildew	X		X	
Botrytis	X	X	(x)	
Berry moth	X	X		
Black rot	X			X
Japanese beetle				X

(person to contact: Serge Savary)

Session L1.4 – Reusing and linking models in livestock farming

1. Background

The task L1.4 deals with modelling the interactions between farm components (livestock, grassland, animal housing, manure storage, farm management). The argument for this task is as follows. Within agriculture, there has been a long history of model building. This has left a legacy of models, most of which have functionality beyond the initial purpose for their development. Nevertheless, many models are not reused, representing an inefficient use of the considerable resources required to develop new models. Models can be reused by linking existing models but this presents both scientific/conceptual and technical challenges. The former arise because different models may vary in their concepts of the same components. In technical terms, model documentation may be inadequate, models may be implemented in different programming languages/environments or there may be legal or property rights barriers. Past attempts to link models within agriculture have been either via bespoke or generic linkage systems. The former have the advantage that they can be closely tailored to a given objective, but involve a considerable cost.

Generic linkage systems provide a framework that can potentially reduce the investment necessary to link models. However, using such linkage systems incurs a cost in terms of the time necessary to learn how to use them and may constrain the functionality that can be achieved.

The task is in two parts, with the first dealing with scientific/conceptual issues and the second dealing with technical issues. The strategy in each case is to prepare a draft document that can then be discussed and modified at a workshop to produce a good draft of a paper. The final editing will occur in the months immediately after the workshop.

Part 1

Ruminant livestock farming both contributes to global climate change and is affected by it. It contributes to global warming through the emission of direct and indirect GHGs (CH_4, N_2O, NO_3^-, NH_3). It can also contribute to or mitigate global warming through changes in the C sequestered in the soil. We will consider the flows of information between components and the timescale with which we need to model them in order to simulate both the contribution to and effects of global warming. Both physical and management components will be considered.

2. Conceptual issues

The conceptual issues that might hinder the reuse of models are:

- Existing models neglect/under-represent important processes
  - Ruminant livestock systems vary widely (e.g. extensive beef, intensive dairy) and existing models were developed for a different system
- Lack of scientific agreement about processes
  - Especially the detail with which to represent them
- Cultural differences
  - e.g. different feed energy accounting systems

The objective of the session was to agree the key functions of farm components, the exchanges of information between them and the frequency with which this should occur.

2.1. Terminology

The farm components are in two different categories:

- Biophysical components:
  - Livestock
  - Fields
  - Animal housing
  - Manure storage
  - Feed storage
- Management components
  - Tactical management (annual – seasonal)
  - Operational management (monthly – daily)

An example of a simple combination of components is shown below. The components are in the boxes and consist of two biophysical components (grassland and livestock) and one management component (grazing manager). The functions of the components are shown in italics and the communication necessary to allow these functions to be preformed are in normal type. In this instance, the grazing manager has the task of applying nitrogen fertiliser and adjusting the livestock present on a continuously-grazed field to maintain a given target herbage mass. If the grazing manager is to perform its function of applying N fertiliser, it needs to exchange information with the grassland at periodic intervals whilst if it is to maintain herbage mass at the target, it needs to exchange information with the livestock module at weekly or daily intervals.

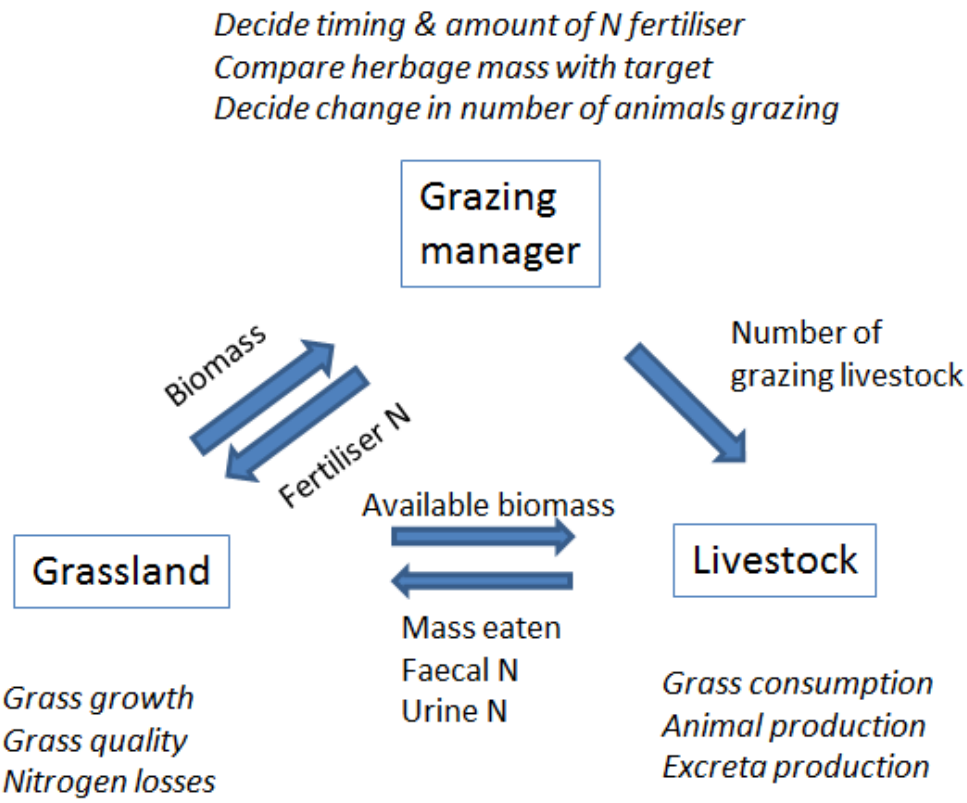

Fig 1. Simple example of flows of information and module functions. Arrows indicate flows of information, text in italics indicate functions.

2.2. Survey of existing models

Since existing farm-scale models have already had to address these issues, a survey was undertaken of the following models:

- IFMS (USA)
- DairyMod (AUS)
- FASSET (DK)
- Farmsim (F)
- FarmAC (EU)
- HolosNor (N)
- SIMSDAIRY (UK/ES)
- Melodie (F)
- AgRECalc (UK)
- SFarMod (UK)
- Dairywise (NL)

These models were characterised as dynamic, static or hybrid. A static model was defined as one in which ….

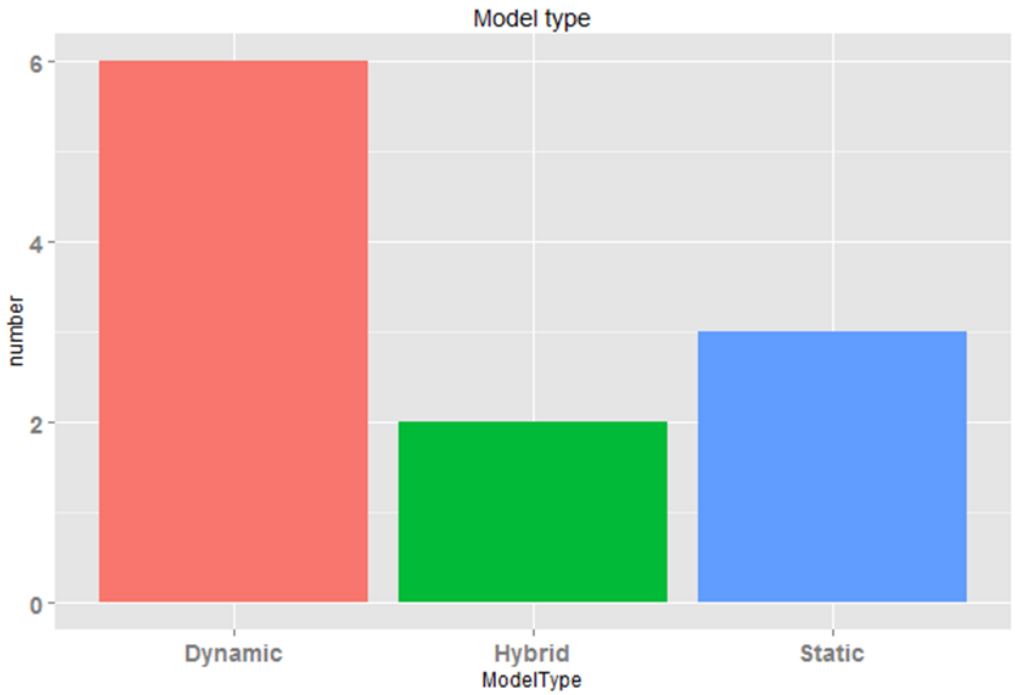

Fig 2. Model types represented in survey

The following structural information was required by most or all models:

- Livestock type (e.g. dairy cattle)
- Livestock group (e.g. early lactating)
- Land area available
- Soil type
- Availability of irrigation
- Location of fields, relative to farm buildings
- Type of animal housing (e.g. freely-ventilated, solid floor)
- Type of manure storage (e.g. slurry tank)

Only a minority of models required information about feed stores or other structures.

The outputs provided by a majority of models at the farm scale were:

- Direct GHG budget.
- Indirect GHG budget
- C budget
- N budget

3. Analysis of Components

3.1. Livestock

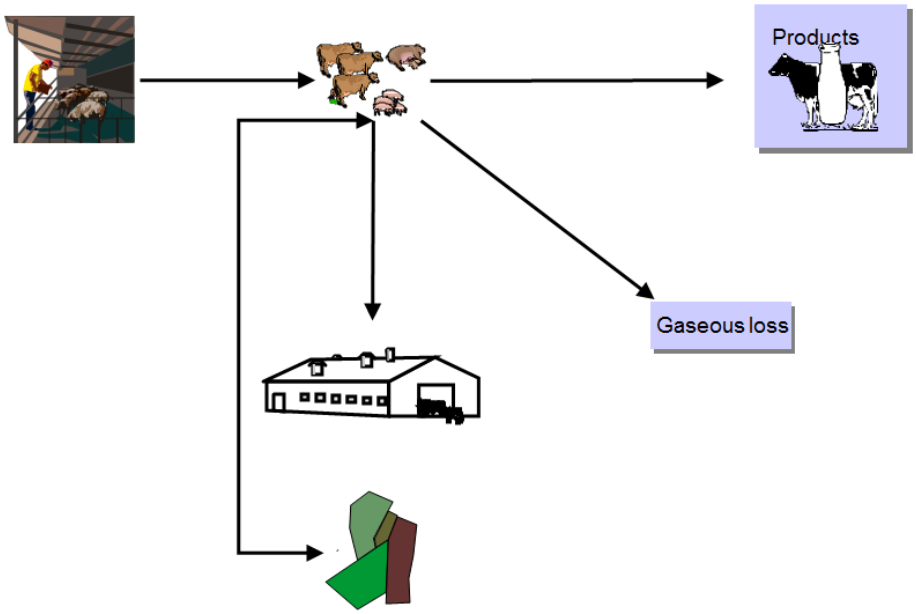

Fig 3. Flows of information for livestock

3.1.1. Farm survey results

	Dynamic	Static
Input		
Feed choices	*	*
Digestibility	*	
Meteorology	(*)	
Outputs		
Milk yield	*	*
Excreta	multiple	single
CH4	*	*
CO2	*	*
Frequency (in/out)	Day/month	Season/year

Multiple = multiple mass units

(*) = many but not all

3.1.2. Issues discussed

Prediction of intake from feed choices

- Most models did this. The choices were made on the basis of energy requirement and sometimes also protein requirement.
- Maximum intake was determined by a variety of (country-specific) means that took account of rumen fill.
- Concentrate feeds were always consumed first, with roughage feeds next.
- Digestibility depends on the chemical composition of the organic matter. The maximum digestibility depends on the lignin content. Starch and sugars are immediately digestible. The extent to which other forms of organic matter (cellulose and hemi-cellulose) is degradable in the rumen depends on residence time.

Estimation of milk yield or growth

- All are made on the basis of energy requirement and sometimes also protein requirement.

Estimation of enteric CH4

- Depends on the amount of organic matter is digested in the rumen. This depends on the intake of organic matter and the extent to which organic matter is degraded in the rumen (see under Prediction of intake).

Information concerning excreta (quantity and quality)

- Total ammoniacal N (TAN) is required for NH3 emission calculations
- Total N is required for N2O emission calculations and the calculation of organic N (total N – TAN)
- Organic matter is required for calculation of CH4 and CO2 emissions

3.2. Animal housing

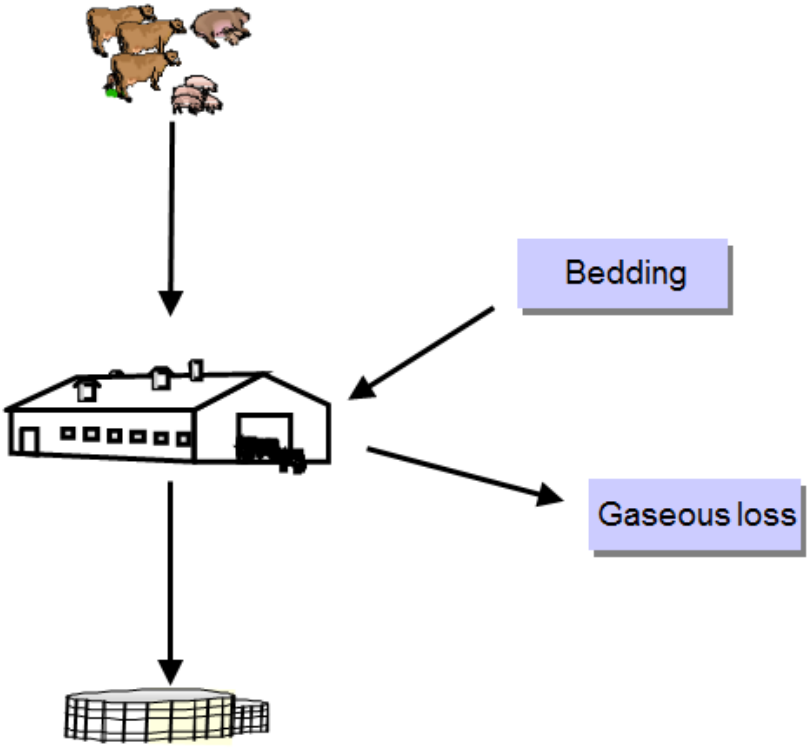

Fig 4. Flows of information for animal housing

3.2.1. Farm survey results

Housing	Dynamic	Static
Input		
Excreta	multiple	single
Meteo	(*)	
Outputs		
Manure	multiple	single
NH3	*	(*)
N2O	*	(*)
N2	*	(*)
CH4	*	(*)
CO2	*	(*)
water	(*)	
Frequency (in/out)	Day/month	Season/year

3.2.2. *Items discussed*

How do dynamic models calculate NH3 emissions?

- Some use a dynamic approach, some static and some a mixture

Do dynamic models consider manure in housing as part of storage?

- Unclear question. The models calculate the emission as a function of the housing temperature and ventilation but report it as part of the storage losses.

Is there a value in explicitly including housing in static models?

- Yes, because it allows mitigation measures to be more easily investigated (the applicable measures are different for housing and storage)

Most dynamic models took account of elements added in bedding and spilt/waste feed.

3.3. Manure storage

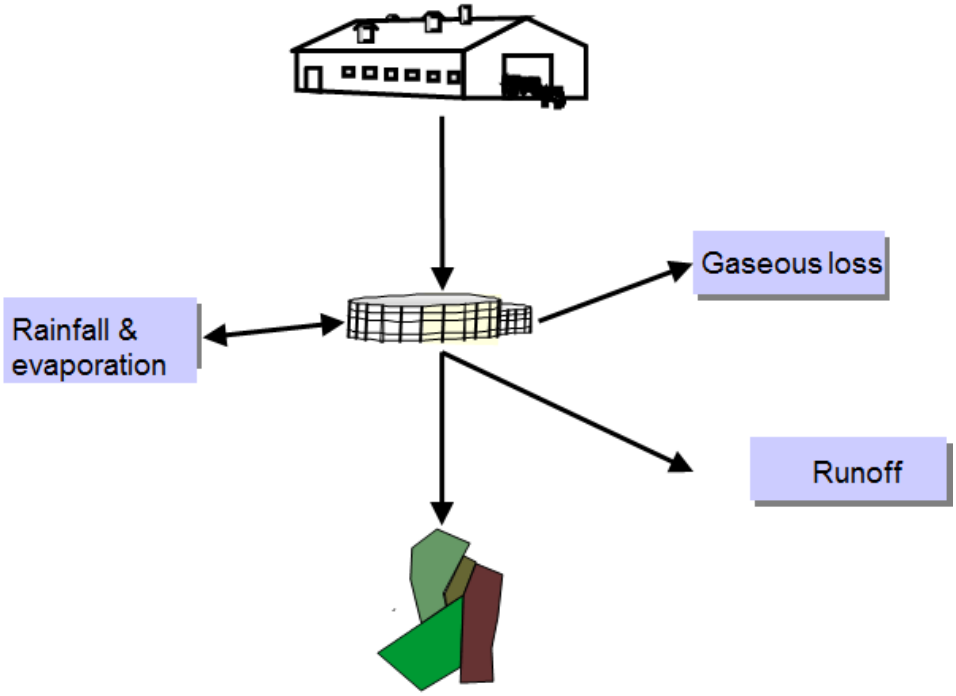

Fig 5. Flows of information for manure storage

3.3.1. Farm survey results

Manure storage	Dynamic	Static
Input		
Manure	multiple	single
Meteo	(*)	
Outputs		
Manure	multiple	single
NH3	*	*
N2O	*	*
N2	(*)	
Other C&N	*	
CH4	*	*
CO2	*	
water	(*)	
Frequency	Day/year	Season/year

3.3.2. Items discussed

How do models calculate NH3 emissions?

- Some use a dynamic approach, some static and some a mixture

How do models calculate N2O emissions?

- All use IPCC

Value of modelling N2 emissions

- Some do, some do not. Models use a multiple of N_2O emissions but the actual multiple varies

How do models calculate CH4 and CO2 emissions?

- Some use a dynamic approach, some static and some a mixture

The modelling of C and N flows in solid manure storage was considered problematic by all dynamic modellers.

3.4. Fields

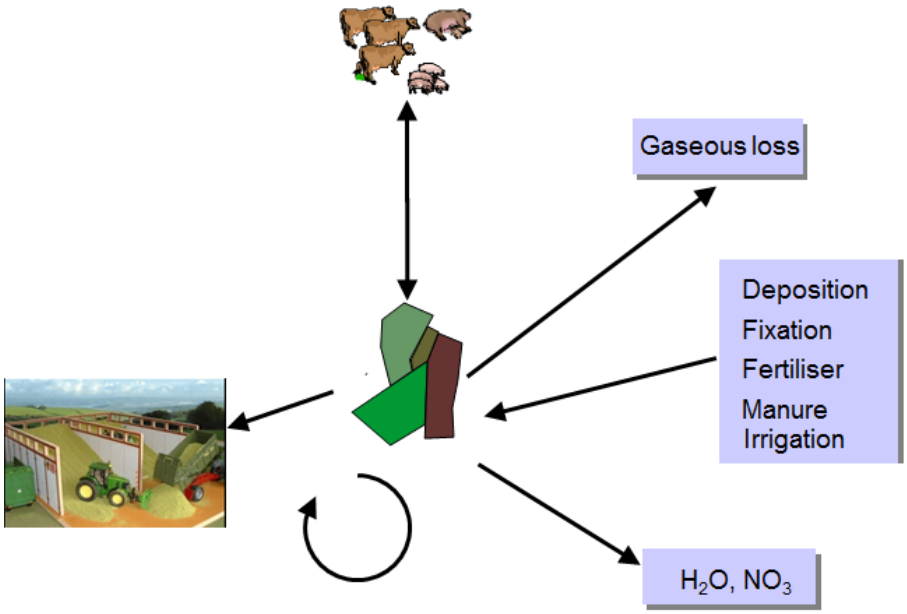

Fig 6. Flows of information for fields

3.4.1. Farm survey results

Field	Dynamic	Static
Inputs		
Manure	multiple	single
Manure application method	*	
Fertiliser	NH4&NO3	Total N
Water	*	
Meteo	(*)	

Field	Dynamic	Static
Outputs		
Production	multiple	single
Digestibility	*	
NH3	*	*
N2O	*	*
N2	*	
Other C&N	*	
CH4	*	*
CO2	*	
water	(*)	

The answer to the following questions:

- How do models calculate NH3 emissions?
- How do models calculate N2O emissions?
- Modelling N2 emissions
- How do models calculate CO2 balance?

Was “Some use a dynamic approach, some static and some a mixture”.

Additional items discussed:

- The N added in irrigation water was missing (this has been added to the diagram).
- We discussed the calculation of nitrate leaching. Some models used a leaching fraction approach (i.e. leaching = fraction * (N input – (N output – gaseous N lost)). Others calculated leaching from water drainage and the concentration of nitrate in soil water.
- We need to clarify how N fixation is calculated.
- We need to know if a model assumes soil C and N is in steady-state at the annual scale.

3.5. Feed storage

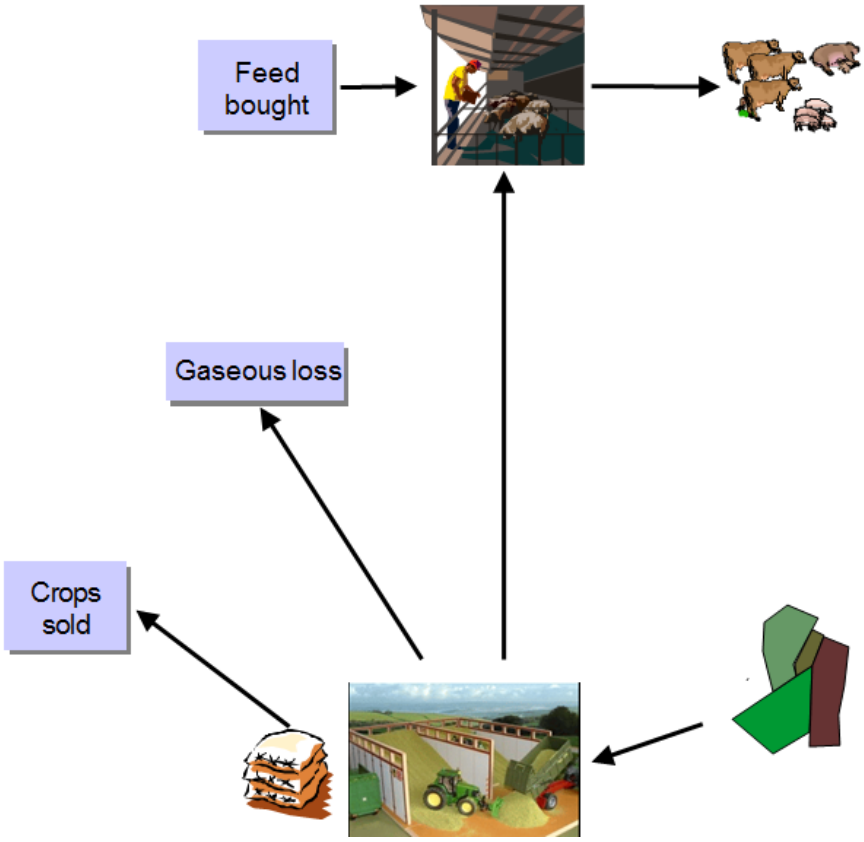

Fig 7. Flows of information for feed storage

3.5.1. Farm survey results

Few models included flows in/out of feed stores. Since there appear to be large losses of C (and possibly N) associated with especially silage making and storage, this appears to be an omission. For C, it is clear that the fermentation process will lead to an emission of CO_2. For N, the type of loss is less clear; although silage can contain significant concentrations of TAN, there should not be much NH_3 emission, since the pH of silage is low.

Losses associated with harvesting, drying (hay) and wilting (silage) are field processes.

3.6. Other

Hardstanding and corrals (places were animals are kept at high density for short or longer periods). We need to know how these are handled. Likewise access roads.

3.7. Management

Farm management can be modelled in three main ways:

- A fixed plan
- A set of rules to set the plan
- An optimisation of resources allocation, according to constraints and an objective function

3.7.1. Tactical farm management

Farm survey results

Tactical	Dynamic	Static
Replacement	*	*
Calving	*	
Conserved feed requirement	*	*
Crop rotation planning	(*)	
Cutting planning	*	
Fertiliser & manure planning	*	
Machinery planning	(*)	

Although the dynamic models generally included more modelling of tactical management, there were examples of dynamic models with fixed plans and static models with optimised resource allocation.

3.7.2. Operational farm management

Farm survey results

Operational	Dynamic	Static
Livestock		
Feed formulation	*	*
Purchase/sale	*	*
Mating	*	
Weaning	*	
Drying off	*	
Housing		
Ventilation	(*)	
Cleaning	(*)	
Manure storage		
Emptying	*	

Field		
Cultivation	*	
Sowing	*	
Fertilisation	*	
Manuring	*	
Cutting	*	
Silage making	*	
Grazing	*	

A fixed plan is commonest for static models whereas the two other methods are used to varying degrees in dynamic models.

4. Next steps

The next steps to produce the paper are:

- To clarify some responses from some modellers.
- Survey the functions of farm modules (one or two sentences per function).
- Analyse results of the function survey.
- Draft a new version of the paper.

Contact: Nick Hutchings

XC6 - Regional case studies (organizer: Pier Paolo Roggero)
with XC1 - **Model comparison and improvement** (Marco Bindi) and **XC14 - Impacts on ecosystem services and rural development** (Katharina Helming).

Tuesday, 28 October
08:30 - 08:45 Opening of the workshop, agenda (PP Roggero)
08:45 - 09:45 Overview of possible contribution of XC1 (Model comparison and improvement) to XC6 Regional Case Studies and possible outcomes. Mapping model output indicators of ecosystem services in Regional case studies OUTPUT: maps models x ESS indicators (G. Bellocchi, M. Bindi)
09:45 - 10:00 Stakeholder involvement in policy cycle (M. Köchy)
[Coffee 10:15 – 10:30]
10:00 - 11:00 Group discussion (or plenary, depending on no. of participants): illustration of previous experiences, identification of major challenges, actions and avenues for research; preliminary discussion on quality criteria requirements for case studies to be further discussed on afternoon and Wednesday sessions. (G. Bellocchi)
11:00 – 11:30 Design of process for developing one or more paper(s).

14:15 – 15:30 • Intro and negotiation of the proposed session agenda (PP Roggero)
• Showing Regional Case studies (10' each)
15:30 – 15:45 Learning from non-MACSUR experiences: "Sustainable Land Management: a research programme based on 12 Regional Projects in 4 Continents" (www.sustainable-landmanagement.net Module A) (A. Paulsch)
15:45 – 16:00 Coffee
16:00 – 16:45 Identifying relevant research questions across MACSUR case studies - interactive (group?) session - Discussion alsoon the criteria for cross case analyses
16:45 – 17:15 Research questions and cross case analyses: report of group discussion and plenary discussion
17:15 – 17:45 Mapping towards actions: participants will be invited to co-design a pathway towards XC6 deliverables (incl. papers). (PP Roggero)

Wednesday, 28 October
08:30 – 08:45 • Intro and negotiation of the proposed session agenda (K. Helming)
• Impact on ecosystem services and rural development in Regional Case Studies
• Introduction: aims and scope of XC14, draft analytical framework, CICES approach
08:45 – 09:00 Example of contribution to ecosystem service assessment from MACSUR models (M. Schönhart)
09:00 – 09:45 Discussion: requirements for analytical framework; opportunities and challenges for implementing the approach; overview of possible contributions from case studies; examples (K. Helming)
09:45 – 10:00 Roadmap, timeline and task distribution (K. Helming)
Coffee break
10:15 – 10:45 Stakeholder engagement policy (M. Köchy)
- At case study scale
- Building up relationships with JPI FACCE StAB

10:45 – 11:30 • Deliberating on regional case study quality requirements and XC6
• Agenda XC6.1-2-3
(PP Roggero, K. Mittenzwei)
11:30 – 12:00 Conclusions, reporting to Hub, timeline for XC6 (PP Roggero)

XC7 - Impact assessment for Europe (organizer: Andrea Zimmermann)

1 Introduction to XC7 (Andrea Zimmermann; 5 min)
2 Overview of XC7.1, XC7.4 and socioeconomic and policy scenarios from the XC16 workshop (Andrea Zimmermann; 15 min + 7 min discussion)
3 Overview of XC7.2 and crop modeling scenarios (Frank Ewert; 15 min + 7 min discussion)
4 Overview of XC7.3 and grassland modeling scenarios (Susanne Rolinski; 15 min + 7 min discussion)
5 Draft of the common protocol for data exchange between XC7.2/7.3/7.4 and discussion (Andrea Zimmermann, all; 5 min + 30 min discussion)
6 Overview of XC7.5 and data needed from the other tasks (Heikki Lehtonen; 15 min + 7 min discussion)
7 Overview of XC7.6 and data needed from the other tasks (Katharina Helming, tbc; 15 min + 7 min discussion)

XC8 - Extreme climatic events (organizer: Richard Tiffin)

In this workshop we will select three plausible extreme event scenarios. We will identify the current knowledge barriers to understanding the impacts of these events on agrifood systems, to inform where modelling is required to improve our understanding. Between this workshop and a follow-up workshop in December, participants will attempt to address the identified knowledge gaps, and develop narrative descriptions of impacts of these extreme events. We aim to produce a paper outlining our selected scenarios, a pathway to quantifying the impacts of extreme events on agrifood systems, and narrative descriptions of the three selected scenarios. Timing is limited in Braunschweig, a rough draft of the paper will be prepared prior to the workshop to help establish an efficient workshop structure. A preliminary program is included below:

Wednesday PM (first part in lecture hall, jointly with TradeM):
14:15 Introduction
14:20-14:50 Talks: Biological responses to extreme events – Crops & Livestock; Modelling crop and economic responses to extreme events; Outputs from the Global Food Security program.
15:50:16:05 Coffee break/networking
16:05-17:45 Group work: Discussions to identify plausible extreme event scenarios, e.g. heat stress during crop flowering, soya production shock in USA and Brazil. Voting to establish top three most interesting scenarios. Identify knowledge gaps or questions that arise from selected scenarios, e.g. how will primary production be affected by an extreme event? How might producers respond to reduced production?

Thursday AM:
08:30-10:00 Group work: Discussion to identify how modelling can be used to address the knowledge gaps or questions that arise from selected scenarios. Which gaps/questions can different models address?
10:00-10:30 Coffee break/networking
10:30-12:00 Group work: Continuation of what gaps/questions can different models address? Next steps - assigning workers to actions to be completed between this workshop and a follow-up workshop in December.

XC11 - Animal feed story (organizer: Barbara Amon)

1 Introduction (Barbara Amon) (8:30-8:45)
2 Topics of interest (Andre Bannink); short introduction addressing the topics (10 min each à one hour, 8:45-10:00)
3 Coffee Break (10:00-10:30)
4 Potential linkages with other MACSUR task (10:30-11:00)
5 Formulation of next steps and time table (11:00-12:00)

XC16 - Overall scenario development (organizer: Anne Biewald)
In this workshop we will discuss how far we have come with developing agriculturally specific SSPs (also called Representative Agricultural Pathways or RAPs), how we can progress with this development and how the scenarios can be quantified and implemented into the regional models developed in the XC6 (regional case studies). We will discuss the scenario development across the different Ms, as especially the agricultural scenarios need to be reflected in different communities (crop, livestock, economic).
Tuesday, 27 October
In the first half of the workshop we will start with key-note speakers from different Themes:
14:15 - 17:45
1 Dr. Anne Biewald (Potsdam Institute for Climate Impact Research), coordinator of the XCA "Overall scenario development": "*An introduction to Europe specific SSPs, developed in the FP7 project IMPRESSIONS*"
2 Dr. Barbara Ammon (Leibniz Institut für Agrartechnik, Potsdam-Bornim), LiveM:"*GHG emission sources in livestock husbandry and mitigation options*"
3 Prof. Frank Ewert (University of Bonn), co-leader of CropM:"*Why is it not sufficient to implement agricultural management into economic models only*"
4 Prof. Hermann Lotze-Campen (Potsdam Institute of Climate Impact Research), co-leader of the Global Economics Team in AgMIP, TradeM: "*The development and quantification of RAPs in AgMIP, first lessons learned*"

COFFEE BREAK

5 Prof. John Antle (Oregon State University), Leader of the Regional Economics Team in AgMIP: "*RAPs, Scenarios and Global-Regional Model Linkages: Lessons from AgMIP Studies and Plans for Coordinated Global and Regional Assessments*"
6 Dr. Andrea Zimmermann (University of Bonn), leader of the XCA "Impact Assessment for Europe", TradeM: "*RAPs and agricultural policy scenarios in CAPRI*"
7 Prof. Heikki Lehtonen (Natural Ressource Institute Finland), TradeM: "*Implementing RAPs in the regional case study Finland*"
Wednesday, 28 October
In the second half of the workshop we will gather in groups and try to define in structured discussions which aspects of the RAPs should be considered and how they can be translated into concrete scenario quantifications.

9.00-10.00 Presentation of different indicators:
-Adaptation measures in agriculture
-Greening in the CAP
-Rural development policies, Pillar II in the CAP
-EU-Water Framework Directive
....
Discussion of further indicators and quantification of the indicators for the different RAPs
10.30-12.00 Discussion on the translation of the indicators to model parametersDefining necessary input for the regional pilot studies from CAPRI and other sources

XC leaders (organized by Martin Banse)
Coordination of XC activities – Wednesday, over lunch

Managers (organized by Richard Kipling)
Exchange of experiences on managing large research networks like MACSUR – Wednesday, over dinner

C1.5 – Incorporation of diseases and pests in crop models (organizer: Christian Kersebaum)
Tuesday 9:00 - 12:00 Mini workshop (Savary)

C1 & C2 - CropM Model improvement and Data analysis (organizer: Christian Kersebaum)
Tuesday
14:15 - 14:35 Introduction and structure of WP1 and WP2 (Kersebaum/Olesen)
14:35 - 15:10 C1.4: Extend crop model assessments to more cropping systems : Work plan, participants, available data, time line (Bindi)
15:10 - 15:45 C2.3: Quantify data gaps for crop modelling: work plan, participants, time line (Olesen)
16:15 - 18:00 C2.5: Empirical analyses of crop responses to climatic variation: work plan, participants, time line (Olesen)
16:15 - 18:00 C1.2: Implementation of extreme events in crop models: work plan, participants, time line (Trnka)
Wednesday
8:00 - 10:00 C1.5 Incorporation of diseases and pests in crop models: participants, available models and data requirements, potential links to crop models (Savary)
10:30 - 11:15 C1.5: Incorporation of diseases and pests in crop models: work plan, available data, time line (Savary)
11:15 - 12:00 C2.4 Observed adaptation options and their efficacy: work plan, participants, time line (Savary)
14:15 - 15:00 C2.2 Climate change scenarios: work plan, participants, time line (Semenov)
15:00 - 15:45 C1.3 Long term effects of management and cropping systems on crop production and ecosystem services: work plan, participants, available data and treatments, time line (Olesen)
16:15 - 17:00 C1.1 Model response to variable site conditions on crop production and ecosystem services: work plan, participants, available data, time line (Kersebaum)
17:00 - 18:00 C2.1: Data compilation, management and presentation: concept, contributers, rules, data rquirements and available data, time line (Janssen)

C3 - CropM Methods of scaling and model linking (organizer: Frank Ewert)
Tuesday
14:15 – 14:25 Welcome and introduction (Ewert)
14:25 – 14:35 Overview and status of activities in C3 (Hoffmann)
14:35 – 14:50 Updates and results from scaling of management rules (phase 3), (Hoffmann)
14:50 – 15:10 Discussion of results from scaling of management rules (phase 3), (All)
15:10 – 15:25 Data and simulation results from Tuscany (Hoffmann)
15:25 – 15:45 Discussion of Tuscany results, (All)
15:45 – 16:15 Coffee break
16:15 – 18:00 Clarification / discussion of the contributions of participants to phase 3 (missing simulations, models, data, …), (All)
18:00 Dinner

Wednesday
08:30 – 10:00 Clarification of next steps of scaling exercise (All)
10:00 – 10:30 Coffee break
10:30 – 12:00 Procedural planning, e.g. papers, time plan, division of responsibilities, etc. (All)
12:00 – 13:00 Lunch

C4 - CropM Uncertainty and Risk analysis (organizer: Reimund Rötter)
Thursday
08:30 - 08:40 Welcome and overview on the sessions (Reimund & Daniel)
08:40 - 08:45 Introduction to SESSION 1 "Impact Response Surface Analyses" (chair: RP Rötter, Luke)
08:45 - 09:10 Inter-model variability in wheat yield responses to changes in climate in the IRS1 model experiment (20+5 min) (S Fronzek, SYKE)
09:10 - 09:30 Discussion on next activities/more outputs from IRS1 and access to model results
09:30 - 09:55 Current status of IRS2 study (M Ruiz-Ramos UPM/Spain & R Ferrise UFL/Italy)
09:55 - 10:15 Break/Refreshments
10:15 - 10:35 Progress report on model - aided barley cultivar design (BCD)/ideotyping (F Tao/Luke)
10:35 - 12:00 Break-outs for informal Working Group meetings (e.g. IRS1; IRS2; BCD)
12:00 - 13:30 Lunch break
13:30 - 14:15 Opportunity to participate in plenary (on stakeholders) OR continue in break-out group
14:15 - 14:20 Introduction to SESSION 2 "Framework for evaluating uncertainty & using ensembles of models) (chair: D Wallach, INRA)
14:20 - 14:40 A framework for evaluating uncertainty in crop model predictions (D Wallach, INRA)
14:40 - 15:30 Plenary or group discussion on related activities in MACSUR (CropM & other themes)
15:30 - 15:45 Break
15:45 - 16:05 Using ensembles of models –new lessons for CropM (D Wallach et al.)
16:05 - 16:30 Plenary or group discussion on related acivities in MACSUR (CropM & other themes)
16:30 - 16:45 Wrap-up and close (Daniel & Reimund)

CropM WP leaders meeting (Thursday, over lunch)

Keynotes/Plenaries 13:30–14:15

Tuesday: *The CAOS Project*. B. Tiemeyer, Thünen Institute
Wednesday: *Hub matters*. MACSUR leaders
Thursday: *Views from policy*. E. Fuhrmann, Austrian Ministry of Ag., For., Env., & Water Managemt and FACCE Governing Board.

L1.3 and L1.4 - LiveM Methods workshop (organizer: Richard Kipling)
The overall objective of Task L1.3 is to bring together expertise from grassland and farm scale modelling communities and to work together towards common goals in farm scale modelling. The workshop will work toward a state of art paper on the characterization of grasslands in farm scale modelling and a work-plan for task activities up to 2017.
The workshop aims are to:

- Explore how grasslands are represented in farm scale modelling
- Discuss strength and weaknesses of current approaches
- Suggest how the representation of grasslands can be improved
- Develop a sate-of-art paper on the representation of grasslands in farm-scale modelling
- Share and learn about possible solutions drawing on experience from MACSUR 1
- Form plans for further work in MACSUR and related projects

By bringing together expertise from different disciplines including grassland, livestock and farm scale modellers and by drawing on the extensive experience gained from inter and intra-disciplinary grassland and farm scale modelling activities in MACSUR 1, we expect a very interesting workshop.
The activities of L 1.3 and L 1.4 are complementary and we hope that many of you can attend the whole joint-workshop.

L1.4: Reusing and linking models in livestock farming (Nick Hutchings)
The overall objective of Task L1.4 is to encourage the reuse of modelling concepts and modelling code related to modelling production, GHG emissions and N losses at the farm-scale. The task itself is in two parts. The first part aims to establish an overview (and hopefully a consensus) of the core functions of individual farm components (livestock, manure management etc) and the flow of information needed between these components if they are to operate at the farm scale. This requires a scientific discussion to which a broad range of LiveM participant may wish to contribute and which will be the focus of the L1.4 session in Braunschweig. The second part of the task will be undertaken next year and the details have not yet been finalised. We will focus on the barriers to using model linkers as a method of using model code. This could include a survey of modellers and the test of a number model linkers. This work will be of a more technical nature and therefore relevant for a model builders and IT specialists.
Both parts of L1.4 are intended to result in a scientific paper. The time available to us in Braunschweig is limited, so to focus the discussions, I will coordinate the production of a rough draft prior to us meeting. This will include a brief description of how existing farm models deal with the following components and their interactions.
The *physical components* potentially present on a ruminant livestock farm are:

- Livestock (usually further divided according to age and production focus)
- Fields (usually further divided further into grassland and arable)
- Access roads, holding yards and feedlots/corrals
- Livestock housing
- Manure storage
- Silage storage

Tactical management (timescale 0.5 to 1.5 years).

- animal husbandry (e.g. replacement rate, length of lactation, expected feed ration and feed requirements)
- grassland and crop rotation planning (e.g. choice of crops, varieties and crop areas, initial designation of grazing and conservation areas, initial manure allocations)

Operational management (timescale <1 day to 0.5 years).

- animal husbandry (e.g. culling, mating, drying off, balancing feed requirement and supply)
- grassland and crop management (e.g. fertilisation and manuring, pesticide spraying, cutting/grazing/silage or haymaking/harvesting)

Since farm-scale modelling is a worldwide activity, I have offered researchers outside Europe the opportunity to make a contribution to the discussion and the resulting paper.

Timing in Braunschweig
There is an overlap between the whole-farm scope of L1.4 and L1.3 which focusses on pasture/animal interactions. After discussions with Mats Høglind, the plan is to allocate most of Thursday 29th to L1.4, before switching to L1.3 in the last period of the afternoon. That way, we ensure that we deal with all farm components and L1.4 can function as an introduction to the more detailed discussions concerning the pasture/animal interactions in the L1.3. The plan is as follows:

Thursday 29 Oct
L1.4
08:30 – 10:00 Animal housing, manure storage, silage storage
10:00 – 10:30 Coffee
10:30 – 12:00 Fields and livestock
14:15 – 15:15 Farm management
15:15 – 15:45 Summing up and time plan for paper
15:45 – 16:15 Coffee

L1.3
16:15 – 17:45 Representation of grasslands in farm scale modelling – overview of current approaches
Friday, 30 October
08:30 – 10:00 What do livestock models require from grassland models in farm scale modelling of production, GHG emissions and N leaching, and how can this be satisfied?
10:00 – 10:30 Coffee
10:30 – 12:00 What do grassland models require from livestock models in farm scale modelling of production, GHG emissions and N leaching, and how can this be satisfied?
13:00 – 14:00 Single issues: modelling vegetative and reproductive growth, species mixtures, uneven distribution of excretal returns, herbage rejection, disease transmission, ...
14:00 – 15:00 Summing up and time plan for paper and work plan
15:00 – 15:30 Coffee

L2.3 - LiveM Modelling adaptation to climate change (organizer: Richard Kipling, task leader: Kairsty Topp)
The workshop will work towards papers on the topic areas covered, and set the work-plan for task activities up to 2017. The workshop aims are to:
- Explore current modelling approaches to adaptation
- Share and learn about possible solutions
- Develop a paper with others on modelling adaptation in livestock systems
- Form plans for further work in MACSUR

As part of the workshop, we would like to invite you to give a 2 minute presentation or 'pitch' that covers the following issues:
1 What is the most important issue that you are currently facing in modelling adaptation to climate change?
2 What additional information/data do you need to advance your modelling work?
3 What methodological issues do you face?
4 Who are the users of your results and the information you provide?

If you cannot attend the workshop, you are welcome to record a presentation and send it to me prior to the event, and we will ensure that the information contained is used as part of the workshop. The objective of the presentations is to inform the discussions, and the development of the paper on the state of modelling adaptation in livestock systems. Your inputs will also inform the subsequent work-plan. If you would like to attend this workshop, send a presentation, or to know more about it, please get in touch with me (if you have not done so already) and register before the 30 Sept. To help us organise this event effectively, as well as registering on the MACSUR website, please contact us directly before 23 September 2015 to let us know if you want to be involved.

TradeM (organizers: Floor Brouwer, Franz Sinabell)

Wednesday, 28 Oct. The first part of the workshop will be combined with XC8.

The session starts in the lecture hall
XC8 (Variability and Extreme Climate Events) will select three plausible extreme event scenarios, and identify the current knowledge barriers to understanding the impacts of these events on agrifood systems, to inform where modelling is required to improve our understanding. Between this workshop and a follow-up workshop in December, participants will attempt to address the identified knowledge gaps, and develop narrative descriptions of impacts of these extreme events. We aim to produce a paper outlining our selected scenarios, a pathway to quantifying the impacts of extreme events on agrifood systems, and narrative descriptions of the three selected scenarios.
14.15: Introduction (Richard Tiffin)
14.20: Biological responses to extreme events – Crops & Livestock (Jacob Bishop)
14.40: Modelling crop responses to extreme events – Gianni Bellocchi
15.00: Combining crop and economic responses – A model-based economic assessment of future climate variability impacts on global agricultural markets (Hermann Lotze-Campen)

15.40: The Global Food Security program – an overview of the process of identifying scenarios and developing responses to them and discussion of main outputs (Richard Tiffin)
16.00: Closure of the presentations in XC8, to be followed after the break for a discussion of next steps.
16.00: Break for coffee/tea

Session 2 – Policy support in MACSUR, Chair: Franz Sinabell
16:15 - 18:15 Short presentations (10 minutes each), followed by a discussion on the findings of MACSUR1 supporting policy.

- Andrea Zimmermann – Policy scenarios and the European Impact Assessments in MACSUR (plan of work)
- Klaus Mittenzwei – Climate change and the policy agenda in Norway
- Heikki Lehtonen – Finnish farmers coping with climate change
- Gabriele Dono – Room for improving the performance of Italian farming in adapting to climate change
- Martin Schönhart – Climate change and the policy agenda in Austria
- Reimund Rötter/Floor Brouwer – Note on the findings in MACSUR 1

Thursday morning, 29 Oct: 9.00 – 12.00
9.00 Model comparison and model improvements

- Anna Milford – Update on consumer behaviour in MACSUR
- Thomas Berger – Agent-based modelling of climate adaptation and mitigation options
- Andrea Zimmermann – How to explain yield gaps in Europe?

10.00 Coffee
10.15 Current state of RAPs and opportunities for regional modelling; presentation of the concept, Franz Sinabell and Martin Schönhart to introduce
11.30 – 12.00 Next steps in TradeM

Session Live 2.3 – Adaptation

Summary, major results, agreements

The purpose of the workshop was to explore the state of the current thinking and modelling of adaptation to climate change with respect to livestock production. This included modelling the biophysical system, and the effects on the economics of the farming system. T

Presentations were invited to explore the current state. Some key points from the discussion are:

- We need to remember that models may not include some relationships that will become important under climate change (perhaps not yet recognised)
- The length and severity of extreme events may limit available management choices, and this is hard to model (e.g. a model may usually apply irrigation in a drought, but previous droughts, or a long drought may mean that irrigation water is not available)
- Farm models can be divided into management-centred economic models, or biophysical models with a limited representation of management (skills/knowledge limitations and complexity of dealing with both domains).

The workshop explored the key adaptations that are deemed to be of relevance to farming systems, and the technical issues, gaps, how to make the outputs from models more accessible, which were ranked in terms of complexity.

Kairsty Topp