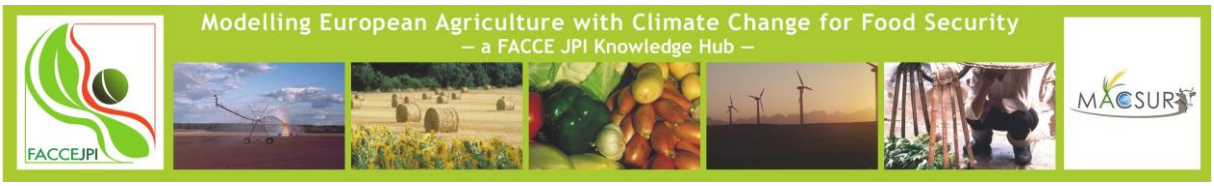

FACCE-MACSUR
Factsheets of the models

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Deliverable type: Report
File name: Report Template.docx
Deliverable reference num.: T1.1
Reported by: Waldemar Bojar 'editor
Acknowledgement: The report could be created thanks to all contributors to the information provided following the questionnaire send out during the summer of 2012

Revision	Changes	Date

Instrument:	Joint Programming Initiative
Topic:	Agriculture, Food Security, and Climate Change
Project:	Modelling European Agriculture with Climate Change for Food Security (FACCE-MACSUR)
Due date of deliverable:	June VI
Submission date:	2013-06-21
Start date of project:	1 June 2012
Duration:	36 months
Deliverable lead partner:	University of Technology and Life Sciences, POLAND P100
Revision:	1.0
Work Package:	TradeM T.1.1
Document ref number:	T1.1 v1.0

Abstract/Executive summary

Table of Contents

D T1.1 (Factsheets of the models)

Abstract/Executive summary

The exploration of adaptation and mitigation measures in the context of global challenges like climate change, food security and expected demographic boom is an field of research of growing importance. Over the last decades many research groups have been developing economic-trade models to analyse consequences on farm welfare, market supply and trade, some of them also address food security and other global concerns. There are many different ways to tackle these issues and the specific advantages and limitations of alternative modelling strategies are not yet well understood. The objective of the WP1 T1.1 task within TradeM theme of MACSUR is to use the results of a survey on trade and economic models of MACSUR Consortium partners to show which topics are currently addressed in the different models, which methods are used and how well these tools are prepared for an integration with other models like climate, crop and livestock models.

Introduction

A main challenge to TradeM is finding appropriate methods of generalization (scaling) of outputs of models at different levels, starting at farm level and up until European and global scales. Such upscaling will enable appropriate integration of different models that exist. In this task an overview of existing models with a focus on (farm) economics and trade is made. A general approach is identified to select models. This is crucial to allow comparability of simulation results. The inventory gives an overview on the type of model, the regional focus, the coverage of commodities and the integration of biophysical aspects. Models use several measures. The most relevant farming systems in Europe are identified and their distribution indicated. This basic information is shared with MACSUR with a view to understand the diversity of farming and the efforts in CropM and LiveM.

Methods

Partners of the MACSUR consortium were invited to describe their models dealing with these themes using a standardized survey. The data collection was conducted during summer 2012 and first results were discussed during the kick-off workshop in October 2012. The data collected in this survey were the basis for a further analysis of model characteristics using literature reviews, in depth model documentation and personal interviews.

Results

As a result of the review of models registered a total of 25 models of economic and trade included in their range diverse model types, scale spatial analysis, products and sectors of the economy, and also the methods of processing. Identified seven models of national, three regional models, fourteen models at the analysis at farm level and/or single activity of agriculture, five macroeconomic models, two models of input – output type and two models of other types. It was found that about fifteen models have the capacity to integrate with models of crop and animal production. Taken as many cross-sectional analyzes to simultaneously classify models to more than one group. Therefore, the part of the discussions between representatives of the various research centres carried out at a conference in Haifa found that a solution to facilitate the creation of computer knowledge centre is the standard computer cloud (Cloud Computing). In the course of analysis were selected several models of engaging the broadest macroeconomic objectives of the project, such as GLOBIOM, CAPRI, Magpie or meta model like MAGNET, which should provide external parameters for other models with a narrower field of spatial analysis, e.g. such problem of scalability of integrated metrics in other models and assessment of acceptable errors. Based on the analysis of models it was found that there is a need to develop a common understanding, but also a critical look at the path solutions climatic and socio-economic issues in the project, which should precede the definition of modelling strategy to these problems, as well as the precise definition of model assumptions.

As a result of the review of the models found their diversity, which concerns non-uniform scale spatial analysis of farm level through to global products and sectors of the economy, as well as multi-temporal coverage of long- to short-term perspective of the analysis. Some of the models are already integrated with models of crop and livestock production. Among the distinguished modelling purposes in most of the support for the economic policies (agriculture), advice or purely scientific development. One model – AGMEMOD, includes measures of food self-sufficiency on the basis of the equilibrium of supply and demand. In most models aspect of trade (between countries) is not included, and models which take into account this aspect of using the Armington assumption. About half of the models analysed so far do not take into account climate change in an explicit manner. Others include this issue by taking into account climate change compounds the yields and the resulting consequences. In many cases, both the effects of climate change mitigation policies and adaptation measures in this area are being analysed. In the field of protection of intellectual property, most models have an open or are made available under the Consortium Agreement. Most of the presented models take into account technological progress in the analysis, as well as the other input data, such as for erosion or soil salting. Models livestock production should in some cases supply business models and economic data for the measurement of methane emissions or greenhouse gas. There were also selected several macroeconomic models that recognize the most comprehensive project objectives, i.e., best reflects the relationship between quality of agricultural raw materials and the various implications caused interactions taking place between the production and distribution of food and the impact of climate change, including aspects of food safety and the accompanying risk.

Discussion

TradeM offers many different models at various (regional) scales – from farm models to global models. This constellation provides unique opportunities to generate an added value not available in other projects. We adopt a pragmatic approach: run different models with a homogeneous set of exogenous assumptions. In order to achieve this, it will be necessary to design the set-up of regional models in a flexible manner. Over the long time horizon many adaptation and mitigation measures are not yet practically applied. The combination of crop / livestock / farm models will give the opportunity to identify new measures. These results can be used in a bottom-up approach to enhance global models.

TABLES/CHARTS – THE MODELS' FACTSHEETS

Model #1: ORANI-ESP DYN

Basic Information	
information provided by	
Name	George Philippidis
Partner-Number	36
submitted by	George Philippidis, gphilippidis@aragon.es
date of report	July 2012
acronym of model	ORANI-ESP DYN
name of model	ORANI España Dynamic
website	-
objectives of the model	The initial objective of the model was the examination of agricultural policy reform in Spain. The input output data have been disaggregated to accommodate a detailed coverage of agricultural and food sectors, whilst the CAP is modeled explicitly (SFP, set aside, intervention etc). More recent research has focused on developing the synergy between economy-wide emissions restrictions (Kyoto and EU 20/20/20) and the impact on the agricultural sector.
major focus:	
ex-ante evaluation	X
ex-post evaluation	X
specific problems of clients	-
methodological development	X
short description of the model	Employing the well known neoclassical single country CGE ORANI model template (developed at Monash University), a Spanish CGE model was constructed employing input output data for 2000. The model has subsequently been updated to 2007 with a data aggregation of 28 agricultural activities and 11 food activities, explicit CAP modeling, supplementary income transfers from national accounts to make up a full SAM and a dynamic extension. A further 'green' variant of the model is currently developing to examine emissions restrictions in Spain. Includes energy nests, full emissions database and complementary slack conditions to model permits (ETS) and non permit schemes.
principal developer(s) and affiliation	CITA, Zaragoza, Spain
development supported by	Two three year projects supported by the Spanish Ministry of Agriculture (INIA)
maintainer(s) and affiliation	CITA, Zaragoza, Spain
other	-
Technical Information	
type of model	Recursive dynamic multi-sector neoclassical single country CGE model
programming language	GEMPACK

dimensions	countries (1), commodities (146 in total; 28 agricultural, 11 food); industries (112 in total, 28 agricultural, 11 food), time (n), endowments (land, capital, 10 labour types), 8 households stratified by income
regions covered currently	Spain (with tops-down extension)
smallest regional unit	-
aggregation of regions	-
time horizon temporal scale: smallest - longest	Smallest 1yr, Longest so far 30 years
representation of trade	Armington assumption
sectors covered	Full coverage of agricultural and non agricultural sectors.
more details on representation of agriculture:	
general notes	one representative farm per country
farm types	-
farm structure	-
variants of management / intensity	standard production
description of input - data	
general notes	Principal sources of data: Spanish national accounts and input-output table for 2007 (Instituto Nacional de Estadística (www.ine.es). Additional data taken from household budget survey data and labour market data (INE), whilst Eurostat agricultural accounts data were employed to disaggregate the agricultural activity/commodity accounts of the IO database.
crop production	22 sectors: product structure as in Eurostat economic accounts of agriculture
livestock production	6 sectors: product structure as in Eurostat economic accounts of agriculture,
variants of management / intensity	standard production, organic production
other	
description of parameters	Substitution and expenditure elasticities are borrowed from different sources and refined according to robustness tests and expert opinion within Spain. Regional land supply function econometrically estimated.
exogeneous projection variables and sources	Population (IMF), World fossil fuel prices (US EIA), World biofuels prices (OECD/FAO), TFPs (Ludena et al 2006), Spanish budget deficit (IMF), GDP (IMF), exports (IMF), investment (European Commission), household consumption (European Commission), CAP payments (FEGA)
model closure rules	Small country assumption, so all world prices exogenous. Real GDP, exports, investment and private consumption are exogenous, whilst government spending is controlled largely by exogenous budget deficit shocks. Imports adjust endogenously. Aggregate employment is endogenous, whilst total capital stock accumulation is endogenous but dependant on total (exogenous) net investment shocks.
other	-

use and applications	
target user group	
policy makers	X
farmers / advisory services	-
scientists	X
other (specify)	general public and stakeholders
policies analysed in most cases	CAP reform
policies analysed most recently	Impact of the economic crisis on agriculture, emissions scenarios
policies - other aspects	-
other analyses	-
economic result indicators	
income / wealth / utility / related	Real income, utility, farm income, factor incomes
production costs related	Factor and intermediate input cost changes
other	Marginal abatement cost estimates under emissions scenarios
bio-physical links and indicators	
land types	arable land, grassland
land uses	Uniform intensity assumed, whilst land heterogeneity modelled via a nested CET function
manure management	
water - indicators	-
air - indicators	-
soil - indicators	-
biodiversity flora	-
biodiversity fauna	-
landscape	-
other environmental aspects/indicators	-
other	-
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	NA
databases (specify)	United Nations Framework Convention on Climate Change (UNFCCC) emissions data incorporated into the benchmark database.
GIS (specify)	NA
link to climate change	Policy only – emissions reduction targets from the Kyoto Protocol, and the EU Burden Sharing Agreement
link to food security	NA
other	NA
current state of development	
regional coverage	ORANI adaptations exist for many countries, including China, Thailand, South Africa, Korea, Pakistan, Brazil, the Philippines, Japan, Ireland, Vietnam, Indonesia, Venezuela, Taiwan and Denmark
sector coverage	upstream sectors of agriculture, food sectors, forestry
methodological enhancements	-
new modules	Incorporation of agricultural bio-physical MAC curves for (*inter alia*) crop and livestock activities employing data from GAINS (http://gains.iiasa.ac.at)
other	-
property rights	

access to core-code of the model	Property of Spanish government
access to scenarios (data/parameters)	-
access to input data	-
access to result data output	-
access to parameters	-
other	-
recent publications	
journal papers	Bourne, M., Childs, J., Philippidis, G. & Feijoo, M. (Forthcoming) Controlling greenhouse gas emissions in Spain: What are the costs for agricultural sectors? *Spanish Journal of Agricultural Research*. Bourne, M., Childs, J., & Philippidis, G. (Forthcoming) Recoger lo que otros han sembrado: El impacto de la crisis financiera global sobre el sector agrario en España *Información Técnica Economíca Agraria*. Philippidis, G. (2010) Measuring the Impacts of the CAP in Spain: A CGE Model Approach, *Economía Agraria y Recusros Naturales*, 10(1), pp99-119.
presentations at conferences	Bourne, M., Childs, J., Feijoo, M. and Philippidis, G., (2012) A General Equilibrium Study of the Effects of EU Emissions Reduction Targets on Spanish Agriculture, 28th International Conference of Agricultural Economists, Foz Do Iguacu, Brazil, August 18th-24th, 2012. Bourne, M., Childs, J., Philippidis, G. (2012) Controlling greenhouse gas emissions in Spain: What are the costs for agricultural sectors?, 86th Annual Conference of the Agricultural Economics Society, University of Warwick, UK, April 16th – 18th. Bourne, M., Childs, J., Philippidis, G., Kreutzmann, J. and Feijoo, M. (2011) A General Equilibrium Study of the Effects of EU Emissions Reduction Targets on Spanish Agriculture, VIII Congress of the Spanish Association of Agricultural Economists, Madrid, Spain, September 14th-17th, 2011. Bourne, M., Childs, J. and Philippidis, G. (2011) Reaping what others have sown: Measuring the impact of the global financial crisis on Spanish Agriculture, 14th Annual Conference on Global Economic Analysis, Venice, Italy, June 16th – 18th, 2011. Philippidis, G. (2009) Evaluating the impacts of the CAP in Spain: A CGE model approach, VII Congress of the Spanish Association of Agricultural Economists, Almería, Spain, September, 2009.
project reports	
technical papers on the model	Philippidis, G., Bourne, M. and Childs, J. & Sanjuán, A.I. (2011) A Dynamic Computable General Equilibrium Model for Agricultural Policy Analysis in Spain: Building a CGE database, pp1-59, CITA Working Paper 11/01, Government of Aragon.

	Philippidis, G., Bourne, M. and Childs, J. (2011) A Recursive Dynamic Computable General Equilibrium Model for Agricultural Policy Analysis in Spain (ORANI-DYN): Modifications to the standard ORANI-G model framework, pp1-62, CITA Working Paper 11/02, Government of Aragon.
policy papers	
web-sites	
other	Philippidis, G. (2012) Estimación del impacto de las políticas del cambio climático sobre los sectores agroalimentarios de las regiones españolas: Un modelo de equilibrio general computable (2012) Presentation to the Spanish Ministry of Agriculture, Madrid, Spain, Abril 25th, 2012. Philippidis, G. (2009) Modelos de equilibrio general computable – Un análisis de los impactos de las reformas de la PAC en España., One day Seminar on the future of the CAP in Spain, University of Madrid, Spain, October, 2009.
strengths and weaknesses	
major strengths	(i) Full characterization of the vertical linkages between the agricultural sectors and the downstream food industries (ii) GEMPACK is user friendly and very well documented. (iii) Only CGE model for Spain with detailed agricultural sector coverage (iv) Strong degree of flexibility in the implementation of various carbon taxes or emission reduction targets
major weaknesses	(i) No feedback between Spain and the rest of the world (ii) Model parameters are based on 'borrowed' estimates from credible sources. However, a full econometric survey for Spain would greatly improve the model's credibility
other	
relevance for MACSUR	
expected benefit for TradeM	Comparison of results for agreed scenarios with other models – mutual validation.
expected benefit for CropM	
expected benefit for LiveM	
expected benefit from TradeM	Exposure to other modeling efforts will highlight further weaknesses (modeling, data) in model as well as 'best practice' modeling. Comparison of results with other models – validation. Better perspective on the link between ag policy and emissions – improve scenario design
expected benefit from CropM	parameters for future crop-yields
expected benefit from LiveM	gaseous emission coefficients
expected / planned enhancements	Incorporation of renewable energy

during the next three years	technologies into the electricity sector; disaggregate the treatment of land (irrigated/non irrigated); incorporate forestry land (sequestration)
main challenges to be tackled to attain the planned enhancements	
other	
other relevant aspects	

Structure of model

Standard ORANI model data structure

		Absorption Matrix					
		1	2	3	4	5	6
		Producers	Investors	Household	Export	Government	Change in Inventories
	Size	I	I	1	1	1	1
Basic Flows	CxS	1BAS	2BAS	3BAS	4BAS	5BAS	6BAS
Margins	CxSxM	1MAR	2MAR	3MAR	4MAR	5MAR	n/a
Taxes	CxS	1TAX	2TAX	3TAX	4TAX	5TAX	n/a
Labour	O	V1LAB					
Capital	1	V1CAP					
Land	1	V1LND					
Production Tax	1	V1PTX					
Other Costs	1	V1OCT					

C = Number of Commodities
I = Number of Industries

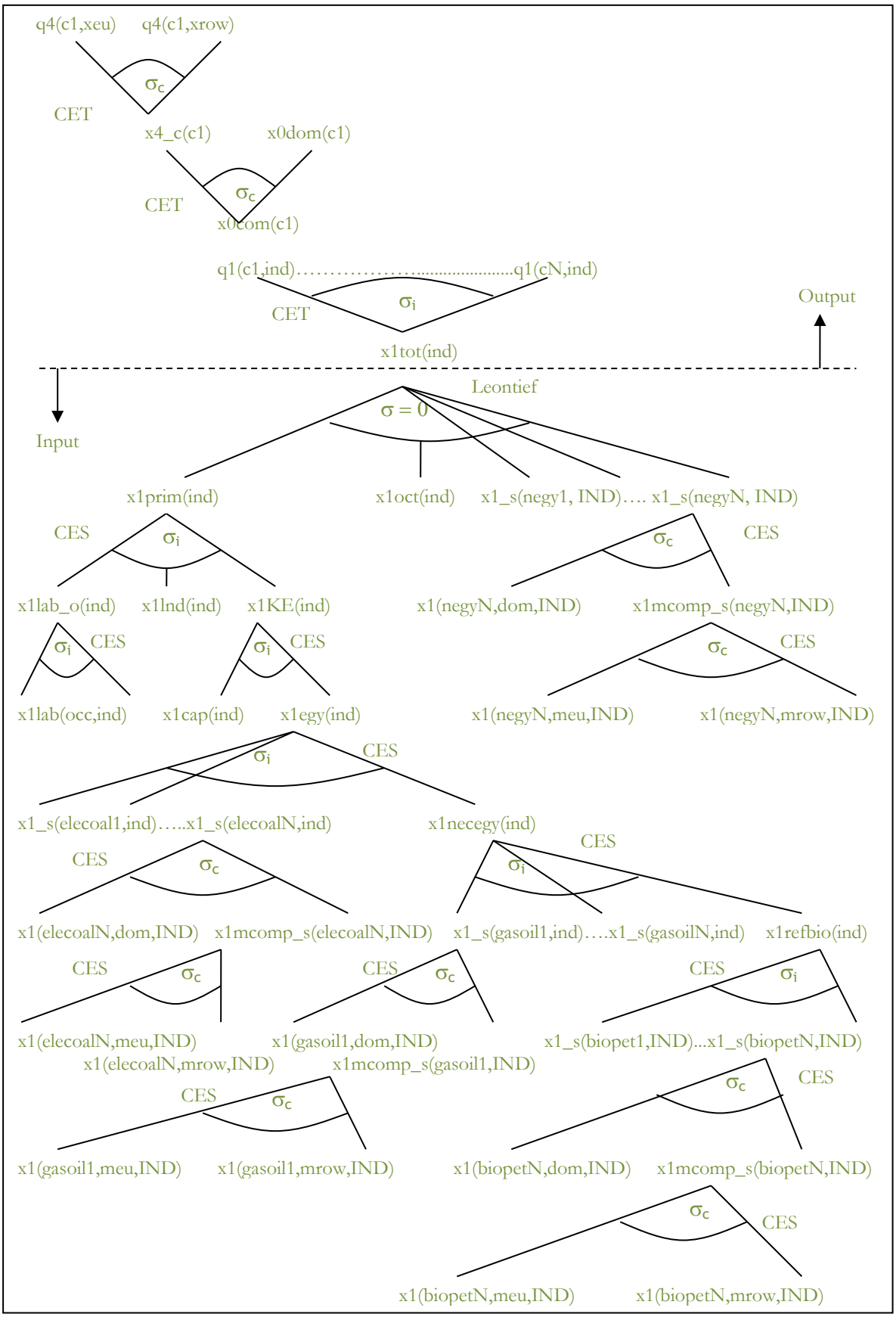
S = 2: Domestic,Imported,
O = Number of Occupation Types

M = Number of Commodities used as Margins

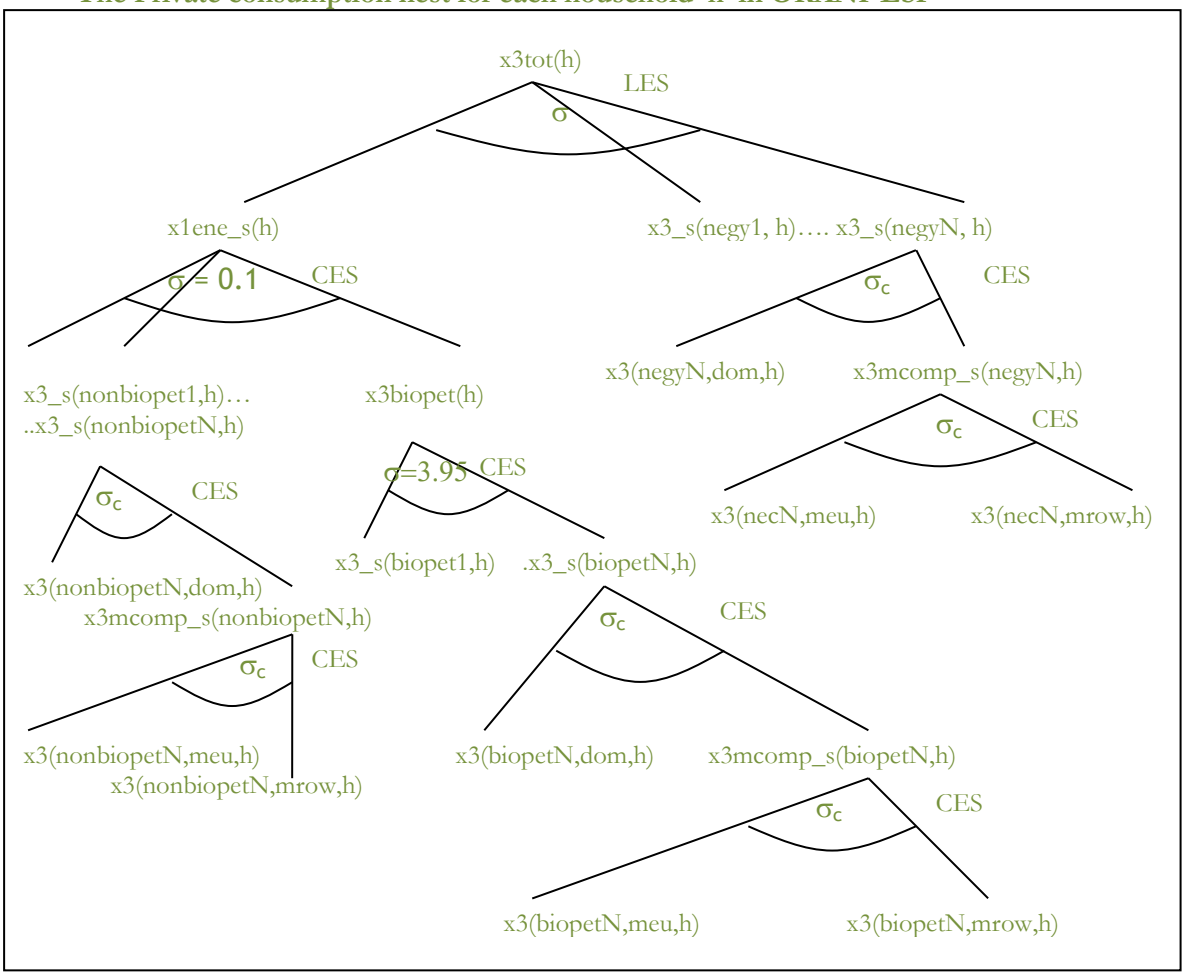
	Joint Production Matrix
Size	I
C	MAKE

	Import Duty
Size	1
C	V0TAR

The Production nest in ORANI-ESP.



The Private consumption nest for each household 'h' in ORANI-ESP



Model #2: APORIA

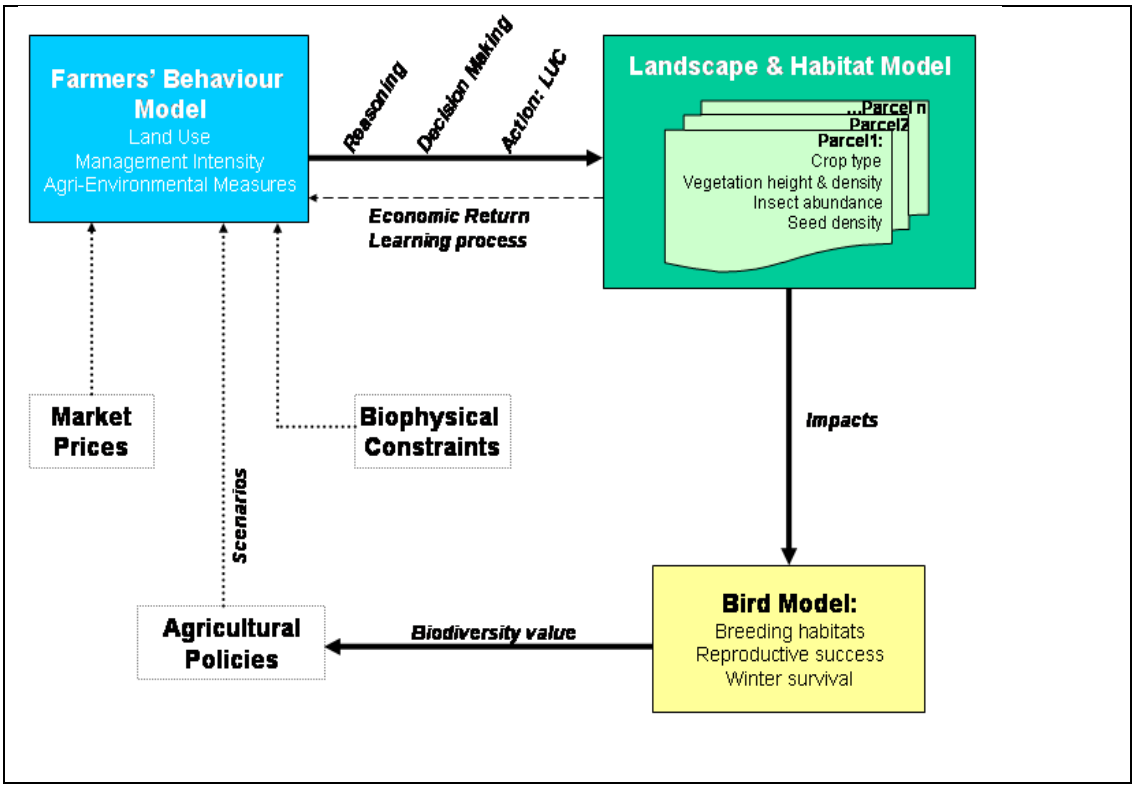
Basic Information	
information provided by	SAC
Name	Andrew Barnes
Partner-Number	
submitted by	Paul Haggarty, p.haggarty@abdn.ac.uk
date of report	
acronym of model	Aporia
name of model	
website	
objectives of the model	Model ecological and economic tradeoffs at a spatial level
major focus:	
ex-ante evaluation	X
ex-post evaluation	X
specific problems of clients	Impact of CAP reform/Intensification
methodological development	X
short description of the model	It is an agent based catchment level model. Calibrated using field level IACS historical data, and field surveys on farmer decision-making, bird population surveys and collation of GIS field level data. AS such it is driven by observed rules based on biophysical growth, economic, ecological and behavioural parameters. A set of scenarios from the EU BAMBU project have been tested as have recent proposals for CAP reform.
principal developer(s) and affiliation	SAC; Unviersity of Edinburgh
development supported by	Scottish Government; EU Ecochange
maintainer(s) and affiliation	Dave-Murray Rust, University of Edinburgh
other	
Technical Information	
type of model	Agent BASed Simulation
programming language	Java Symphony
dimensions	2 intensive cropping catchments, time (n), endowments (land, capital, labour, social capital)
regions covered currently	Scotland
smallest regional unit	Field
aggregation of regions	Catchment
time horizon temporal scale: smallest - longest	2020-2050
representation of trade	Stochastic Price generation
sectors covered	General cropping; Cereals; Grasland

more details on representation of agriculture:	
general notes	
farm types	General cropping; Cereals; Grasland
farm structure	Based on IACS data
variants of management / intensity	Behavioural responses to prices and ecological status (through number of habitats created)
description of input - data	
general notes	IACS field level; Surveys of Behavioural responses (weightings); Crop growth; Bird population
crop production	X
livestock production	
variants of management / intensity	Extensive-intensive
other	
description of parameters	for each field production is derived from crop growth and stochastic weather generators; planning is modelled through farmer responses to prices, weather and habitats (bird) creations.
exogeneous projection variables and sources	BAMBU 2050 scenarios: intensivity, biofuels, prices
model closure rules	???
other	
use and applications	
target user group	
policy makers	X
farmers / advisory services	
scientists	X
other (specify)	
policiesanalysed in most cases	CAP reform; Biofuels
policiesanalysed most recently	As above
policies - other aspects	
other analyses	
economic result indicators	
income / wealth / utility / related	X
production costs related	X
other	
bio-physical links and	

indicators	
land types	X
land uses	X
manure management	
water - indicators	X
air - indicators	X
soil - indicators	X
biodiversity flora	X
biodiversity fauna	X
landscape	X
other environmental aspects/indicators	Bird populations
other	
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	LPJ-GUESS
databases (specify)	IACS; Census; FADN
GIS (specify)	IACS
link to climate change	IPCC coefficients
link to food security	Conversion to energy units
other	
current state of development	
regional coverage	X
sector coverage	
methodological enhancements	Behavioural Integration
new modules	
other	
property rights	
access to core-code of the model	Public
access to scenarios (data/parameters)	Restricted
access to input data	Restricted
access to result data output	Public
access to parameters	Public
other	
recent publications	
journal papers	Guillem, E.E. and**Barnes, A.P.** (2012). Farmers perceptionsofbirdconservationandfarmingmanagementat a catchmentlevel. Land UsePolicy (*forthcoming*) Guillem,E.E.,**Barnes,A.P.**, Rounsevell, M. and Renwick, A. (2012).Refiningperception-basedfarmertypologieswiththeanalysisofpastlandusechange. *Journal of Environmental Management 110 (15), 226-235*
presentations at conferences	Guillem E.E., Murray-Rust D., Robinson D.T., **Barnes A.P.**, Rounsevell MDA (2011). The effectsoffarmersperceptionsandobjectives on

	landusechangeandecosystemservices: The caseof a Scottisharablecatchment. In: Landscape Ecology andEcosystem Services. IALE (UK)
project reports	
technical papers on the model	
policy papers	Forthcoming on CAP reform
web-sites	
other	
strengths and weaknesses	
major strengths	Spatial level modelling; behavioural rules beyond simple rational utility
major weaknesses	Aggregation to country; trade levels
other	
relevance for MACSUR	
expected benefit for TradeM	Ecological indicators
expected benefit for CropM	As above; Crop production in intensive scnarios
expected benefit for LiveM	
expected benefit from TradeM	Integration with coutnry level models (through prices) for farmers to respond to.
expected benefit from CropM	
expected benefit from LiveM	
expected / planned enhancements during the next three years	Livestock Modelling Catchment to be paramterised and integrated.
main challenges to be tackled to attain the planned enhancements	Survey work needed; diverse skills sets
other	
other relevant aspects	

Structure of model


Farmers' Behaviour Model
Land Use
Management Intensity
Agri-Environmental Measures
Reasoning
Decision Making
Action: LUC
Economic Return
Learning process
Landscape & Habitat Model
...Parcel n
Parcel2
Parcel1:
Crop type
Vegetation height & density
Insect abundance
Seed density
Market Prices
Biophysical Constraints
Scenarios
Impacts
Agricultural Policies
Biodiversity value
Bird Model:
Breeding habitats
Reproductive success
Winter survival

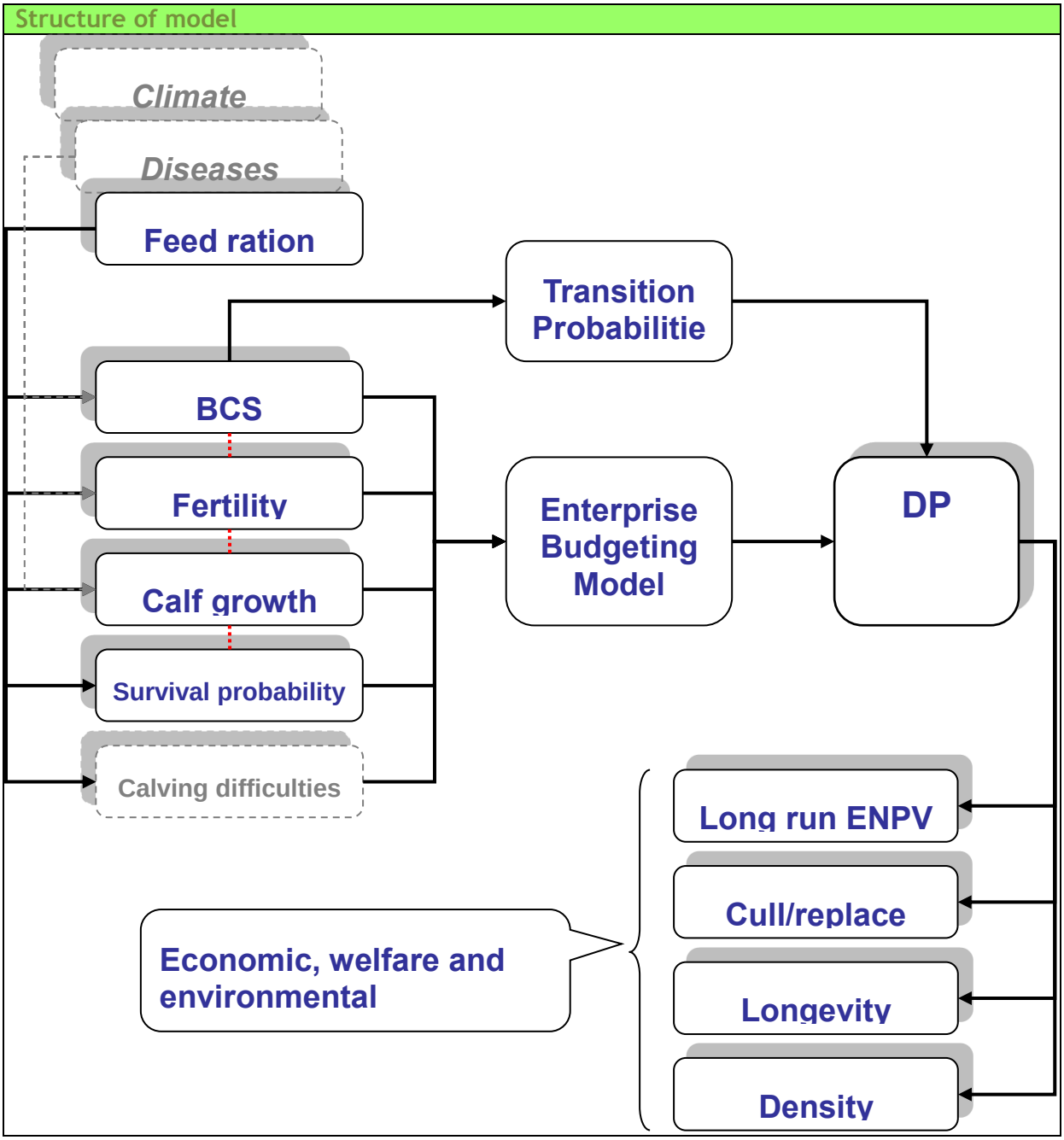
Model #3: Beef Cow DP

Basic Information	
information provided by Name Partner-Number	SAC
submitted by	Paul Haggarty, p.haggarty@abdn.ac.uk
time of report	August 2012
acronym of model	Beef Cow DP
name of model	Beef SucklerCow Dynamic Programming
website	
objectives of the model	
major focus:	Explore trade-offs between animal welfare and cow replacement strategies in suckler herds
ex-ante evaluation	X
ex-post evaluation	X
specific problems of clients	
methodological development	X
short description of the model	This dynamic programming (DP) model was developed to explore the trade-offs between animal welfare indicators and between animal welfare and farm profitability. The objective was to identify the main economic constraints and incentives in enhancing the welfare of sucker cows. The objective function of the DP is specified to maximise the expected net present value from current cows and all successors by making appropriate replacement decisions. The DP incorporated calving pattern, body condition score, parity and incidence of involuntary culling.
principal developer(s) and affiliation	Dr BoudaVosoughAhmadi and Prof Alistair Stott, Scottish Agricultural College (SAC)
development supported by	Scottish Government
maintainer(s) and affiliation	SAC
other	
Technical Information	
type of model	Optimisation, Stochastic, Dynamic, Dynamic Programming
programming language	Excel, Visual Basic, using GPDP algorithm
dimensions	150 states
regions covered currently	Scotland
smallest regional unit	Farm/enterprise
aggregation of regions	
time horizon temporal scale: smallest - longest	Annual Short run (finite) and long run (infinite)
representation of trade	
sectors covered	Beef suckler cow
more details on representation of	

agriculture:	
general notes	
farm types	Spring calving beef suckler cow
farm structure	
variants of management / intensity	
description of input - data	
general notes	
crop production	
livestock production	Input data include: parity, calving period, calving difficulty score, body weights of cow and calf, body condition score of cow at weaning, number of services received by the cow, probability of involuntary culling of cows, stage return (the margin of calf sales and culled cows over feed supplementation and other variable costs).
variants of management / intensity	
Other	
description of parameters	
exogeneous projection variables and sources	A dataset for a period of six years (2006-2011) collected from the Scottish Agricultural College's (SAC) Beef farm at Easter Howgate was used to parameterise the model.
model closure rules	
other	
use and applications	
target user group	
policy makers	X
farmers / advisory services	X
scientists	X
other (specify)	
policies analysed in most cases	Trade-off between animal welfare and replacement strategies in suckler cows
policies analysed most recently	The economic impact of sacrifice fields in out-wintered scukler cows
policies - other aspects	
other analyses	
economic result indicators	
income / wealth / utility / related	Net present value of gross margin
production costs related	margin of calf sales and culled cows over feed supplementation and other variable costs
other	
bio-physical links and indicators	
land types	
land uses	Long run herd structure and replacement rates as indicator of

	pressure on land
manure management	
water - indicators	
air - indicators	
soil - indicators	
biodiversity flora	
biodiversity fauna	
landscape	
other environmental aspects/indicators	
other	
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	
databases (specify)	A dataset for a period of six years (2006-2011) collected from the Scottish Agricultural College's (SAC) Beef farm at Easter Howgate was used to parameterise the model.
GIS (specify)	
link to climate change	
link to food security	
other	
current state of development	
regional coverage	Scotland
sector coverage	Beef suckler cow systems
methodological enhancements	
new modules	
other	
property rights	
access to core-code of the model	SAC's agreement required
access to scenarios (data/parameters)	
access to input data	
access to result data output	
access to parameters	
other	
recent publications	
journal papers	
presentations at conferences	VosoughAhmadi, B.; Morgan, C.A. and Stott, A.W. (2009) Trade-offs between conflicting animal welfare concerns and cow replacement strategy in out-wintering Scottish suckler herds. In: Proceedings of the 83rd Annual Conference of the Agricultural Economics Socitey, March 30th – April 1st, 2009, Dublin, Ireland. Full Text
project reports	
technical papers on the model	
policy papers	VosoughAhmadi, B.; Nath, M.;Morgan, C.A. and Stott, A.W. (2010) Beef Cow Management in Scotland: A Sensitive Balancing Act. Knowledge Scotland

	Ploicy Brief. Full Text
web-sites	
other	
strengths and weaknesses	
major strengths	- This model incorporates elements of animal welfare score (i.e. nutrition and body condition score), fertility parameters (calving periods) and financial performances of the animals in suckler cow systems - Ability to optimise the system in both long and short term - Generates long run state probabilities that determines the herd structure and replacement rates. - Transparent and user friendly
	- Limitation of direct inclusion of physical/technical constraints
other	
relevance for MACSUR	
expected benefit for TradeM	
expected benefit for CropM	
expected benefit for LiveM	
expected benefit from TradeM	
expected benefit from CropM	
expected benefit from LiveM	This model is relevant to livestock management frameworks.
expected / planned enhancements during the next three years	
main challenges to be tackled to attain the planned enhancements	
other	
other relevant aspects	


Structure of model
Climate
Diseases
Feed ration
Transition Probabilitie
BCS
Fertility
Calf growth
Survival probability
Calving difficulties
Enterprise Budgeting Model
DP
Long run ENPV
Cull/replace
Longevity
Density
Economic, welfare and environmental

Model #4: Dairy Cow DP

Basic Information	
information provided by	SAC
Name	
Partner-Number	
submitted by	Paul Haggarty, p.haggarty@abdn.ac.uk
date of report	August 2012
acronym of model	Dairy Cow DP
name of model	DairyCowDynamic Programming
website	http://ahdss.sac.ac.uk/
objectives of the model	
major focus:	Response of optimal dairy cow replacement policy to animal diseases (e.g. Johne's disease, mastis)
ex-ante evaluation	X
ex-post evaluation	X
specific problems of clients	X
methodological development	X
short description of the model	The objective was to maximise the expected net present value of returns from a current heifer (newly calved in year 0) and all its successors over 20 annual stages. The objective is achieved by selecting the appropriate sequence of replacement decisions ('keep cow/heifer' or 'replace with heifer') at the start of each stage. the range of possibilities was reflected by 180 'states', that is, 15 milk yield states at each of 12 lactation states, the milk yield states representing (approximately) the normal distribution of yield.
principal developer(s) and affiliation	Prof Alistair Stott, Scottish Agricultural College (SAC)
development supported by	Scottish Government and Defra
maintainer(s) and affiliation	SAC
other	
Technical Information	
type of model	Optmisation, stochastic, dynamic, dynamic programming
programming language	Fortran
dimensions	180 states
regions covered currently	UK
smallest regional unit	Farm/ enterprise
aggregation of regions	
time horizon	Long-run and short-run
temporal scale: smallest - longest	
representation of trade	
sectors covered	Dairy cattle
more details on representation of agriculture:	
general notes	

farm types	Dairy cattle
farm structure	
variants of management / intensity	
description of input - data	
general notes	
crop production	
livestock production	Milk yield distribution per lactation, probability of involuntary culling, value of cull cow, variable costs, fixed costs, milk price, calf sale value, replacement heifer price, impact of disease on milk yield distribution.
variants of management / intensity	
other	
description of parameters	
exogeneous projection variables and sources	Adjustment for the impact of animal diseases on yield
model closure rules	
other	
use and applications	
target user group	
policy makers	X
farmers / advisory services	X
scientists	X
other (specify)	
policies analysed in most cases	Financial incentive to controlparatuberculosis ondairy farms in the UK; Optimumreplacement policies for thecontrol of subclinical mastitis.
policies analysed most recently	
policies - other aspects	
other analyses	
economic result indicators	
income / wealth / utility / related	NPV of replacement heifer
production costs related	Fixed and variable costs
other	
bio-physical links and indicators	
land types	
land uses	
manure management	
water - indicators	
air - indicators	
soil - indicators	
biodiversity flora	
biodiversity fauna	
landscape	
other environmental	

aspects/indicators	
other	
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	
databases (specify)	
GIS (specify)	
link to climate change	
link to food security	
other	
current state of development	
regional coverage	UK
sector coverage	Dairy cattle
methodological enhancements	
new modules	
other	
property rights	
access to core-code of the model	SAC's agreement required
access to scenarios (data/parameters)	
access to input data	
access to result data output	Online free version if available
access to parameters	
other	
recent publications	
journal papers	Stott A.W., Jones G.M., Humphry R.W., Gunn G.J. (2005): Financial incentive tocontrol paratuberculosis (Johne's disease) on dairy farms in the UnitedKingdom. Veterinary Record, 156, 825-831.Full Text Stott, A. W., Jones, G. M., Gunn, G J., Chase-Topping, M.,Humphry, R.W., Richardson, H. & Logue, D. N. (2002) Optimumreplacement policies for the control of subclinical mastitis due to S aureusin dairy cows. Journal of Agricultural Economics 53, 627-644. Full Text
presentations at conferences	
project reports	
technical papers on the model	
policy papers	
web-sites	
other	
strengths and weaknesses	
major strengths	
major weaknesses	
other	
relevance for MACSUR	
expected benefit for TradeM	
expected benefit for CropM	

expected benefit for LiveM	
expected benefit from TradeM	
expected benefit from CropM	
expected benefit from LiveM	Relevant to animal health and welfare bio-economic frameworks
expected / planned enhancements during the next three years	
main challenges to be tackled to attain the planned enhancements	
other	
other relevant aspects	

Structure of model

Model #5: EWES LP

Basic Information	
information provided by	SAC
Name	
Partner-Number	
submitted by	Paul Haggarty, p.haggarty@abdn.ac.uk
date of report	August 2012
acronym of model	EWES LP
name of model	Economics and Welfare of Extensively managed Sheep flocks Linear Programme
website	Link
objectives of the model	Explore extensive sheep and cattle farm management response to 'shocks' e.g. policy, prices etc.
major focus:	
ex-ante evaluation	X
ex-post evaluation	X
specific problems of clients	
methodological development	X
short description of the model	It is a farm management LP thatmaximises sheep and cattle enterprise gross margin subject to land, labour and animal performance constraints. It allocates grazing, forages and bought in feedsto meet daily energy demand of animals on a monthly basis throughout the farming year. Production functions used are based on established relationships between feed energy intake and animals' production. Grass feed energy supply is based on a published model of grass growth in Great Britain.
principal developer(s) and affiliation	Prof Alistair Stott & Dr BoudaVosoughAhmadi, Scottish Agricultural College (SAC)
development supported by	Defra and Scottish Government
maintainer(s) and affiliation	SAC
other	
Technical Information	
type of model	Optimisation, deterministic, dynamic, linear programming
programming language	Excel and Visual Basic by using 'What's Best' add-in solver
dimensions	3 production activities (sheep, cattle, grass production) and 6 consumption activities (hill and pasture grass, aftermath grazing, own produced hay/silage consumption, bought-in hay/silage consumption and, concentrate consumption), 6 energy transfer activity, 36 sets of constrains.

regions covered currently	Great Britain
smallest regional unit	Farm/enterprise
aggregation of regions	possible
time horizon temporal scale: smallest - longest	annual
representation of trade	-
sectors covered	Livestock (sheep and cattle)
more details on representation of agriculture:	
general notes	
farm types	
farm structure	
variants of management / intensity	Extensive sheep and cattle farm systems
description of input - data	
general notes	An inventory of 20 extensive sheep farms in Grain Britain used plus an additional survey to collect further details of management practices. Larger datasets can be imported and run using a visual basic (VB) macro developed for this purpose.
crop production	-
livestock production	Sheep sector: is disaggregated (ewes, single and twin lambs), beef sector: suckler beef cows.
variants of management / intensity	
other	
description of parameters	The objective of the LP is to maximise sheep and cattle enterprise gross margin subject to land, labour and animal performance constraints. The LP followslivestock farming year in aseries of monthly periods. In each month, grass feed energysupply from hill, pasture and in-bye land on the farm is calculated. This is matched with the animals' demand for feed energy,given the average animals' metabolisable energy requirementsbased on AFRC recommendations. These, in turn, depended on therelevant performances and decisions recorded in theinventory of the farms, such as lambing/calving date,twinning rate, weaning percent, breed of sheep/cattle, areas ofdifferent land types, fertiliser usage etc. Grass yields on landshut-off for conservation are accumulated in the LP as hayor silage and made available later as required. Where home-grownstocks are inadequate, hay and/or concentrates

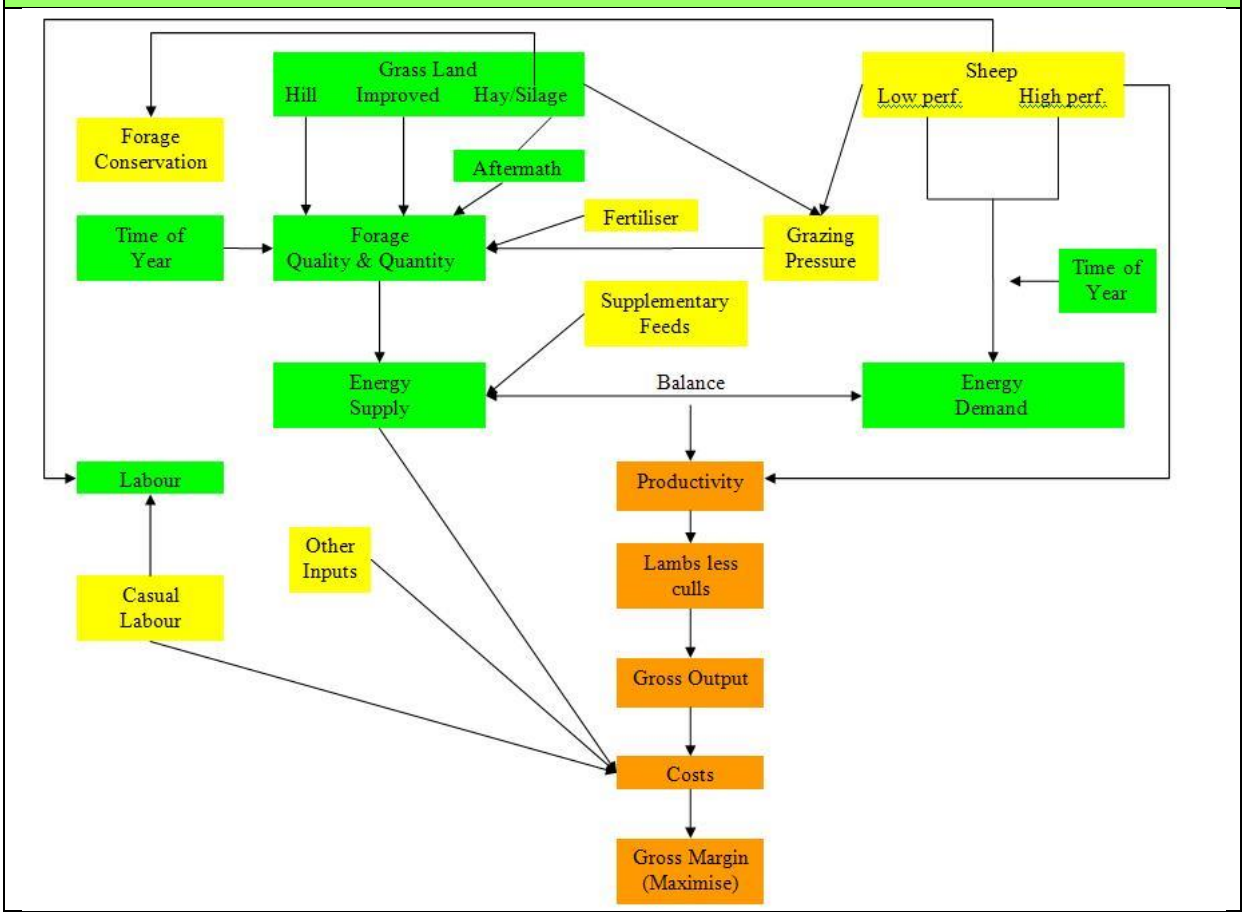
	could be purchased asrequired. Variable costs of hill, pasture and conservationland arealso included, excludingfertiliser costs calculated dependingon reported usage.
exogeneous projection variables and sources	Grass growth model developed by Armstrong et al. (1997). Armstrong H M, Gordon I J, Grant S A, Hutchings N J, Milne J A, Sibbald A R. 1997. A model of the grazing of hill vegetation by sheep in the UK. 1. The prediction of vegetation biomass. Journal of Applied Ecology 34:166–185.
model closure rules	
other	
use and applications	
target user group	
policy makers	X
farmers / advisory services	X
scientists	X
other (specify)	
policies analysed in most cases	Interactions between profit and animal welfare on extensive sheep farms in Great Britain (2012)
policies analysed most recently	CAP reform scenarios
policies - other aspects	Animal welfare and health, GHG emissions
other analyses	
economic result indicators	
income / wealth / utility / related	Gross margin, Net margin
production costs related	Variable costs, casual labour costs, feed and forage costs
other	- Biotechnical outputs include: flock size, land, feed, labour requirements, GHG emissions. - Economic output include: maximised farm gross margin including casual labour
bio-physical links and indicators	
land types	Hill, pasture and hay/silage production land
land uses	
manure management	Nitrogen applied
water - indicators	
air - indicators	CH4 and N2O from livestock
soil - indicators	
biodiversity flora	
biodiversity fauna	
landscape	
other environmental aspects/indicators	
other	
integration: models, tools, data	

names and acronyms of other models and technical aspects of model-link	
databases (specify)	
GIS (specify)	
link to climate change	
link to food security	
other	
current state of development	
regional coverage	Great Britain
sector coverage	Sheep and suckler beef cow
methodological enhancements	
new modules	
other	
property rights	
access to core-code of the model	SAC's agreement required
access to scenarios (data/parameters)	
access to input data	
access to result data output	
access to parameters	
other	
recent publications	
journal papers	• Stott, A.W.; VosoughAhmadi, B.; Dwyer, C.M.; Kupiec, B.; Morgan-Davies, C.; Milne, C.E.; Ringrose, S.; Goddard, P. Phillips, K and Waterhouse, A. (2012). Interactions between profit and welfare on extensive sheep farms. Animal Welfare. 21 (S1), 57-64. Full Text
presentations at conferences	• VosoughAhmadi, B.; Erhard, H.W.; Dwyer, C.M.; Morgan-Davies, C.; Waterhouse, A.; Milne, C.E.; Kupiec-Tehan, B.; Ringrose, S.;Goddard, P.;hillips, K. & Stott, A.W. (2010). Impacts of labour on interactions between economics and animal welfare in extensive sheep farms. In: Proceedings of the 84th Annual Conference of the Agricultural Economics Society, March 30th – 31st, 2010, Edinburgh, UK. Full Text • Stott, A.W.; VosoughAhmadi, B.; Morag-Davies, C.; Dwyer, C.; Goddard, P.; Phillips, K.; Milne, C.E.; Kupiec, B.; Ringrose, S. and Waterhouse, A. (2009). Evaluating extensive sheep farming systems. In: Proceedings of the Integrated Agricultural Systems: Methodologies, Modelling and Measuring conference, June 2-4, 2009, Edinburgh, UK. Full Text
project reports	• Further study to assess interactions

	between economics, husbandry & welfare in large, extensively managed sheep flocks - AW1024. Full Text
technical papers on the model	
policy papers	
web-sites	
other	
strengths and weaknesses	
major strengths	- This model incorporates aspects of animal-based farm-level models and a model of vegetation growth under sheep grazing that allows the user to predict technical coefficients for the LP that fit individual farm circumstances for each month of a typical farming year. - It ensures that input-output relationships that are usually explicit in a science-based model but often fixed in an LP are linked with the decision-making (optimum resource allocation) focus of the LP. - It provides an objective benchmarking framework with which to assess the profit potential of each farm in any given dataset.
major weaknesses	- Simplifications: for example, feed energy demand is limited to that of the average ewe/cattle on the farm in terms of its weight, date of conception, lambing/calving, weaning, number of lambs/calves weaned etc. Also three land types are considered each with one grass species typical of that land type with, in addition, a proportion of heather on the hill land estimated by the farmer. - Detailed bio-physical data required.
other	
relevance for MACSUR	
expected benefit for TradeM	
expected benefit for CropM	
expected benefit for LiveM	The EWES LP model could be adapted and used in exploring extensive livestock farm management response to 'shocks' e.g. policy, prices etc.
expected benefit from TradeM	
expected benefit from CropM	
expected benefit from LiveM	
expected / planned enhancements during the next three years	
main challenges to be tackled to attain the planned enhancements	

other	
other relevant aspects	

Structure of model



Model #6: MOTAD LP

Basic Information	
information provided by Name Partner-Number	SAC
submitted by	Paul Haggarty, p.haggarty@abdn.ac.uk
time of report	August 2012
acronym of model	MOTAD LP
name of model	Minimisation Of Total Absolute DeviationsLinear Programme
website	http://ahdss.sac.ac.uk/
objectives of the model	
major focus:	Income risk minimising beef-cow farm management
ex-ante evaluation	X
ex-post evaluation	X
specific problems of clients	
methodological development	X
short description of the model	This model combines epidemiological and economic concepts and modelling techniques, to integrate animal health into whole-farm business management. The aim was to assess the relative contribution that disease prevention could make to whole-farm income and to the variability in farm income (risk).The MOTAD LP model was applied to farm-management decision making in cow-calf herds and was linked to an epidemiological model of bovine viral diarrhoea (BVD).
principal developer(s) and affiliation	Prof Alistair Stott, Scottish Agricultural College (SAC)
development supported by	Scottish Government
maintainer(s) and affiliation	SAC
other	
Technical Information	
type of model	Optimisation, stochastic, dynamic, linear programming
programming language	Excel
dimensions	
regions covered currently	Scotland
smallest regional unit	Farm/ enterprise
aggregation of regions	
time horizon temporal scale: smallest - longest	Annual
representation of trade	
sectors covered	Beef cattle
more details on representation of agriculture:	
general notes	
farm types	
farm structure	

variants of management / intensity	
other	
description of input - data	
general notes	
crop production	
livestock production	13 activities, 20 constraints, impact of animal disease (BVD) on sale values, costs of interventions/preventions.
variants of management / intensity	
other	
description of parameters	
exogeneous projection variables and sources	Simulation for the impact of disease
model closure rules	
other	
use and applications	
target user group	
policy makers	X
farmers / advisory services	X
scientists	X
other (specify)	
policies analysed in most cases	the economic impact of bovine viraldiarrhoea (BVD) at the whole-farm level
policies analysed most recently	
policies - other aspects	
other analyses	
economic result indicators	
income / wealth / utility / related	Minimum total deviation from fixed farm income constraint
production costs related	Variable costs and costs of preventions
other	
bio-physical links and indicators	
land types	
land uses	
manure management	
water - indicators	
air - indicators	
soil - indicators	
biodiversity flora	
biodiversity fauna	
landscape	
other environmental aspects/indicators	
other	
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	
databases (specify)	
GIS (specify)	

link to climate change	
link to food security	
other	
current state of development	
regional coverage	Scotland
sector coverage	Beef cattle
methodological enhancements	
new modules	
other	
property rights	
access to core-code of the model	SAC's agreement required
access to scenarios (data/parameters)	
access to input data	
access to result data output	Online free version if available
access to parameters	
other	
recent publications	
journal papers	Stott, A.W., Lloyd, J., Humphry, RW and Gunn, G.J., (2003) A linear programming approach to estimate the economic impact of bovine viral diarrhoea (BVD) at the whole-farm level in Scotland. Preventive Veterinary Medicine, 59, 51-66. Full Text
presentations at conferences	
project reports	
technical papers on the model	
policy papers	
web-sites	http://ahdss.sac.ac.uk/
other	
strengths and weaknesses	
major strengths	- The model combines epidemiological and economic concepts and modelling techniques, to integrate animal health into whole-farm business management. - Transparent and user friendly
major weaknesses	
other	
relevance for MACSUR	
expected benefit for TradeM	
expected benefit for CropM	
expected benefit for LiveM	
expected benefit from TradeM	
expected benefit from CropM	
expected benefit from LiveM	Relevant to animal health and welfare bio-economic frameworks
expected / planned enhancements during the next three years	
main challenges to be tackled to attain the planned enhancements	
other	

other relevant aspects	

Structure of model

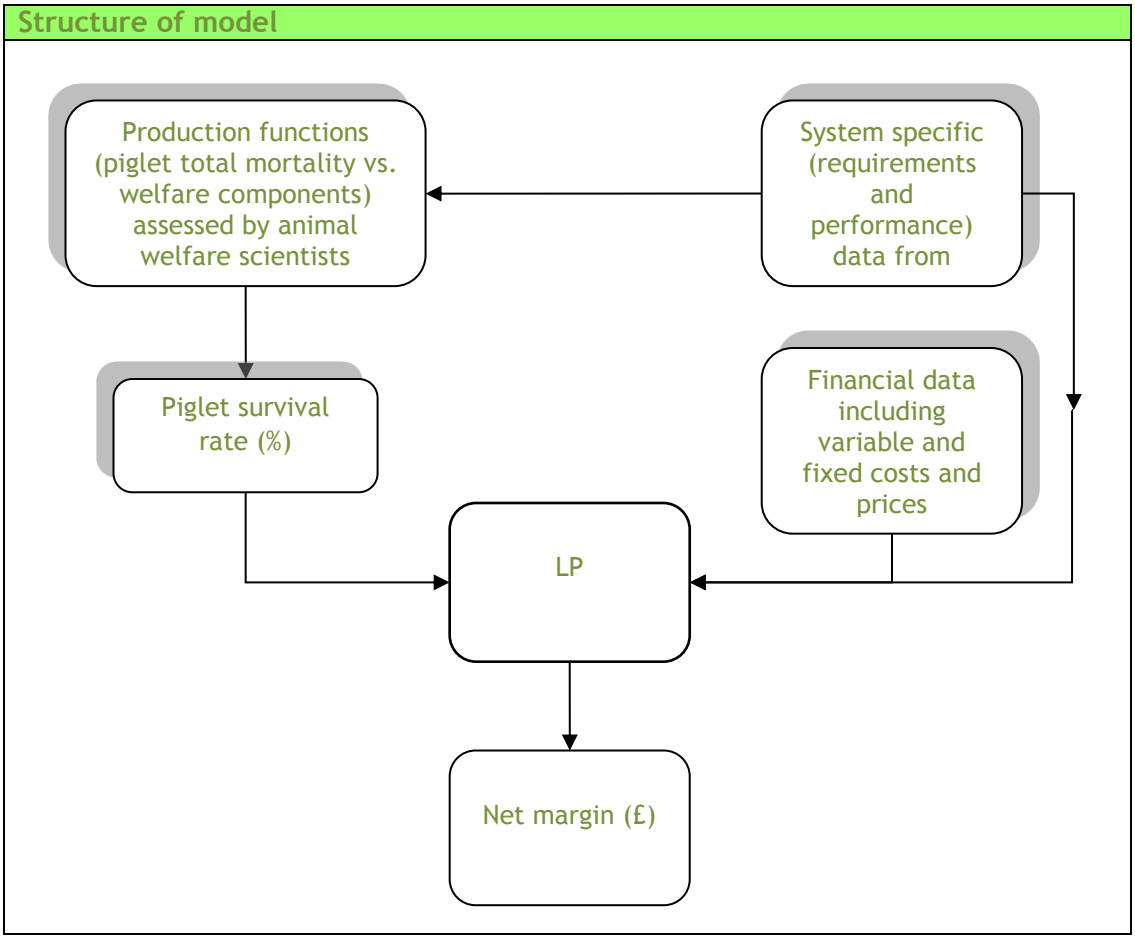
Model #7: PigSafeLP

Basic Information	
information provided by Name Partner-Number	SAC
submitted by	Paul Haggarty, p.haggarty@abdn.ac.uk
time of report	August 2012
acronym of model	PigSafeLP
name of model	Piglet and Sow Alternative Farrowing Environment Linear Programme
website	http://www.bpex.org.uk/2TS/health/PigSafe.aspx
objectives of the model	
major focus:	Explore relationships between costs and benefits of alternative farrowing systems
ex-ante evaluation	X
ex-post evaluation	X
specific problems of clients	
methodological development	X
short description of the model	This Linear programming (LP) model was developed to examine possible trade-offs between profit and welfare within alternative farrowing systems and to support the design of welfare-friendly yet commercially viable alternatives.
principal developer(s) and affiliation	Dr BoudaVosoughAhmadi and Prof Alistair Stott, Scottish Agricultural College (SAC)
development supported by	BPEX, QMS, RSPCA and Defra through "Re-designing the farrowing environment from first principles to optimise animal welfare and economic performance (PIGSAFE)" project.
maintainer(s) and affiliation	SAC
other	
Technical Information	
type of model	Optimisation, deterministic, static, linear programming model
programming language	Excel
dimensions	Activities (18), constraints (25), farrowing systems modelled (16)
regions covered currently	Farrowing systems in GB and other EU members
smallest regional unit	Pig breeding enterprise
aggregation of regions	-
time horizon temporal scale: smallest - longest	
representation of trade	
sectors covered	Pig industry
more details on representation of agriculture:	
general notes	
farm types	Pig breeders
farm structure	
variants of management / intensity	Intensive
other	

description of input - data	
general notes	
crop production	
livestock production	Farrowing to weaning
variants of management / intensity	
other	
description of parameters	LP was used to establish the profit (measured as net margin) maximising farm management strategy for a given farrowing system subject to constraints that reflect the main resource limitations and aspects of the welfare of the sow and piglet. The LP uses technical coefficients to link key activities with resources they require, such as feed, labour, space, substrate, power and capital investment. Three main 'welfare components' (WC) namely space, substrate and temperature were included as constraints. Keeping sows, producing litters and weaners, providingcertain levels of feed, labour, space, substrate, electricity and investment were the main activities in themodel. Technical coefficients for production activities dealt with litter size and piglet mortality, thus providing number of piglets at a standard weaning age to give piglet-to-weaner flow. To account for sow and piglet welfare, additional activities, including providing extra space, extra power andextra substrate were introduced to allow these WC constraints to be varied from the default within constraints set by the system if this generated a higher net margin.
exogeneous projection variables and sources	A dataset that includes quantitative values from 145 items of the reviewed literature providing required data on farrowing systems to be used in the LP.
model closure rules	
other	
use and applications	
target user group	
policy makers	X
farmers / advisory services	X
scientists	X
other (specify)	X Stakeholders
policies analysed in most cases	Economic and animal welfare trade-offs
policies analysed most recently	
policies - other aspects	
other analyses	
economic result indicators	
income / wealth / utility / related	Maximised net margin per weaner.
production costs related	Farrowing to weaning variable costs and

	investment cost of housing systems
other	
bio-physical links and indicators	
land types	
land uses	
manure management	
water - indicators	
air - indicators	
soil - indicators	
biodiversity flora	
biodiversity fauna	
landscape	
other environmental aspects/indicators	
other	
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	
databases (specify)	A dataset that includes quantitative values from 145 items of the reviewed literature: Baxter,E.M., Lawrence,A.B. &Edwards,S.A. 2011. Alternative farrowing systems: design criteria for farrowing systems based on the biological needs of sows and piglets. Animal, 5, 580-600.
GIS (specify)	
link to climate change	
link to food security	
other	
current state of development	
regional coverage	Great Britain
sector coverage	Pig breeders
methodological enhancements	
new modules	
other	
property rights	
access to core-code of the model	SAC's agreement required
access to scenarios (data/parameters)	
access to input data	
access to result data output	
access to parameters	
other	
recent publications	
journal papers	VosoughAhmadi, B.; Stott, A.W.; Baxter, E.M.; Lawrence, A.B. and Edwards, S.A. (2011). Animal welfare and economic optimisation of farrowing systems. Animal Welfare. 20, 57-67. Full Text
presentations at conferences	VosoughAhmadi, B.; Baxter, E.M.; Stott, A.W.; Lawrence, A.B. and Edwards, S.A. (2009) Animal welfare and economic optimisation of farrowing systems. In: Proceedings of the Knowing Animals Conference, March 5-6, 2009, Florence, Italy.

project reports	
technical papers on the model	
policy papers	
web-sites	Link
other	
strengths and weaknesses	
major strengths	- This model incorporates animals' welfare needs and financial performances of the animals indifferent farrowing systems in one framework - transparent structure in Excel
major weaknesses	- Technical data requirements including relationship (production function) between welfare components and outputs (weaners).
other	
relevance for MACSUR	
expected benefit for TradeM	
expected benefit for CropM	
expected benefit for LiveM	This model is relevant to animal welfare and health related frameworks.
expected benefit from TradeM	
expected benefit from CropM	
expected benefit from LiveM	
expected / planned enhancements during the next three years	
main challenges to be tackled to attain the planned enhancements	
other	
other relevant aspects	


Structure of model
Production functions (piglet total mortality vs. welfare components) assessed by animal welfare scientists
System specific (requirements and performance) data from
Piglet survival rate (%)
Financial data including variable and fixed costs and prices
LP
Net margin (£)

Model #8: A4SMOD

Basic Information	
information provided by Name Partner-Number	 Gabriele Dono (Luca Giraldo and Raffaele Cortignani) P62
submitted by	Gabriele Dono, dono@unitus.it
time of report	August 2012
acronym of model	A4SMOD
name of model	Agricultural Systems Small Scale Stochastic Model
website	
objectives of the model	A4SMOD's main objective is to capture the adaptation strategies of small scale farming typologies to uncertain outcomes consequent to climatic variability. Also, it allows to represent the effect of climate change as changes of meteorological variability and thus of uncertainty the farmers are exposed to. This variability is expressed as probability distributions of relevant climatic variables; the effect of climate change is expressed as modification of those distributions. The model allows the simulation of agricultural policy and climatic scenarios, including plausible planned adaptation strategies. The adaptation strategies can be specified for land and resources use and for cost and revenues impacts. They can be defined at farm type level.
major focus:	
ex-ante evaluation	X
ex-post evaluation	
specific problems of clients	X
methodological development	X
short description of the model	It is a supply, short run, stochastic model. 4SMod allows representing a sequence of choices that are made under conditions of uncertainty. This is useful to represents the decision-making of production activities conducted at certain times (stages), which are influenced by certain conditions (states of nature) that are not known with certainty. The decision maker does not know which state of nature will occur, and can only give them a certain probability of happening. This condition is typical of the decision-taking of agricultural

	sector.
principal developer(s) and affiliation	Gabriele Dono, Raffaele Cortignani, Luca Giraldo, Graziano Mazzapicchio. [Department of Science and Technology for Agriculture, Forestry, Nature and Energy DAFNE - Università della Tuscia, Italy]
development supported by	Italian Ministry of Agriculture (MIPAAF) through the AGROSCENARI research project
maintainer(s) and affiliation	DAFNE - Università della Tuscia, Italy
other	
Technical Information	
type of model	Static, Discrete Stochastic, Supply, Territorial, Multi-farming typologies
programming language	GAMS
dimensions	farming typologies (24 in the last version),production activities (30), time (1), endowments (land, capital, labour, water),
regions covered currently	Sardinia
smallest regional unit	Farming typology
aggregation of regions	bottom up by aggregation of farming-models
time horizon temporal scale: smallest - longest	Short run 10 days - year
representation of trade	-
sectors covered	agriculture
more details on representation of agriculture:	
general notes	24 representative farms per territory
farm types	Dairy, Sheep breeding, Horticultural, Rice, Orchards, …
farm structure	Small, medium and large according to income and labour/land ratio; presence of farm wells
variants of management / intensity	standard production, alternative productions (organic, low-input, different time of seeding and harvesting)
description of input - data	
general notes	Primary (collected by field survey to experts and farmers) and secondary data referring to a specific year (baseline). The Primary data refer to the cropping technics, practices and prices. The secondary data come from the FADN,Agricultural Census and Water User Association database served to define the structural characteristic of the farming typologies and the water use.

crop production	Cropping activities
livestock production	Dairy and sheep sectorsare disaggregated (calves, heifers, suckler-cows, sheeps, other)
variants of management / intensity	standard production, alternative productions
other	
description of parameters	Optimization supply model constrained by the endowments
exogeneous projection variables and sources	local prices (Chamber of Commerce) policy parameters (CAP, Regional Government) production function parameters (both primary data and EPIC model) water use parameters (Water User Association)
model closure rules	Optimal solution found
other	
use and applications	
target user group	
policy makers	X
farmers / advisory services	X
scientists	X
other (specify)	general public and stakeholders (WUA, farm cooperatives,…)
policies analysed in most cases	CAP implementation
policies analysed most recently	CAP implementation 2007/2013 Water Framework Directive 06/2000
policies - other aspects	Simulation of defined adaptation strategies, Nitrate Framework is forthcoming
other analyses	output response to scarcity of resources
economic result indicators	
income / wealth / utility / related	Expected Gross margin of each farming typology (Objective Function)
production costs related	accounting costs external labour input purchase
other	working units shadow prices water use
bio-physical links and indicators	
land types	arable land, grassland, orchards land, irrigable land (good and poor quality)
land uses	different levels of intensity (standard, low-input)
manure management	quantities enter regional N-input (N-balance is forthcoming)
water - indicators	m3 extraction of groundwater, m3 of collective surface water
air - indicators	-
soil - indicators	-
biodiversity flora	-

biodiversity fauna	-
landscape	-
other environmental aspects/indicators	Input of N and P, K, kg pesticide, Balance between liquid manure application and constraints of Vulnerable Nitrate Zone (forthcoming)
other	
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	Agronomic: Environmental Policy Integrate Climate (EPIC); Climate: ENSEMLES for Global Change Simulations and REGCCA for statistical downscaling
databases (specify)	Meteorological stations of the area; Climatic data
GIS (specify)	
link to climate change	X
link to food security	
other	Estimation of probability distribution function of relevant climatic variables and synthetic indexes of physical factors (Evapotranspirational demand,…)
current state of development	
regional coverage	Sardinia
sector coverage	downstream sectors of agriculture
methodological enhancements	Simultaneous uncertainty on different variables
new modules	-
other	
property rights	
access to core-code of the model	
access to scenarios (data/parameters)	
access to input data	
access to result data output	
access to parameters	
other	
recent publications	
journal papers	- Dono, Mazzapicchio, 2010: Uncertain water supply in an irrigated Mediterranean area: an analisys of the possible economic impact of Climate Change on the farm sector, *Agricultural Systems*, Vol. 103, Issue 6. - Dono, Cortignani, Doro, Giraldo, Ledda, Pasqui, Roggero, 2012: Evaluating productive and economic impacts of climate change variability on the farm sector of an irrigated Mediterranean area. *Agricultural Systems* (Forthcoming).
presentations at conferences	Dono G., Cortignani R., Giraldo L., Severin S., Doro L., Ledda L., Roggero

	P.P., Possible impacts of climate change on Mediterranean irrigated farming systems. Paper presentato al Congresso EAAE 2011 "Change and Uncertainty", Zurigo CH, 30 agosto- 2 settembre 2011.
project reports	
technical papers on the model	
policy papers	
web-sites	
other	
strengths and weaknesses	
major strengths	- linkages between climatic, agronomic and economic aspects; - integrated software to estimate probability distribution function (@risk) and put the results into the model; - demand for resources in the entire territory; - definition of adaptation strategies for each farming typology; - researcher-friendly programming tool, which helps to run scenarios and to compare scenario results.
major weaknesses	- lack of integration with climatic related aspects such as pathogens and soil; - extended database behind the model; - strongly related to local issues (climatic, agronomic and economic), adaptation to other territories is costly.
other	
relevance for MACSUR	
expected benefit for TradeM	Representation of multiple aspects of climate change as perceived by local economic subjects. Modelling of decision-making of farmers in the short run is relevant for the adaptation policy specification.
expected benefit for CropM	Identification of the economic relevance of agronomic consequences of climate changes in the short run (which is relevant for the adaptation policy specification)
expected benefit for LiveM	Identification of the economic relevance of animal production consequences of climate changes in the short run (which is relevant for the adaptation policy specification)
expected benefit from TradeM	integration with larger-scale models and with partial equilibrium models.
expected benefit from CropM	parameters for future crop-yields and input requirements
expected benefit from LiveM	parameters for future animal productivity and input requirements. Responsiveness to extreme climatic variation.
expected / planned enhancements during the next three years	Standardization of the model components in order to:

	- make it more adaptable to different regions; - simplify the interaction process with climatologists, agronomists for the identification of climatic issues in the territory; - to ease the definition of different uncertainties which farmers perceive as connected to the multiple elements of climate change.
main challenges to be tackled to attain the planned enhancements	Problems of working at small and local scale and find representativeness for larger areas
other	
other relevant aspects	

Model #9: DYMORHA

Basic Information	
information provided by	UNIBO
Name	University of Bologna
Partner-Number	62
submitted by	Davide Viaggi davide.viaggi@unibo.it
date of report	5/09/2012
acronym of model	DYMORHA
name of model	DYnamic MOdel for the analysis of Rural Household investment behAviour
website	
objectives of the model	The model assess the impact of policy scenarios on investment behavior and, through it, on selected sustainability indicators
major focus:	
ex-ante evaluation	x
ex-post evaluation	
specific problems of clients	
methodological development	
short description of the model	Household level model, maximization of NPV based on the aggregation of net income, introduction of scenarios
principal developer(s) and affiliation	Viaggi Davide, University of Bologna
development supported by	1. Farm investment behaviour under the CAP reform process, Contract n. 151247-2008 A08-IT, call for tenders J05/25/2008 IPTS JRC Siviglia. 2. Investment behaviour in conventional and emerging farming systems under different policy scenarios, CONTRACT 150369-2005 F1SC IT, call for tenders J05/13/2005, IPTS JRC Siviglia.
maintainer(s) and affiliation	Viaggi Davide, University of Bologna
other	
Technical Information	
type of model	Mixed Integer
programming language	GAMS
dimensions	Depends on farm
regions covered currently	Selected farms in Spain, France, Italy, Netherlands, Germany, Poland, Bulgaria, Greece
smallest regional unit	Farm
aggregation of regions	none
time horizon	Longest (25 years, but can be extended)
temporal scale: smallest - longest	
representation of trade	None
sectors covered	Agriculture, other household activities
more details on representation of agriculture:	

general notes	
farm types	individual
farm structure	
variants of management / intensity	One version includes organic farming
description of input - data	
general notes	
crop production	x
livestock production	x
variants of management / intensity	x
other	
description of parameters	Detailed representation of assetes, savings and borrowing balances
exogeneous projection variables and sources	Product prices, resources prices
model closure rules	Everything is sold out at the end
other	
use and applications	
target user group	
policy makers	x
farmers / advisory services	
scientists	x
other (specify)	
policies analysed in most cases	CAP reforms, market prices of agricultural policies
policies analysed most recently	same
policies - other aspects	
other analyses	
economic result indicators	
income / wealth / utility / related	income
production costs related	
other	Nitrogen, water, labour; investment pattern and timing
bio-physical links and indicators	
land types	
land uses	
manure management	
water - indicators	x
air - indicators	
soil - indicators	
biodiversity flora	
biodiversity fauna	
landscape	
other environmental aspects/indicators	Fertilizers indicator
other	
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	none
databases (specify)	

GIS (specify)	
link to climate change	Possible parameterization with different water availability and distribution among key sources; effect of incentives for investment in climate-relate measures
link to food security	
other	
current state of development	
regional coverage	x
sector coverage	
methodological enhancements	x
new modules	
other	
property rights	
access to core-code of the model	Restricted to IPTS (owner)
access to scenarios (data/parameters)	Restricted to IPTS (owner)
access to input data	Restricted to IPTS (owner)
access to result data output	Restricted to IPTS (owner)
access to parameters	Restricted to IPTS (owner)
other	
recent publications	
journal papers	1. Viaggi D., Raggi M. Gomez y Paloma S. (2011): Farm-Household Investment Behaviour and the CAP decoupling: methodological issues in assessing policy impact, *Journal of Policy Modelling*, 33 (1), pp. 127-145. 2. Viaggi D., Raggi M. Gomez y Paloma S., (2010): An integer programming dynamic farm-household model to evaluate the impact of agricultural policy reforms on farm investment behaviour, *European Journal of Operational Research*, 207 , pp. 1130–1139. Plus other submitted
presentations at conferences	Several, but key results are in the papers above and in the reports
project reports	3. Gallerani V., Gomez y Paloma S., Raggi M., Viaggi D. (2008): *Investment behaviour in conventional and emerging farming systems under different policy scenarios*, JRC Scientific and technical reports, EUR 23245 EN – 2008, ISBN 978-92-79-08348-8, ISSN 1018-5593, DOI 10.2791/94554 4. Viaggi D., Bartolini F., Raggi M., Sardonini L., Sammeth F., Gomez y Paloma S. (2011). Farm investment behaviour under the CAP reform

	process. (pp. 142). ISBN: 978-92-79-19424-5. LUXEMBOURG: Publications Office of the European Union.
technical papers on the model	
policy papers	
web-sites	
other	
strengths and weaknesses	
major strengths	The model gives a very detailed treatment of investment decisions and their consequence; good connections with technical/ingegneristic information; being also dynamic it allows considerations of evolution over time
major weaknesses	It allows to consider only one individual case and a limited number of invesmment alternatives (form computational reasons)
other	
relevance for MACSUR	
expected benefit for TradeM	Ability to cross validate simpler model of reaction to policy by considering more complex dynamic and household-wide effects
expected benefit for CropM	
expected benefit for LiveM	
expected benefit from TradeM	
expected benefit from CropM	More detailed technical coefficient, better understanding of how to fit climatic variables
expected benefit from LiveM	
expected / planned enhancements during the next three years	Better connection with technical/climatic variables;
main challenges to be tackled to attain the planned enhancements	
other	
other relevant aspects	

Model # 10: ITALY NN

Basic Information	
information provided by	UNIBO
Name	University of Bologna
Partner-Number	62
submitted by	Davide Viaggi davide.viaggi@unibo.it
date of report	5/09/2012
acronym of model	No name yet
name of model	No name yet
website	http://www.capandtrade.acteon-environment.eu/
objectives of the model	The model assess the impact of the introduction of water trading among farmers
major focus:	
ex-ante evaluation	x
ex-post evaluation	
specific problems of clients	
methodological development	
short description of the model	Territorial model, maximization of gross margin, introduction of scenarios differentiated by the diverse water rights assignments and diverse water availability
principal developer(s) and affiliation	Zavalloni Matteo, Raggi Meri, Viaggi Davide, University of Bologna
development supported by	PRIN 2003; Water Cap & Trade – IWRM net
maintainer(s) and affiliation	Zavalloni Matteo, Raggi Meri, Viaggi Davide, University of Bologna
other	
Technical Information	
type of model	Mixed Integer
programming language	GAMS
dimensions	69 kb
regions covered currently	Reno Basin – Emilia Romagna (It)
smallest regional unit	Farm
aggregation of regions	
time horizon	Smallest
temporal scale: smallest - longest	
representation of trade	
sectors covered	agriculture
more details on representation of agriculture:	
general notes	
farm types	Fruit and Mixed fruit-Crop farms based on cluster analysis (5 types)
farm structure	side activity / professional
variants of management / intensity	Different farm extent
description of input - data	

general notes	
crop production	x
livestock production	
variants of management / intensity	x
other	
description of parameters	Economic and technical coefficients
exogeneous projection variables and sources	Product prices, labour prices, water prices and availability
model closure rules	
other	
use and applications	
target user group	
policy makers	x
farmers / advisory services	
scientists	x
other (specify)	
policies analysed in most cases	The introduction of water markets, water pricing
policies analysed most recently	
policies - other aspects	
other analyses	
economic result indicators	
income / wealth / utility / related	income
production costs related	Energy, water
other	
bio-physical links and indicators	
land types	
land uses	x
manure management	
water - indicators	x
air - indicators	
soil - indicators	
biodiversity flora	
biodiversity fauna	
landscape	
other environmental aspects/indicators	Fertilizers, pesticide index
other	
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	None, but data have been inconnection to GIS applications
databases (specify)	
GIS (specify)	GIS representation of output data
link to climate change	Possible parametrization with different water availability and distribution among key sources
link to food security	
other	
current state of development	
regional coverage	
sector coverage	

methodological enhancements	x
new modules	
other	
property rights	
access to core-code of the model	Restricted to UNIBO
access to scenarios (data/parameters)	Restricted to UNIBO
access to input data	Restricted to UNIBO
access to result data output	Restricted to UNIBO
access to parameters	Restricted to UNIBO
other	
recent publications	
journal papers	
presentations at conferences	
project reports	X forthcoming/planned
technical papers on the model	
policy papers	
web-sites	
other	paper abstract submitted for the book "Economics of Water management in agriculture" edited by Bournaris, Berbel, Manos, Viaggi
strengths and weaknesses	
major strengths	It adds to the literature the assessment of the effect of different water right assignments for the design of a potential water market in Italy
major weaknesses	It does not include a dynamic analysis
other	
relevance for MACSUR	
expected benefit for TradeM	Consideration of innovative resource (water) policies and coordination mechanisms; detailed treatment of water management issues at the basin and farm scale; connection with water policies (e.g. WFD)
expected benefit for CropM	Simulation of changes in crop mix patterns to support territorial agronomic/ecological modelling
expected benefit for LiveM	
expected benefit from TradeM	More realistic market scenarios, demand side, price volatility and feed backs
expected benefit from CropM	More detailed technical coefficient, production function related to water, better understanding of how climatic variables would affect technical coefficients
expected benefit from LiveM	
expected / planned enhancements during the next three years	Including option right trade? Including dynamic analysis
main challenges to be tackled to attain the planned enhancements	The lack of an existing institutional framework supporting water trading in

	the region
other	
other relevant aspects	

Model #11: GLOW_VECM

Basic Information	
information provided by Name Partner-Number	 Luciano Gutierrez P62
time of report	Sept. 2012
acronym of model	GLOW_VECM
name of model	GLObal Wheat Vector Error Correction Model for the TradeM inventory
website	http://www.gutierrezluciano.net/GLO_VECM/
objectives of the model	GLOW_VECM's objective is to analyze the wheat sector using a dynamic global model. The main country players, Argentina, Australia, Canada, EU, Russia and USA are analyzed in order to capture how they react to domestic and international shocks.
Ks asmajor focus:	
ex-ante evaluation	X
ex-post evaluation	X
specific problems of clients	
methodological development	X
short description of the model	It is a dynamic, multicountry model. It allows first studying the heterogeneity of responses of single country to different domestic and international shocks. Second it permits to compute a global response by aggregating the single country model and finding an equilibrium solution. The model allows, for example, to simulate how wheat prices react to shocks as a change in the stock to use ratio, exchange rates, oil price and climate changes. The model can be also used for forecasting wheat price for different scenarios
principal developer(s) and affiliation	NRD-UNISS
development supported by	MIUR, UNISS, NRD
maintainer(s) and affiliation	NRD-UNISS
other	
Technical Information	
type of model	Global vector error correction model with exogenous variables
programming language	GAUSS
dimensions	countries (7), commodities (1)
regions covered currently	Argentina, Australia, Canada, EU, Russia, USA, Other countries.
aggregation of regions	bottom up by aggregation of country-models
sectors covered	Wheat sector
description of input - data	
general notes	database of monthly time series, covering the period 2000.1 – last available month (currently 2012.6)
description of parameters	VECM estimates are obtained by using ML methods

exogeneous projection variables and sources	Exchange rates (USDA), Oil prices (World Bank), Climate change (EM-DAT)
model closure rules	Aggregation using trade export shares
other	
use and applications	
target user group	
policy makers	X
farmers / advisory services	
scientists	X
other (specify)	general public and stakeholders
other aspects	forecasting wheat prices
strengths and weaknesses	
major strengths	- global model. - reduced form model (always identified) - integrated software to estimate equations and put the results into the model; - transparent structure. Open GAUSS procedures; - researcher-friendly programming tool;
major weaknesses	- identification, estimation, and validation process is computationally heavy
relevance for MACSUR	
expected benefit for TradeM, CropM and LiveM	- Providing a global scenario for wheat prices
expected benefit from TradeM	- concise scenario for model comparison - learn from approaches of other models.
expected benefit from CropM	- parameters for future wheat-yields

Model #12: MAGPIE

Basic Information	
information provided by	Potsdam Institute for Climate Impact Research (PIK)
Name	Dr. Hermann Lotze-Campen
Partner-Number	P83
submitted by	Hermann Lotze-Campen, lotze-campen@pik-potsdam.de
date of report	16 Aug 2012
acronym of model	MAGPIE
name of model	Model of Agricultural Production and its Impacts on the Environment
website	http://www.pik-potsdam.de/research/climate-impacts-and-vulnerabilities/research/rd2-flagship-projects/musix-multi-sector-impacts-and-climate-extremes
objectives of the model	MAgPIEis a global land use allocation model, based on a mathematical programming approach. Itis coupled to the grid-based dynamic vegetation model LPJmL with a spatial resolution of 0.5°x0.5°. MAgPIE takes regional economic conditions such as demand for agricultural commodities, technological development and production costs as well as spatially explicit data on potential crop yields, land and water constraints into account. Based on these, the model derives specific land use patterns, yields and total costs of agricultural production for each grid cell.
major focus:	
ex-ante evaluation	X
ex-post evaluation	
specific problems of clients	
methodological development	X
short description of the model	The objective function of MAgPIEis to minimize total cost of production for a given amount of regional food and bioenergy demand. Regional food energy demand is defined for an exogenously given population in 10 food energy categories, based on regional diets.Food and feed energy for the demand categories can be produced by 20 cropping activities and 3 livestock activities. Feed for livestock is produced as a mixture of crops, crop residuals, processing by-products, green fodder produced on crop land, and pasture. Variable inputs of production are labour, chemicals, and other capital (all measured in US$). Costs of production are derived from the Global Trade Analysis Project (GTAP) Database. The model can endogenously decide to acquire yield-increasing technological change at additional costs. The use of technological change is either triggered by a better cost-effectiveness compared to other investments or as a response to resource constraints, such as land scarcity. For future projections the model works on a time step of 10 years in a recursive dynamic mode. The link between two consecutive

	periods is established through the land-use pattern. The optimized land-use pattern from one period is taken as the initial land constraint in the next. If necessary, additional land from non-agricultural areas can be converted into cropland at additional costs.
principal developer(s) and affiliation	Hermann Lotze-Campen, Alexander Popp, Jan Philipp Dietrich, Anne Biewaldand PIK land use team (see website)
development supported by	PIK, BMBF Germany, EU DG Research
maintainer(s) and affiliation	Hermann Lotze-Campen, Alexander Popp, Jan Philipp Dietrich, Anne Biewaldand PIK land use team (see website)
other	Christoph Müller, Susanne Rolinski and PIK LPJmLmodeling team (link to CropM and LivestockM)
Technical Information	
type of model	Non-linear mathematical programming model; Agricultural sector model
programming language	GAMS
dimensions	10 economic world regions; approx. 60.000 spatial grid cells (50kmx50km resolution); 10 food demand categories; 20 cropping activities; 3 livestock activities
regions covered currently	10 economic world regions
smallest regional unit	Grid cell: 50kmx50km
aggregation of regions	Aggregation from single countries to regions
time horizon temporal scale: smallest - longest	1995 – 2095, 10-year time steps
representation of trade	Partly endogenous net trade, based on scenarios of liberalization
sectors covered	Various agricultural sub-sectors (20 cropping activities, 3 livestock activites), bioenergy
more details on representation of agriculture:	
general notes	Top-down optimization model
farm types	
farm structure	
variants of management / intensity	Endogenous implementation of technological change
description of input - data	
general notes	Economic data at the regional level (based on GTAP database); biophysical data at the grid level (based on FAOSTAT)
crop production	Potential yields from the LPJmL vegetation-hydrology-crop model, at grid level, based on climate data from various GCMs (rainfed and

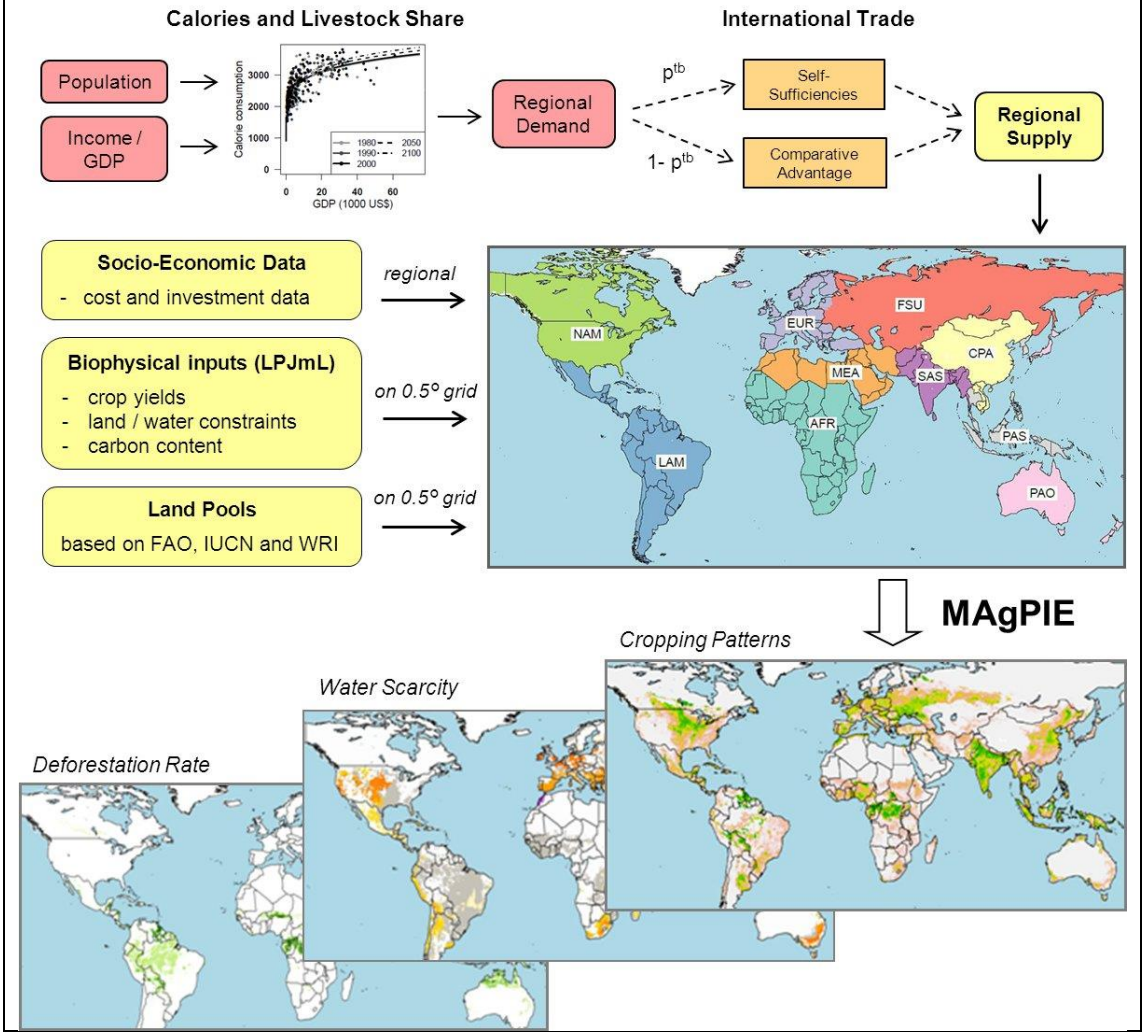
	irrigated separate)
livestock production variants of management / intensity	Livestock systems based on FAOSTAT
other	
description of parameters	Production costs based on GTAP and FAOSTAT; transportation costs based on JRC; Technology costs based on IFPRI
exogeneous projection variables and sources	Population by region: World Bank, SRES scenarios; GDP per capita by region: SRES scenarios, IIASA
model closure rules	Objective function: Global cost minimization
other	
use and applications	
target user group	
policy makers	X
farmers / advisory services	
scientists	X
other (specify)	
policies analysed in most cases	Land use policies, Forest conservation, Trade policies, Climate policies
policies analysed most recently	Bioenergy targets; Interplay between trade and land use change
policies - other aspects	Diet change, Climate change adaptation
other analyses	Measures of land use intensity and technological change
economic result indicators	
income / wealth / utility / related	Welfare: Changes in food prices; changes in producer and consumer surplus
production costs related	Changes in total agricultural production costs
other	Shadow prices for biophysical units of land and irrigation water
bio-physical links and indicators	
land types	Cropland, rangeland, managed forests, un-managed forests, other natural vegetation, urban
land uses	20 cropping activities, rangeland, managed forest, various types of bioenergy
manure management	Calculation of N, P, K balances
water - indicators	Water availability for irrigation (from LPJmL); shadow price for water
air - indicators	

soil - indicators	Soil carbon content (from LPJmL)
biodiversity flora	
biodiversity fauna	
landscape	Explicit shares of land uses for each grid cell (50kmx50km)
other environmental aspects/indicators	Potential crop yields for different climate scenarios until 2095 (from LPJmL)
other	
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	Linked to biophysical vegetation-crop-hydrology model LPJmL and to macroeconomy-energy model ReMIND in an Integrated Assessment framework at PIK
databases (specify)	GTAP database, FAOSTAT database
GIS (specify)	
link to climate change	Explicit modeling of climate change impacts on crop yields (grid level, 50kmx50km) with LPJmL
link to food security	Explicit modeling of food demand, based on projections of GDP per capita; Changes in food prices for different scenarios
other	
current state of development	
regional coverage	10 economic world regions
sector coverage	Agriculture, Bioenergy
methodological enhancements	Under development: forest management, livestock systems, rangeland management
new modules	Endogenous bilateral trade
other	
property rights	
access to core-code of the model	Upon request, with cooperation agreement
access to scenarios (data/parameters)	Upon request, with cooperation agreement
access to input data	Public data: FAOSTAT, JRC; Commercial data: GTAP database
access to result data output	Scientific publications
access to parameters	Upon request, with cooperation agreement
other	Open source strategy and licensing under development
recent publications	
journal papers	Krause, M., Lotze-Campen, H., Popp, A., Dietrich, J.-P., Bonsch, M. (2012): Conservation of undisturbed natural forests and economic

	impacts on agriculture, Land Use Policy 30: 344-354 [2013] [ISI] Bodirsky, B. L., Popp, A., Weindl, I., Dietrich, J. P., Rolinski, S., Scheiffele, L., Schmitz, C., and Lotze-Campen, H. (2012): Current state and future scenarios of the global agricultural nitrogen cycle, Biogeosciences Discuss., 9, 2755-2821, http://www.biogeosciences-discuss.net/9/2755/2012/. Dietrich, J.P., Schmitz, C., Müller, C., Fader, M., Lotze-Campen, H., Popp, A. (2012): Measuring agricultural land-use intensity - A global analysis using a model-assisted approach. Ecological Modelling 232: 109-118. (http://www.sciencedirect.com/science/article/pii/S0304380012001093). [ISI] Schmitz, C., Biewald, A., Lotze-Campen, H., Popp, A., Dietrich, J.P., Bodirsky, B., Krause, M., Weindl, I. (2012): Trading more Food - Implications for Land Use, Greenhouse Gas Emissions, and the Food System. Global Environmental Change 22(1): 189–209, doi:10.1016/j.gloenvcha.2011.09.013 [ISI] Popp, A., Krause, M., Dietrich, J.P., Lotze-Campen, H., Beringer, T., Leimbach, M. (2012): Additional CO2 emissions from land use change - forest conservation as a precondition for sustainable bioenergy production. Ecological Economics 74: 64–70 [ISI] Popp, A., Lotze-Campen, H., Leimbach, M., Knopf, B., Beringer, T., Bauer, N., Bodirsky, B. (2011): On sustainability of bio-energy production: integrating co-emissions from agricultural intensification. Biomass and Bioenergy 35: 4770-4780. doi:10.1016/j.biombioe.2010.06.014 [ISI] Popp, A., Dietrich, J.P., Lotze-Campen, H., Klein, D., Bauer, N., Krause, M., Beringer, T., Gerten, D., Edenhofer, O. (2011): The economic potential of bioenergy for climate change mitigation with special attention given to implications for the land system. Environ. Res. Lett. 6 (2011) 034017 [ISI] Leimbach, M., Popp, A., Lotze-Campen, H., Bauer, N., Dietrich, J.P., Klein, D. (2011): Integrated assessment models - the interplay of climate change, agriculture, and land use in a policy tool. In: Dinar, A., Mendelsohn, R. (eds.): Handbook on Climate Change in Agriculture. Edward Elgar, Cheltenham, UK. (Chapter 10) Popp, A., Lotze-Campen, H., Bodirsky, B. (2010): Food consumption, diet shifts and associated non-CO2 greenhouse gases from agricultural production. Global Environmental Change 20: 451–462. doi:10.1016/j.gloenvcha.2010.02.001 [ISI] Lotze-Campen, H., Popp, A., Beringer, T., Müller, C., Bondeau, A., Rost, S., Lucht, W. (2010): Scenarios of global bioenergy production: The trade-offs between agricultural expansion, intensification and trade. Ecological Modelling 221: 2188-2196, doi:10.1016/j.ecolmodel.2009.10.002 (available online: 13 Nov 2009) [ISI] Lotze-Campen, H., Müller, C., Bondeau, A., Rost, S., Popp, A., Lucht, W. (2008): Global food demand, productivity growth and the scarcity of land and water resources: a spatially explicit mathematical programming approach. Agricultural Economics 39(3): 325-338. doi: 10.1111/j.1574-0862.2008.00336.x [ISI]
presentations at conferences	See website
project reports	

technical papers on the model	
policy papers	
web-sites	http://www.pik-potsdam.de/research/climate-impacts-and-vulnerabilities/research/rd2-flagship-projects/musix-multi-sector-impacts-and-climate-extremes
other	
strengths and weaknesses	
major strengths	Global coverage with 50kmx50km grid; explicit link between socio-economic drivers and biophysical constraints; explicit link between agriculture and other major land uses; endogenous technological change; good coverage of climate impacts on agriculture
major weaknesses	Inflexible food demand; relatively inflexible trade flows; relatively weak forest implementation
other	
relevance for MACSUR	
expected benefit for TradeM	Advanced global assessments of climate change impacts on agriculture with high spatial detail; assessment of important adaptation options (trade, technological change, land expansion); assessment of major trade-offs between adaptation, mitigation, nature conservation and food security
expected benefit for CropM	Generation of global demand scenarios and land use patterns as an input to regional assessments or global crop models
expected benefit for LiveM	Generation of global demand scenarios and land use patterns as an input to regional assessments or livestock models; Trade-offs between bioenergy and livestock production, competition for land
expected benefit from TradeM	Exchange with more-detailed region-specific economic models; link with more advanced agricultural trade models and CGE models
expected benefit from CropM	Scenarios on changes in crop yields under climate change, especially extreme events; reduced uncertainty on CO2 fertilization; improved data on production costs
expected benefit from LiveM	Scenarios on changes in livestock production systems and feeding efficiencies under climate change; improved data on production costs
expected / planned enhancements during the next three years	Analysis of climate uncertainty and extremes; improved livestock and rangeland management; improved trade implementation
main challenges to be tackled to attain the planned enhancements	Crop model input on yield impacts under climate extremes; Data availability on livestock systems and rangeland management; Model feasibility with flexible trade implementation
other	Improved Integrated Assessment links with LPJmL and ReMIND
other relevant aspects	

Structure of model



Model #13: DREMFIA

Basic Information	
information provided by Name Partner-Number	 HeikkiLehtonen P92
submitted by	HeikkiLehtonen, heikki.lehtonen@mtt.fi
time of report	August 2012
acronym of model	DREMFIA
name of model	DynamicREgional sector Model of FInnish Agriculture
website	
objectives of the model	Agricultural and agri-environmental policy analysis
major focus:	
ex-ante evaluation	X
ex-post evaluation	X
specific problems of clients	X
methodological development	X
short description of the model	It is a dynamic recursive, national, multiregional,multi-market partial equilibrium system. It can provide significant detail on agricultural support payments and budget ceilings of each subsidy category inside Finland. DREMFIA is maximizing producer and consumer surplus at the national level, based on spatial price equilibrium. Includes 18 production regions and 2 major coupled parts: (1) a technology diffusion model which determines sector level investments in different production technologies (3 farm sizes in dairy production in each 18 regions) (2) a price endogenous optimisation routine - spatial price equilibrium - which simulates annual regional production decisions (within the limits of fixed factors) and price changes, i.e. supply and demand reactions, by maximising producer and consumer surpluses subject to regional product balance and resource (land and capital) constraints. However EU price scenarios are given and domestic prices can be deviated from EU prices only in a limited extent depending on the substitution parameters of an Armington system and transportation costs.Where estimation was not feasible or meaningful, parameters have been calibrated. The endogenous structural change countrymodels containbehaviouralparameters on savings rate and propensity to invest in alternative techniques.
principal developer(s) and affiliation	HeikkiLehtonen, MTT AgrifoodResearh Finland /Economic Research
development supported by	mainly by many many projects and some little MTT budget money since 1995…
maintainer(s) and affiliation	HeikkiLehtonen, MTT AgrifoodResearh Finland /Economic Research

other	
Technical Information	
type of model	dynamic recursive, partial equilibrium, national, multiregion,multi-market
programming language	GAMS
dimensions	regions (18), commodities (5 groups, 3-18 items in each), time (annual solutions 1005-2020, solutions for years 2030, 2040, 2050), export and import variables, feeding variables for each animal type in each regions
regions covered currently	18 regions in Finland
smallest regional unit	Some small regions of appr. 5000 hectares
aggregation of regions	bottom up by aggregation of representative subregionalmodels => 4 main regions with independent consumption variables and foreign trade variables (due to Armington based demand in each of the 4 main regtions=> whole country 4 main regions divided to smaller regions according to subsidy payments areas (support zones) => smaller and larger regions inside main regions
time horizon temporal scale: smallest - longest	annual solutions 1005-2020, solutions for years 2030, 2040, 2050
representation of trade	Armington assumption
sectors covered	agriculture and dairy product processing (18 dairy products), sugar processing (from domestic sugarbeets) in each of the 4 main regions
more details on representation of agriculture:	
general notes	one representative farm per region
farm types	3 farm types for dairy, 1 for others per region
farm structure	endogenous structural change – number of dairy cows in each 3 farm size groups in each 18 regions
variants of management / intensity	2 intensity groups for grass silage, 2 groups of bulls of different slaughter weight
description of input - data	
general notes	database of annual time series, covering, a period from1995 to the latest available year; land use, number of animals,initial feed use, production, imports, human food consumption, exports, production function parameterization for dairy milk yield and crops, initial values for processing variables of dairy product and sugar, agricultural support payments across all support zones (explicitly defined – regional disaggregation partly according to support zones)
crop production	land use statistics used in validation and calibration 1995-2011
livestock production	animal numbers beef sector is disaggregated (calves, heifers, suckler-cows, bulls, oxen)

variants of management / intensity	standard production, NO organic production
other	
description of parameters	Parameters of the Armington demand system is partly based on price elasticities of demand, and partly calibrated substitution elasticities
exogeneous projection variables and sources	EU prices (OECD-FAO) policy parameters (known policies and support payment levels kept up to date) macro variables (national sources: price inflation of inouts) consumption trends of foodstuffs
model closure rules	total supply =ge= demand land and animal number constraints
other	
use and applications	
target user group	Only researchers use this model! Results are used by all groups below
policy makers	X
farmers / advisory services	X
scientists	X
other (specify)	
policies analysed in most cases	CAP implementation, National support implementation
policies analysed most recently	CAP reform proposal 2011 (esp. article 68 on coupled CAP payments), national support payments
policies - other aspects	GHG abatement impacts (incl. restrictions on organic soils), nutrient balances in various policy scenarios, impacts of slurry separation
other analyses	
economic result indicators	
income / wealth / utility / related	farm income in regions and whole country farm income per hour of labour
production costs related	total production costs average production costs per hectare and animal average production costs per kg produced marginal costs (per hectare and animal) land rents (marginal value of land in each region), average profitability coefficient per main region (4)
other	total labour use in 4 main regions, milk quota trade in 3 administrative regions => endogenous milk quota prices
bio-physical links and indicators	
land types	arable land, grassland, set-aside (2 different kind of set-aside)
land uses	2 land use intensities in silage grass production
manure management	quantities enter regional N-balance possible to choose slurry separation, nutrient trade => improved overall use of phosphorous

water - indicators	N-balance, P-balance, area under pesticide application
air - indicators	NH3
soil - indicators	
biodiversity flora	1 composite index based on field level studies, given diversity index per crop
biodiversity fauna	"butterfly index" based on field level calculations per crop
landscape	Shannon diversity index
other environmental aspects/indicators	
other	
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	
databases (specify)	
GIS (specify)	
link to climate change	a number of yield scenarios already included based on Peltonen-Sainio, P., Jauhiainen, L., Hakala, K. &Ojanen, H. 2009. Climate change and prolongation of growing season: changes in regional potential for field crop production in Finland. Agricultural and Food Science 18: 171-190. => N and P requirements
link to food security	
other	
current state of development	
regional coverage	
sector coverage	
methodological enhancements	Implementing structural change also for pig sector first, then possibly to other sectors, if successful (too little working volume on development to endogenise all structural change – some productivity scenarios for crop production , referring to total factor productivity studies in Finland (which show slow TFP development)
new modules	
other	Dremfia is planned to be one part of a larger multi-scale integrated model "Agrisimu" – implementation is slow and outcome is dependent on chosen case examples, for which the model system is constructed first Lehtonen, H.S., Rötter, R.P., Palosuo, T.I., Salo, T.J., Helin, J.A., Pavlova, Y., Kahiluoto, H.M. (2010). A Modelling Framework for Assessing Adaptive Management Options of Finnish Agrifood Systems to Climate Change. Journal of Agricultural Science, Vol 2, No 2 (2010), p. 3-16. ISSN: 1916-9752. E-ISSN: 1916-9760. http://ccsenet.org/journal/index.php/jas/article/viewFile/4599/4888
property rights	

access to core-code of the model	MTT only
access to scenarios (data/parameters)	MTT- a large number of scenarios implemented directly in the code following “one-touch-change-over” -principle
access to input data	MTT -many excel-files
access to result data output	MTT -many excel-files
access to parameters	MTT
other	
recent publications	
journal papers	Regina, K., Lehtonen, H., Nousiainen, J. & Esala, M. 2009. Modelled impacts of mitigation measures on greenhouse gas emissions from Finnish agriculture up to 2020. Agricultural and Food Science, Vol.18, 3-4: 477-493. http://www.mtt.fi/afs/pdf/mtt-afs-v18n3-4p477.pdf Lehtonen, H., Lankoski, J. & Koikkalainen, K. 2007. Economic and environmental performance of alternative policy measures to reduce nutrient surpluses in Finnish agriculture. Agricultural and Food Science Vol. 16 (2007): 420-441. http://www.mtt.fi/afs/pdf/mtt-afs-v16n4p421.pdf Lehtonen, H., Bärlund, I., Tattari, S. & Hilden, M. 2007. Combining Dynamic Economic Analysis and Environmental Impact Modelling: Addressing Uncertainty and Complexity of Agricultural Development. Environmental Modelling and Software 22, 5: 710-718. Lehtonen, H., Peltola, J. &Sinkkonen, M. 2006. Co-effects of climate policy and agricultural policy on regional agricultural viability in Finland. Agricultural Systems 88 (2006) 472-493. Rankinen, K., Kenttämies, K., Lehtonen, H. &Nenonen, S. 2006: Nitrogen load predictions under land management scenarios for a boreal river basin in northern Finland. Boreal Environment.Research 11: 213–228. Bärlund, I., Lehtonen, H. &Tattari, S. 2005. Assessment of environmental impacts following alternative agricultural policy scenarios. Water Science and Technology, vol. 51, issue 3-4 (March-April 2005) pp. 117-125. Lehtonen, H., Aakkula, J. &Rikkonen, P. 2005. Alternative Policy Scenarios, Sector Modelling and Indicators: A Sustainability Assessment. Journal of Sustainable Agriculture, Vol. 26: Issue 4 (August 2005): p. 63-93. Lehtonen, H. 2004. Impacts of de-coupling agricultural support on dairy investments and milk production volume in Finland. ActaAgriculturaeScandinavica, Section C – Economy, Vol. 1. Nr. 1 / April 2004, p. 46-62. Miettinen, A., Lehtonen, H., Hietala-Koivu, R. 2004. On diversity effects of alternative agricultural policy reforms in Finland: an agricultural sector modelling approach. Agricultural and food science 13, 3: 229-246.
presentations at conferences	Lehtonen, H. 2010. Technology diffusion, farm size structure and regional land competition in dynamic partial equilibrium. Paper presented in 114th EAAE Seminar “Structural Change in Agriculture: Modeling Policy Impacts and Farm Strategies”. Berlin, Germany, April 15-16 2010. http://www.eaae114.hu-berlin.de/fullpapers/lehtonen2 Lehtonen, H. 2008a. Resolving the conflict between environmental damage and agricultural viability in less favoured areas. Contributed paper presented at XIIth Congress of the European Association of Agricultural Economists EAAE 2008 Congress, Ghent, Belgium. August 26-29, 2008. http://ageconsearch.umn.edu/bitstream/44150/2/212.pdf Lehtonen, H. 2008b. Impacts of phasing out milk quotas on structure and production of Finnish dairy sector. In: Bartova, L., M'barek, R. &Ratinger, T. (eds.). Proceedings of the 107th EAAE seminar, 29th January-1st

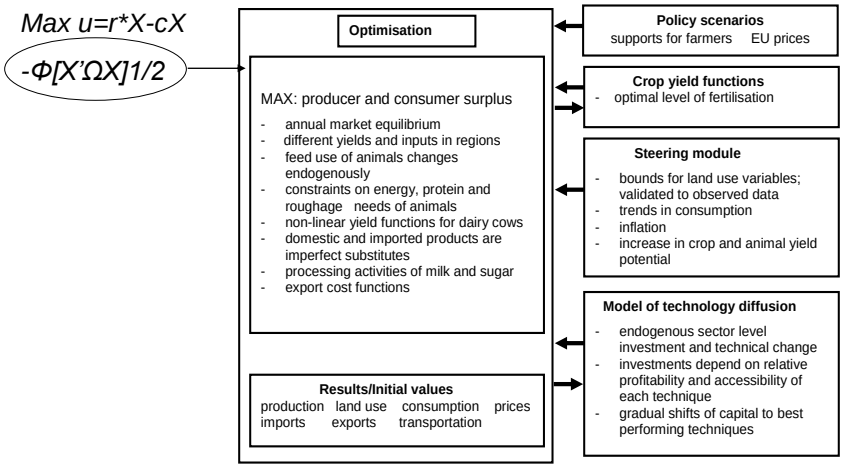
	February, 2008, Seville, Spain. 15 p. http://ageconsearch.umn.edu/handle/6465 Lehtonen, H. & Kujala, S. 2007. Climate change impacts on crop risks and agricultural production in Finland. Contributed paper presented in 101st EAAE seminar “Managing Climate Risks in Agriculture”, held in Berlin, Germany, July 5-6 2007. 21 p. http://ageconsearch.umn.edu/bitstream/9259/1/sp07le01.pdf . Lehtonen, H. 2006. Endogeneous investments and technological change in analysing impacts of agricultural policies on production and farm structure. Paper presented in 96th EAAE Seminar “"Causes and Impacts of Agricultural Structures", 10-11 January 2006, Tänikon, Switzerland. http://www.fat.admin.ch/eaae96/prog.html Lehtonen, H., Lankoski, J., Niemi, J. & Ollikainen, M. 2005. The impacts of alternative policy scenarios on multifunctionality. Contributed paper presented at the XIth EAAE Congress in Copenhagen, Denmark, 24-27 August 2005 [15 pages]. Available at http://ageconsearch.umn.edu/bitstream/24459/1/cp05le01.pdf
project reports	Lehtonen, H., Niemi, J., Koikkalainen, K., Knuuttila, M. 2011. Lannan tehokkaamman hyödyntämisen taloudelliset ja rakenteelliset vaikutukset tila- ja aluetasolla. In: Sari Luostarinen, Johanna Logrén, Juha Grönroos, Heikki Lehtonen, Teija Paavola, Katri Rankinen, Jukka Rintala, Tapio Salo, Kari Ylivainio, Markku Järvenpää (toimittajat). Lannan kestävä hyödyntäminen. MTT Raportti 21: s. 56-87. http://www.mtt.fi/mttraportti/pdf/mttraportti21.pdf (English abstract)
technical papers on the model	Lehtonen, H. 2001. Principles, structure and application of dynamic regional sector model of Finnish agriculture. Academic dissertation. Systems Analysis Laboratory, Helsinki University of Technology. Publisher: Agrifood Research Finland, Economic Research (MTTL). Publications 98. Helsinki. 265 pages. http://lib.tkk.fi/Diss/2001/isbn9512256894/
policy papers	Lehtonen, H. (ed.) 2004. The Reform of the European Union’s Common Agricultural Policy (CAP) in Finnish agriculture. MTT Economic Research 2004. 140 p. In Finnish, includes a 9-paged executive summary in English. http://www.mtt.fi/mtts/pdf/mtts62.pdf Lehtonen, H. & Niemi, J.K. 2008. Arvioita 141-ratkaisun vaikutuksista sian- ja siipikarjanlihantuotantoon Suomessa. LiiteMTT:ntiedotteeseen 25.1. 2008. 4s. www.mtt.fi – Ajankohtaista – Uutiset – Arkisto – 2008 (Appendix to a Press release on effects of decoupling national aid for pig and poultry animals; In Finnish) Lehtonen, H., Niemi, J.K., Tauriainen, J. & Niemi, J. 2008. Tuotantosidonnainen vai tuotannosta irrotettu kotieläintuki yksimahaisille 142-alueella? Luottamuksellinen julkaisematon raportti Maa- ja metsätalousministeriölle 9.5.2009. 18s. Lehtonen, H., Niemi, J.K., Tauriainen, J. & Niemi, J. 2008. (”Coupled or decoupled Nordic Aid for pig and poultry animals (art. 142)”). Confidential unpublished report presented to Ministry of Agriculture and Forestry May 8 2008. 18p. MTT 2007. AN EVALUATION ON THE IMPACT OF NORDIC AID SCHEMES IN NORTHERN FINLAND AND SWEDEN. Sector level economic analysis of Nordic Aid in Finnish agriculture - DREMFIA sector model used in “Analysis” part of “An evaluation on the impact Nordic Aid schemes in northern Finland and Sweden”. Evaluation by MTT Agrifood Research Finland and Swedish institute for food and agricultural economics (SLI), prepared for European Commission, DG Agriculture and Rural Development and DG Economic Analyses and Evaluation. http://ec.europa.eu/agriculture/eval/reports/nordic/fulltext_en.pdf Niemi, J., Koivisto, A., Latukka, A., Lehtonen, H. Liesivaara, P., Rikkonen, P., Tauriainen, J., Knuuttila, M. & Vatanen, E. 2012. Etelä-Suomenkansallisentuenvaikutustenarviointi. (Evaluation of national support of Southern Finland - English summary and conclusions p. 12-20). Komission päätöksen K(2008)696) mukaisten toimenpiteiden soveltaminen ja vaikutukset Suomessa. MTT Raportti 57. 100p.

	http://www.mtt.fi/mttraportti/pdf/mttraportti57.pdf
web-sites	
other	
strengths and weaknesses	
major strengths	- Provides dynamic and regional results National level policy choices can be explicitly included because spatial aggregation fits exactly geographical support zones Provides development paths of agricultural production and structural development on annual basis Relatively flexible in terms of model structure and extensions For example, new products and policy instruments, as well as indicators can be included in a straightforward manner Optimisation provides firm economic logic, provided that non-linearities in the model eliminate corner solutions Shadow prices of balance equations are useful in validation Technology diffusion model is validated uniquely using the data from farm structure statistics directly Well behaved (internal point solutions) feeding and animal number variables, corner solutions are rare esp in dairy and beef animal feeding The model is based on a large set of sectoral data and farm level input use specifications, i.e. ad hoc specifications are avoided Unique parameter combinations are used in calibration, some OLS Up to now validation has been consistent and convincing for various clients and audience (actual development is shown in results graphs as well) endogenous milk quota prices comparable with actual ones in the 3 main regions
major weaknesses	- Some normative optimization behavior still existing in crop production, in particular, not sufficient non-linear specifications (only yields depend on N use and some Armington non-linearities in demand) exogenous demand trends: total domestic demand is given some flexibility constraints within (1-5% deviation allowed) a given trend value of consumption of each foodstuff – the model mainly optimizes demand by solving for demand for domestic product and imported product, which are not restricted. Hence explaining the overall level of demand is not attempted, but Armingtonelasticities can be easily calibrated in re-producing the observed imports => relatively correct values for domestic food consumption, possibility for analyzing demand scenarios => what is produced, how much and where if consumer behavior changes (such as possible meat demand reduction) Time-consuming validation: Armingtonelasticities together with price elasticities of demand are validated jointly through to replicate observed price changes Compiling and updating large sets of price and acitivity data each year from various sources Product and quota prices are convenient in validation, if there are no large random fluctuations in the data, such as extraordinary weather This is time consuming since the entire ex-post development path is validated, giving emphasis on recent observations Small changes are made in the parameter values of many products almost every year when new price information becomes available No or little generally accepted validation criteria available in the literature for sectoraloptimisation models ! Updating requires continuous efforts in data work The model is rather specific in terms of input specifications; large sets of input price data A large number of farm subsidies and criteria for their payment change

other	
relevance for MACSUR	
expected benefit for TradeM	Provides another look and viewpoint in agricultural development in Nordic context – dynamic development paths and explicit links to farm level adaptation analysis, under construction in various domestic research projects. Provides a point for comparison for CAPRI results. Different aggregation, and in terms of farm, structure and production conditions, aggregation is more exact and useful in Dremfia, which however does not show trade flows between different EU countries, and hence not that well relative position of Finnish agriculture in the group of different EU countries. Hence two sets of model results of slightly different logic and paradigm may provide two storylines of adaptation => strong and weak results to be evaluated from both models.
expected benefit for CropM	Crop productivity change results + necessary input use specifications in necessary agronomic changes per crop can be fed in DREMFIA => results show how relevant productivity development is in the case of each crop – which crops may become relatively more competitive, and which produce relatively more value added due to increased productivity
expected benefit for LiveM	Possible favoured / not favoured livestock production lines due to climate change, regional changes in livestock production may bring new challenges for livestock management
expected benefit from TradeM	learn from approaches of other models learn from farm level analysis and farm to sector level linkage implementation
expected benefit from CropM	parameters for future crop-yields +input use requirements
expected benefit from LiveM	Possible heat stress impacts on dairy yields (pig growth and costs), and other impacts on other livestock, such as pigs, poultry
expected / planned enhancements during the next three years	Crop productivity change results + necessary input use specifications in necessary agronomic changes per crop can be fed in DREMFIA – in domestic projects farm level specifications can be consistently changed to DREMFIA input aggregation
main challenges to be tackled to attain the planned enhancements	Sufficient working volume on a number of farm level model types in different regions – farm level one region per production line is not enough, 2-3 regions necessary at least
other	
other relevant aspects	

Structure of model: DREMFIA

The specified risk terms are added to DREMFIA sector model based on mathematical programming



Model #14: FARM DSS

Basic Information	
information provided by	Name Partner-Number **P100**
time of report	June 30, 2012
acronym of model	**FARM DSS**
name of model	**Farm Decision Support SysteM** - Specific Model for the TradeM inventory **P100 UTP**
website	
objectives of the model	FARM DSS's main objective is to support farmers' decisions about efficient crop production technology selection taking attention owned and hired recourses quantity and quality, production structure, production scale, etc.
short description of the model	It is an Expert System based on algorithms used decision rules, functions and interpretations rules, farmer-expert's knowledge, external data bases (FADN, EUROSTAT, Agricultural CENSUS, GUS and others). AI tools (AITECH package) let apply model solutions to simulate different decision scenarios satisfying all end-users:, e.g. farmers, manufacturers of production means and all interested organizations in sustainable development of agriculture and rural areas.
principal developer(s) and affiliation	University of Technology & Life Sciences
development supported by	University of Technology & Life Sciences
maintainer(s) and affiliation	University of Technology & Life Sciences
other	
Technical Information	
type of model	Expert system based on decision rules, interpretation rules and mathematical functions of branched structure giving satisfactory solutions; modular structure of this model enables easy connection with others - inserting some data through the data aggregates decreases laboriousness of input data preparation
programming language	AITECH package original programming language based on C++ and TURBO PASCAL one (PC SHELL module)
dimensions	countries (not limited), commodities (not limited), time (n), endowments

	(land, capital, labour, sectors (2)
regions covered currently	POLAND, Kujawy & Pomorze Province
smallest regional unit	a farm of any country, province
aggregation of regions	up bottom by aggregation of some parameters of a given region to farm models (prices, climatic conditions, technical standards, etc.)
representation of trade	through prices of food raw materials
sectors covered	agriculture and first level of processing (also within a farm),
more details on representation of agriculture	each model is based on databases and knowledge bases and includes many products
description of input - data	domain knowledge bases and data bases from farm machinery technical and exploitation parameters, crop technologies, prices of products and means production, labour payments, bank interest rates, natural conditions evaluation parameters – biophysical aspects, e.g. a number of available time for crop operation performance, etc.
description of parameters	for every farm and business crops can be calculated financial and natural inputs and outputs to find out the most satisfactory solutions and know how to select farm machinery under specific circumstances of a given farm having given production structure, scale, form of farm equipment usage, etc.
exogeneous projection variables and sources	world prices (FAPRI, OECD-FAO), EUROSTAT data, policy parameters (Erjavec, ...) macro variables, e.g. on labour payment (national sources), e.g. national bank interests
model closure rules	Resources has to be balanced by inputs (e.g. agricultural land area)
other	
use and applications	
policies analysed in most cases	Farmer decisions agreed with CAP and domestic implementation in Member States
policies analysed most recently	Farmer decisions agreed with CAP reform proposal 2011, Roadmap 2050
policies - other aspects	analytical consistency across the country farm models is essential to combine them and it also facilitates the comparison of policy impacts across different farm country models.
other analyses	output response to capacity constraints
economic result indicators	**economic result indicators**
income / wealth / utility / related	Efficiency farm equipment index
production costs related	production costs related
other	other
bio-physical links and indicators	
land types	Specific ones for Kujawy & Pomorze region

land uses	Specific ones for Kujawy & Pomorze region
Water	Rainfalls distribution
Air	Temperatures distribution
Biodiversity (not within a single household specialized in few products but within many households manufactured many products but connecting mutually over work specialization)	
other environmental aspects	
other	
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	Agro climatic model for Kujawy & Pomorze Province, MODAM, FAMOS, CAPRI
Other	Through intelligent agents (autonomous software applications) being able by themselves search, link and co-operate with other model applications)
current state of development	
regional coverage	Countries from Northern Europe
sector coverage	agriculture
methodological enhancements	Quality of natural recourses measured more precisely with models worked out within CropM theme
new modules	Bio-physical impacts for input-output relations
other	
property rights	
access to core-code of the model	bilateral the project partners agreements
access to scenarios (data/parameters)	consortium agreement
access to data input	consortium agreement
access to result data output	consortium agreement
access to parameters	consortium agreement
other	consortium agreement
recent publications	
journal papers	journal papers Bojar W., 2005. Studium wyboru maszyn w gospodarstwach rolniczych w świetle rozwoju systemów wspomagania decyzji. Rozprawy nr 114. Akademia Techniczno-Rolnicza w Bydgoszczy. Bojar W., 2005. Application of Expert Systems for Farm Machinery Selection In a view of situation of Family Farms In Poland, BTN Seria B Nr 57, 49-57. Bojar W.L., Dzieża G., 2007.

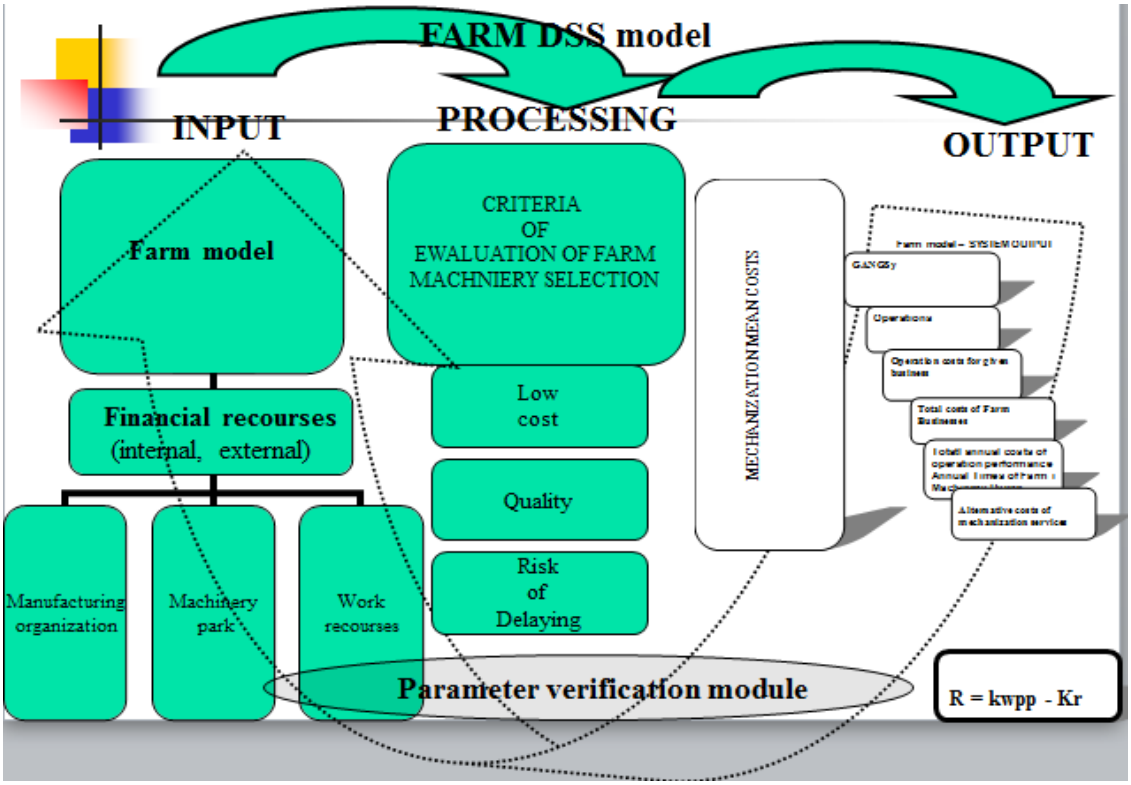
	Circumstances of Improvement of Farm Management Information Systems at Family Farms in Poland. The Proceedings of the International Scientific Seminar – AKAL on: Work Science in Agriculture, BOKU University of Natural Resources and Applied Life Sciences, Vienna, s. 33-38. Bojar W. 2008. Metody doskonalenia zarządzania przedsiębiorstwami rolnymi. (Management improvement methods in agricultural enterprises) ANNALES UNIVERSITATIS MARIAE CURIE-SK ODOWSKA LUBLIN – POLONIA VOL. LXIII (1) SECTIO E. s. 104-117.
presentations at conferences	presentations at conferences Bojar W., 1994. The use of Simulation Methods in Solving the Problem of Farm Machinery Selection (Wykorzystanie metod symulacyjnych dla rozwiązania problemu wyboru maszyn w gospodarstwach rolniczych). The International Seminar Proceedings on Rational Mechanization of Family Farms, Institute of Agricultural Mechanization, Agricultural University, Lublin, Poland, 118-128. Bojar W., Dzieża G., 1994. Zastosowanie modelu DSS do rozwiązywania problemu wyboru maszyn w warunkach gospodarstw polskich. Mat. Konf. z I polsko-holenderskiej konferencji naukowej Problemy zarządzania restrukturyzowanymi przedsiębiorstwami rolnymi w Polsce (Management problems of big farms in transition in Poland). Katedra Ekonomiki Rolnictwa i Informatyki ATR w Bydgoszczy, 21-31. Drelichowski L., Bojar W., 1994. Ocena procesów restrukturyzacyjnych rolnictwa państwowego. Zagrożenia, szanse i kierunki rozwiązań. Mat. Konf. Agrobiznes Rynek- Giełda- Finanse – Bankowość, AR w Szczecinie, 35-42. Bojar W., Dzieża G., 1995. Economical and organizational implications of machinery selection problem under mixing farming circumstances in Poland (Ekonomiczno-

	-organizacyjne uwarunkowania doboru maszyn w warunkach wielokierunkowej produkcji rolniczej w Polsce). Mat. Konf. z II polsko-holenderskiej konferencji naukowej Problemy zarządzania restrukturyzowanymi przedsiębiorstwami rolnymi (Management problems of restructured big farms). Wydawnictwa Uczelniane ATR w Bydgoszczy (I), 13-20. Bojar W., Kroeze G.H., 1995. IMAG-ORSPEL, a Useful Tool for Decision Support in Polish Agriculture (IMAG-ORSPEL – instrument przydatny w procesie wspomagania decyzji w warunkach rolnictwa polskiego). XXVI International Congress In Work Science , Lillehammer , Norway, 35-43. Bojar W., 1996. Problemy budowy i zastosowań Decision Support Systems (Systemów Wspomagnia Decyzji) i systemów ekspertowych w świetle literatury i badań własnych. Mat. Konf. KOMPUTEROWE SYSTEMY WIELODOSTĘPNE – Wielodostępne systemy informatyczne do zarządzania przedsiębiorstwem, ATR – IBS PAN Bydgoszcz – Ciechocinek, 35-44. Bojar W., 2003. Przegląd metod sztucznej inteligencji (AI) i ocena ich przydatności do tworzenia systemów wspomagania decyzji (SWD) w rolnictwie na podstawie literatury przedmiotu i prac badawczo-dydaktycznych. Mat. Konf. Komputerowe Systemy Wielodostępne KSW'2003 – Zastosowanie technik informacyjnych w gospodarce i zarządzaniu wiedzą, Katedra Informatyki w Zarządzaniu ATR w Bydgoszcz, 159-169.
project reports	
technical papers on the model	
policy papers	
web-sites	
Other, e.g. business application of model tools built up on the base of a given model	
strengths and weaknesses	
major strengths	- strong panel database behind the model; - strong knowledge base behind the model obtained through Web 2.0 ; - - transparent structure in FARM DSS model code, which leads to relatively low entry costs for new model users;

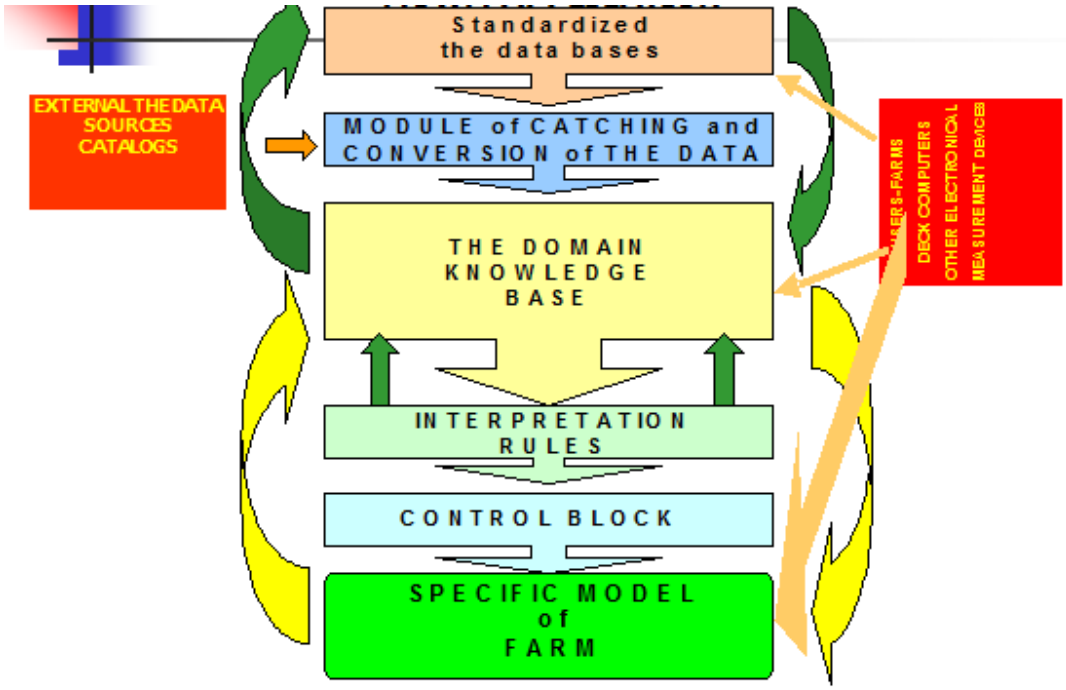
	- researcher-friendly programming tool, which helps to run scenarios and to compare scenario results; User interface let verify inserted values by advanced users (treated as experts) to verify and update knowledge covered within proposed model solutions High openness for external data High level of decision problem structuring, Average laboriousness of input data preparation Unique solutions creating
major weaknesses	- many steps necessary to find out final solutions - exogenous input prices; - no automatic and universal procedures converted the data from poorly standardized the EU domain data bases concerning agriculture, e.g. different structures of data bases in different countries and even in different research institutes of a given Member State, into the model
other	
relevance for MACSUR	
expected benefit from TradeM	integration with Agro climatic model for Kujawy & Pomorze Province, MODAM, FAMOS, CAPRI and others concise scenario for model comparison learn from approaches of other models benefit from better data,
expected benefit from CropM	parameters for future crop-yields in particular dependencies between weather parameters and levels of yields of particular crops within set up periods in the past and expected effects of those dependencies in the future
expected benefit from LiveM	inputs for commonly used recourses by crop and animal production, e.g. tractors, machinery
expected / planned enhancements during the next three years	Creation of automatic and universal procedures converted the data from differentiated heterogeneous data sources into the model to develop the model as multi user system supported, except of farms, also local, country and the EU level institutions from surroundings of farms, e.g., banks, policy makers, consumer organizations, etc.
main challenges to be tackled to attain the planned enhancements	Conceptual work on development of described model towards multi user and multi agent system
other	
other relevant aspects	
A level of respecting in model	EURGAP, GLOBAL GAP, HACCP, etc.

structure international standards important for food consumers	

SUBSTANTIAL STRUCTURE OF FARM DSS MODEL



INFROMATIVE STRUCTURE OF FARM DSS MODEL



Model #15: AGMEMOD

Basic Information	
information provided by Name Partner-Number	Myrna van Leeuwen (LEI WUR) and Martin Banse (vTI)
time of report	September 2012
acronym of model	AGMEMOD
name of model	AGricultural Member States MODelling
website	http://www.agmemod.eu/
objectives of the model	AGMEMOD's main objective is to capture the heterogeneity of European agriculture across EU Member States, while enabling simulations of the CAP and national agricultural policies in a consistent and harmonised way. Yearly projections are conducted for each commodity and country for a ten-year time horizon. These serve as baselines for impact analyses of policy changes
major focus:	
ex-ante evaluation	X
ex-post evaluation	X
specific problems of clients	
methodological development	X
short description of the model	It is a dynamic, partial, multi-country, multi-market equilibrium system. It can provide significant detail on the main agricultural sectors in each EU Member State. Most equations have been estimated econometrically at the individual Member State level. Where estimation was not feasible or meaningful, parameters have been calibrated. The country models contain the behavioral responses of economic agents to changes in prices, policy instruments and other exogenous variables on the agricultural market. Commodity prices clear all markets considered.
principal developer(s) and affiliation	AGMEMOD Partnership, a consortium of national university institutes and research agencies from EU countries and potential accession countries
development supported by	Commission, through the 5th and 6th Framework Programme, JRC-IPTS
maintainer(s) and affiliation	LEI, vTI, Teagasc, Inra, BOCU, UCL, IEABG, IAEI, FOI, EAU, MTT, LJUB, Akdeniz University, CUB, UNIVPM, LSIAE, LAEI, UNL, SAU, QUB, IWE, WAU, AFE
other	
Technical Information	

type of model	dynamic, partial, multi-country, multi-market equilibrium system
programming language	GAMS
dimensions	countries (29), commodities (6 groups, 20+ items), time (n), endowments (land)
regions covered currently	EU (except Malta), Russia, Macedonia, Serbia, Croatia, Turkey, Russia, Ukraine
smallest regional unit	Member State
aggregation of regions	bottom up by aggregation of country-models
time horizon	10 to 15 years (projections up to 2025)
temporal scale: smallest - longest	Year
representation of trade	net trade
sectors covered	agriculture and first level of processing
more details on representation of agriculture:	
general notes	one representative farm per country
farm types	-
farm structure	-
variants of management / intensity	standard production, organic production
description of input - data	
general notes	database of annual time series, covering, when possible, a period from 1973 to the latest available year; balance sheets for all primary agricultural, commodities and most food processing commodities, generally including opening and ending stocks, production, imports, human food consumption, exports, feed use, processing and industrial use for primary agricultural commodities
crop production	product structure as in economic accounts of agriculture
livestock production	in general: as in economic accounts of agriculture, beef sector is disaggregated (calves, other cattle, dairy cows, suckler cows) pig sector is disaggregated (sows, swines, piglets) sheep sector is disaggregated (ewes, lamb)
variants of management / intensity	standard production, organic production
other	
description of parameters	for each commodity in each country agricultural production as well as supply, demand, trade, stocks and domestic prices are derived from econometrically estimated equations
exogeneous projection variables and sources	world prices (FAPRI, OECD-FAO) policy parameters (OECD, EC, national sources)

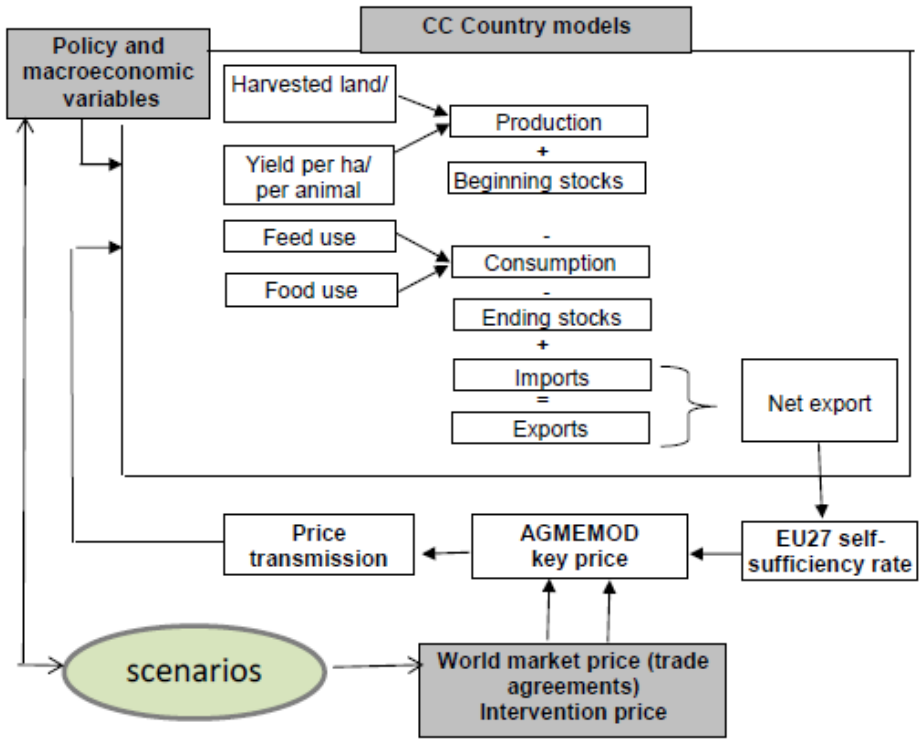
	macro variables (national sources)
model closure rules	one element of the supply and demand balance for each commodity is used as a closure variable (mostly imports or exports)
other	
use and applications	
target user group	
policy makers	X
farmers / advisory services	X
scientists	X
other (specify)	general public and stakeholders
policies analysed in most cases	CAP implementation in Member States
policies analysed most recently	CAP reform proposal 2011 Dairy policy reforms Accession studies (Turkey)
policies - other aspects	analytical consistency across the country models is essential to combine them and it also facilitates the comparison of policy impacts across different countries.
other analyses	output response to capacity constraints; financial (macro-economic) situation impacts on agricultural sector
economic result indicators	
income / wealth / utility / related	Producer/consumer surplus gross value added (post calculation)
production costs related	Feed costs, other costs (via inflator)
other	annual working units
bio-physical links and indicators	
land types	arable land, grassland
land uses	Yield trends
manure management	
water - indicators	
air - indicators	
soil - indicators	
biodiversity flora	
biodiversity fauna	
landscape	
other environmental aspects/indicators	
other	
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	Magnet (extension of GTAP model), ORANGE (Dutch single-country CGE model)
databases (specify)	Based on Eurostat and national sources
GIS (specify)	EU member states maps for results
link to climate change	
link to food security	Self-sufficiency rates for crops, animal products and dairy products in the countries covered
other	
current state of development	

regional coverage	Brazil, Kazakhstan
sector coverage	upstream sectors of agriculture forestry
methodological enhancements	Endogenous world market price formation (done for crops and meats, under development for dairy products)
new modules	Suggested improvements or extensions: -regionalisation within country (useful for e.g. Russia, Brazil, Turkey) - improve yield equation ('yield gap' issue) - link to energy use, emissions (via coefficients linked to production levels) - other non EU countries - new commodities (e.g. sugar canes in Brazil)
other	Preliminary: link with FAPRI, link with Global Rice Model
property rights	
access to core-code of the model	consortium agreement
access to scenarios (data/parameters)	consortium agreement
access to input data	consortium agreement
access to result data output	consortium agreement
access to parameters	consortium agreement
other	consortium agreement
recent publications	
journal papers	P. Salamon, M. van Leeuwen, A. Tabeau, A. Koç, G. Bölük, T. Fellmann. (2010) *Potential impacts of a Turkish EU-membership on agri-food markets.* Landbauforschung - vTI. Agriculture and Forestry Research 4 2010 (60)193-204
presentations at conferences	Thomas Fellmann, Myrna van Leeuwen, Petra Salamon, Ali Koç, Gülden Bölük. *The effects on Turkey's agricultural income and markets of a potential accession to the EU.* Eurasia Business and Economic Society Conference. June 2011 Martin Banse, Oliver van Ledebur, Myrna van Leeuwen, Andrzej Tabeau. *Agricultural Market Performance in the EU after the 2000 and 2003 CAP Reform. An Ex-post Evaluation based on AGMEMOD.* 122nd EAAE Seminar Ancona February 2011 Thomas Fellmann et al. *EU enlargement to Turkey: potential impacts on agricultural markets and how they are shaped by changes in macroeconomic conditions.* Gewisola conference. September 2011
project reports	*IPTS study: "Impact Analysis of CAP Reform on the main Agricultural Commodities" (2006)* *EU27 Baseline Outlooks* - *2008 outlook, presented in Brussels (June 2008)* - *2010 outlook, presented in Brussels (April 2010)* - *2011 outlook, presented in Brussels*

	(September 2011) *IPTS study: "Modelling and analysis of the European Dairy and milk sector" (2009)* *IPTS study: "Extension of the AGMEMOD model towards Turkey and accession scenarios" (2010)* *IPTS study: "Extension of the AGMEMOD model towards Russia and Ukraine and implementation of endogenous price formation " (2012)* *Various project reports on the national country level*
technical papers on the model	*Available at http://www.agmemod.eu/* *Via contacting myrna.vanLeeuwen@wur.nl or Martin.Banse@vti.bund.de*
policy papers	*Salputra G, Chantreuil F, Hanrahan K, Donnellan T, Van Leeuwen M, Erjavec E (2011) Policy harmonized approach for the EU agricultural sector modelling. Agricultural and Food Science. Vol. 20(2011): 119-130* *Emil Erjavec, Frédéric Chantreuil, Kevin Hanrahan, Trevor Donnellan, Guna Salputra, Maja Kožar, Myrna van Leeuwen (2011) Policy assessment of an EU wide flat area CAP payments system. Economic Modelling 28 (2011) 1550–1558*
web-sites	*http://www.agmemod.eu/*
Book	*F. Chantreuil, K. Hanharan and M. van Leeuwen (eds) (2012) The future of EU agricultural markets by AGMEMOD. Published by Springer*
strengths and weaknesses	
major strengths	*results on individual country level* *strong panel database behind the model;* *integrated software to estimate equations and put the results into the model;* *transparent structure in GAMS model code, which leads to relatively low entry costs for new model users;* *researcher-friendly programming tool, which helps to run scenarios and to compare scenario results;*
major weaknesses	*exogenous land prices* *agricultural sector income calculation not included* *- the influence of the oil price is not included in bio-energy demand and supply functions*
other	
relevance for MACSUR	
expected benefit for TradeM	
expected benefit for CropM	
expected benefit for LiveM	
expected benefit from TradeM	concise scenario for model comparison learn from approaches of other models feed-back from gross trade models with bilateral trade flows changes in factor (esp. land) prices
expected benefit from CropM	integration with biophysical land use model benefit from better data, in particular

	yield potentials for crops with improved parameters for future crop-yields
expected benefit from LiveM	integration with biophysical land use model benefit from better data, in particular yield potentials for pasture with improved parameters for future pasture yields gaseous emission coefficients
expected / planned enhancements during the next three years	
main challenges to be tackled to attain the planned enhancements	
other	
other relevant aspects	

Structure of model (AGMEMOD)



Model #16: CAPRI

Basic Information	
information provided by	
Name	Wolfgang Britz, Thomas Heckelei
Partner-Number	P115
submitted by	Thomas Heckelei, thomas.heckelei@ilr.uni-bonn.de
date of report	August 21st, 2012
acronym of model	CAPRI
name of model	Common Agricultural Policy Regional Impact
website	www.capri-model.org
objectives of the model	
major focus:	Ex-ante evaluation of policy impacting the EU agricultural sector
ex-ante evaluation	X
ex-post evaluation	X
specific problems of clients	
methodological development	
short description of the model	Global, highly detailed agricultural sector model with a focus on Europe to analyze policy and other impacts on agricultural production, markets, trade and the environment
principal developer(s) and affiliation	EU wide CAPRI network, co-ordinated by Wolfgang Britz, University Bonn
development supported by	EU Commission
maintainer(s) and affiliation	Teams at: University Bonn; JRC-IPTS Seville; JRC-IES Ispra; vTIBraunschweig; LEI The Hague; NILF Oslo; FOAG Bern
other	
Technical Information	
type of model	Comparative static, deterministic; Combination of aggregate EU regional programming-type supply models with global multi-commodity bilateral trade model
programming language	GAMS + JAVA based interface
dimensions	Space and trade flows(see below), commodities (ca. 50), time points, items (market balances, prices, costs, economic and environmental indicators …), production activities
regions covered currently	Globe
smallest regional unit	Farm types inside NUTS2 regions or 1x1 km clusters (EU27)
aggregation of regions	EU at NUTS2/Farm types/1x1 km clusters; Norway / Turkey / Western Balkans at NUTS2; Rest of globe: 77 countries/country blocks in 40 trade blocks linked by trade flows
time horizon	Comparative static; typical mid-term application for 10 years ahead, also long term (2030,2040,2050) applications
temporal scale: smallest - longest	
representation of trade	Bi-lateral trade flows based on Armington assumptions, detailed trade policy (specific and ad valorem tariff, bi- and multi-lateral TRQs, entry price systems etc.)

sectors covered	primary agriculture, dairies, oilseed crush, bio-fuels
more details on representation of agriculture:	
general notes	ca 50 products, full coverage of all types of agriculture land use; young animal chains
farm types	9 most important farm types per NUTS2 plus residual type (13 specialization times 3 economic size classes)
farm structure	
variants of management / intensity	High/low variants for agricultural activities, distinction between rainfed and irrigated in prototype
description of input - data	
general notes	Complex data processing chain building on data fusion sourced mostly official data sources (EUROSTAT, FAOSTAT, UN …) to ensure consistency and completeness over spatial scales from globe to farm type; time series date back typically to 1985/1990
crop production	
livestock production	
variants of management / intensity	
other	Engineering data, national statistical year books, WTO schedules, WTO notification, …
description of parameters	Estimated cost function parameters for arable crops; rest synthetic (supply, demand, Armingtonelasticities); flexible function forms calibrated against regularity conditions
exogeneous projection variables and sources	EU market outlook (AGLINK-COSIMO baseline), IMPACT, FAO long term outlook; one Bayesian motivated outlook tool
model closure rules	n.a.
other	
use and applications	
target user group	
policy makers	X (analysis of existing results via Graphical User Interface)
farmers / advisory services	
scientists	X (for model applications)
other (specify)	X (outlook type simulations for ag-business companies, mainly ag-input suppliers)
policies analysed in most cases	CAP reform, multi-lateral and bi-lateral trade agreements, bio-fuels, GHG abatement policy instruments, macro-economic shocks (GDP, oil prices)
policies analysed most recently	CAP 2011 reform proposal, sugar market reform
policies - other aspects	Module for GHG permit trade; detailed representation of Pillar I and II and EU border protection
other analyses	Diet shifts, climate change impacts
economic result indicators	

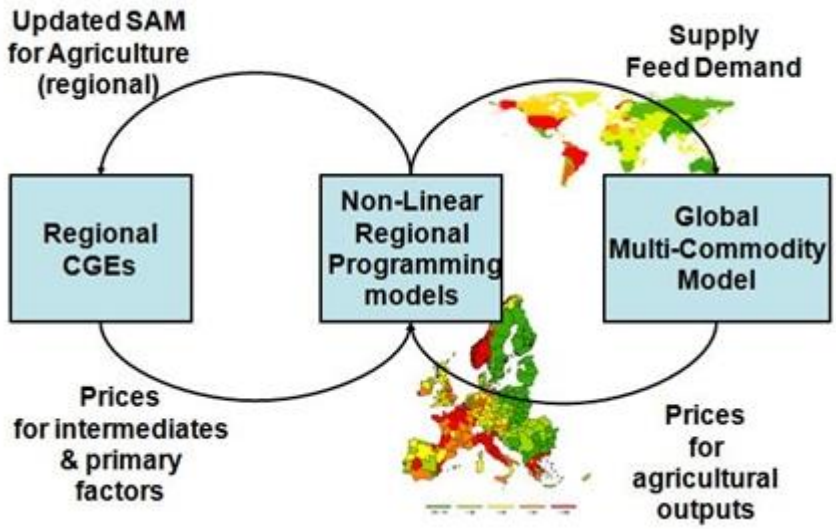
income / wealth / utility / related	Welfare analysis (money metric, ag profits, processing industry profits, tax payers costs, tariff revenues, TRQ rents)
production costs related	Detailed input cost information for each of the ca. 50 production activities at farm type level; detailed break down of input use in agriculture
other	Detailed representation of CAP budget; WTO/OECD trade policy indicators for Europe
bio-physical links and indicators	
land types	Arable, grass lands; land supply functions derived from CLUE-S
land uses	varying, i.e. endogenous intensity
manure management	Substitution between mineral fertilizer and manure endogenous
water - indicators	N leaching and runoff
air - indicators	NH3, N2O, CH4
soil - indicators	N,P,K surplus at soil level; erosion risk
biodiversity flora	Biodiversity indicators at 1x1 km clusters
biodiversity fauna	
landscape	Shannon index for 'biodiversity'
other environmental aspects/indicators	Life cycle assessment energy
other	GHG emissions according to IPCC standards (EU and globally)
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	Linked in past applications to GTAP, CLUE-S; part of SEAMLESS and SENSOR
databases (specify)	integrated in SEAMLESS database
GIS (specify)	interfaces exist and regularly used
link to climate change	GHG indicators, adaptation and mitigation policies are modeled
link to food security	capturing trade impacts of food security policy and food price developments
other	
current state of development	
regional coverage	Further break down of internal trade component (Africa, East Asia)
sector coverage	Fish (in prototype)
methodological enhancements	Endogenous farm structural change
new modules	Regional CGEs (in development in current CAPRI-RD FP project 2009-2013)
other	
property rights	
access to core-code of the model	Open source
access to scenarios (data/parameters)	Open source (if not blocked by request of client)
access to input data	Open source
access to result data output	Open source
access to parameters	Open source
other	Distribution via software version system
recent publications	
journal papers (selected from	Renwick, A., Jansson, T., Verburg, P. H.,

2012/2011)	Revoredo-Giha, C., Britz, W., Gocht, A. and McCracken, D., (2012):**Policy reform and agricultural land abandonment in the EU,** *Land Use Policy*, 30 (2013) 446 - 457, doi:10.1016/j.landusepol.2012.04.005 Britz, W., Gocht, A., Pèrez Dominguez, I., Jansson, T., Grosche, S. and Zhao, N. (2012):**EU-Wide (Regional and Farm Level) Effects of Premium Decoupling and Harmonisation Following the Health Check Reform,** *German Journal of Agricultural Economics*, vol. 61, p. 44-56 Wolf, O., Perez-Dominguez, I., Rueda-Cantuche, J.M., Tukker, A., Kleijn, R., de Koning, A., Bausch-Goldbohm, S. and Verheijden, M. (2011): **Do healthy diets in Europe matter to the environment? A quantitative analysis**, *Journal of Policy Modeling*, 33(1), pp 8-28 Kempen, M., Witzke. P., Pérez-Dominguez. I., Jansson, T. and Sckokai, P. (2011): **Economic and environmental impacts of milk quota reform in Europe**, *Journal of Policy Modeling,* 33(1), pp 29-52 Gocht, A., and Britz, W. (2011): **EU-wide farm type supply models in CAPRI - How to consistently disaggregate sector models into farm type models**.*Journal of Policy Modeling*, 33(1), pp 146-167 Jansson, T., und Heckelei, T. (2011): **Estimating a Primal Model of Regional Crop Supply in the European Union**, *Journal of Agricultural Economics*, 62 (1), pp 137-152 Leip A., Britz W., de Vries W. and Weiss F. (2011): **Farm, land, and soil nitrogen budgets for agriculture in Europe calculated with CAPRI,** *Environmental Pollution* 159(11), 3243-3253 Tukker A, de Koning A, Wolf O, Bausch-Goldbohm S, Verheijden M, Kleijn R, Pérez-Domínguez I and Rueda-Cantuche JM (2011):**Environmental Impacts of Changes to Healthier Diets in Europe**, *Ecological Economics 70* (2011) 1776-1788, Elsevier
presentations at conferences (only if not covered also in journal articles/policy papers)	Britz, W., Jansson, T., Törmä, H., Witzke, P., Zawaliñska, K. and Dwyer, J.:**Modelling CAP Pillar I and II instruments - approaches in the CAPRI-RD project**; EAAE 2011 Congress, August 30 to September 2, 2011 Zurich, Switzerland Gocht, A., Britz, W., Ciaian, P. and Gomez y Paloma S.:**EU-wide Distributional Effects of EU Direct Payments Harmonization analyzed with CAPRI**, EAAE 2011 Congress, August 30 to September 2, 2011 Zurich, Switzerland
project reports	See also: http://www.capri-model.org/dokuwiki/doku.php?id=capri:capri_pub
technical papers on the model	See http://www.capri-

	model.org/dokuwiki/doku.php?id=capri:docs
policy papers (selected from 2012/2011)	Renwick, A., Revoredo-Giha, C., McCracken, D., Jansson, T., Verburg, P. H., Britz, W. und Gocht, A.: **Assessment of the Impact of Agricultural and Trade Policy Reform on Land Use in the EU**, Research report for the **United Kingdom Government Department for Environment, Food and Rural Affairs**, 138 pages A. Burrell, E. Ferrari, A. González Mellado, M. Himics, J. Michalek, S. Shrestha and B. Van Doorslaer (authors), A. Burrell (editor) (2011):**Potential EU-Mercosur Free Trade Agreement: Impact Assessment. JRC Reference Reports**, EUR 25011 EN, Luxembourg Morredu, C.(main author and editor), with contributions by Martini, R., Kimura S., Britz, W., Gocht, A., Perez, I., Hart, K. and Baldock, D. (2011):**Evaluation of Agricultural Policy Reforms in the European Union. OECD**, Paris Henk van Zeijts, KoenOvermars, Willem van der Bilt, NynkeSchulp, Jos Notenboom, HenkWesthoek (PBL), John Helming, Ida Terluin (LEI - Wageningen UR), Sander Janssen (Alterra - Wageningen UR) (2011):**Greening the Common Agricultural Policy: impacts on farmland biodiversity on an EU scale. Netherlands Environmental Assessment Agency**. PBL publication number: 500136005. The Hague, 2011 Bert Smit, Kees de Bon:**Sugar quotas: yes or no? Economic consequences for sector, chain, international market situation and third world.** The Hague, **LEI**, 2011, Report 2011-065
web-sites	
other	
strengths and weaknesses	
major strengths	High detail and resolution; full coverage of agricultural sector (products, activities, input use) for EU and combination with global trade model; high spatial downscaling component; network of contributors; tracking record
major weaknesses	Complexity; data and parameter needs
other	
relevance for MACSUR	
expected benefit for TradeM	supporting analysis of CC related policies and ag-trade. Rare combination of physical representation and global trade
expected benefit for CropM	Pilot project linking of CAPRI with crop growth model at larger scale
expected benefit for LiveM	provision of framework data for livestock production in EU
expected benefit from TradeM	endogenising certain model variables in flexible links with other models
expected benefit from CropM	spatially heterogeneous yields under different climate scenarios

expected benefit from LiveM	-
expected / planned enhancements during the next three years	Establishment of risk behavior in CAPRI
main challenges to be tackled to attain the planned enhancements	establishment of conceptually consistent link to crop growth models that reflects appropriate transition of time scales and spatial scales as well as corresponding behavioral model
other	
other relevant aspects	

Structure of model



Model #17: SFARMOD

Basic Information	
information provided by	
Name	Eric Audsley
Partner-Number	143
submitted by	Eric Audsley, e.audsley@cranfield.ac.uk
date of report	August 2012
acronym of model	SFARMOD
name of model	Silsoe Farm Model
website	http://www.cranfield.ac.uk/sas/cerf/modelling.html
objectives of the model	To determine the optimum cropping of a farm
major focus:	
ex-ante evaluation	X
ex-post evaluation	
specific problems of clients	X
methodological development	X
	Note: The underlying model is used in many ways in different projects. Separate submissions are used for the major land use projects.
short description of the model	The model is a detailed model of the cropping, labour and machinery on a farm as a function of soil type and climate. Thus for example the time required for ploughing is a function of the soil type, nitrate leaching (and rotational N carry-over) from surplus N available to a crop is a function of soil type and (net) rainfall (as is the workable hours available and crop yields). Multiple objectives are calculated but most often profit is the single objective used. A version of the model is used within the IMPEL, REGIS, ACCELERATES and CLIMSAVE integrated model systems for climate change analysis. These systems include a crop model which provides crop yield, sowing and harvest date. The model predicts the optimum cropping as arable and as grassland and hence based on the profit the expected land use under future climate, technical and socio-economics scenarios.
principal developer(s) and affiliation	Eric Audsley Cranfield University
development supported by	BBSRC, Defra, EU Framework programmes
maintainer(s) and affiliation	Eric Audsley Cranfield University
other	Daniel Sandars, Kerry Pearn, Cranfield University
Technical Information	
type of model	Linear programme
programming language	Visual Basic (uses XPRESSMP or COINMP as solvers)
dimensions	Cells of common soil and climate. EU projects use the European Soils Database, UK projects use the NSRI soil database. REGIS uses 5km grids with the dominant soil in 1km grids, CLIMSAVE

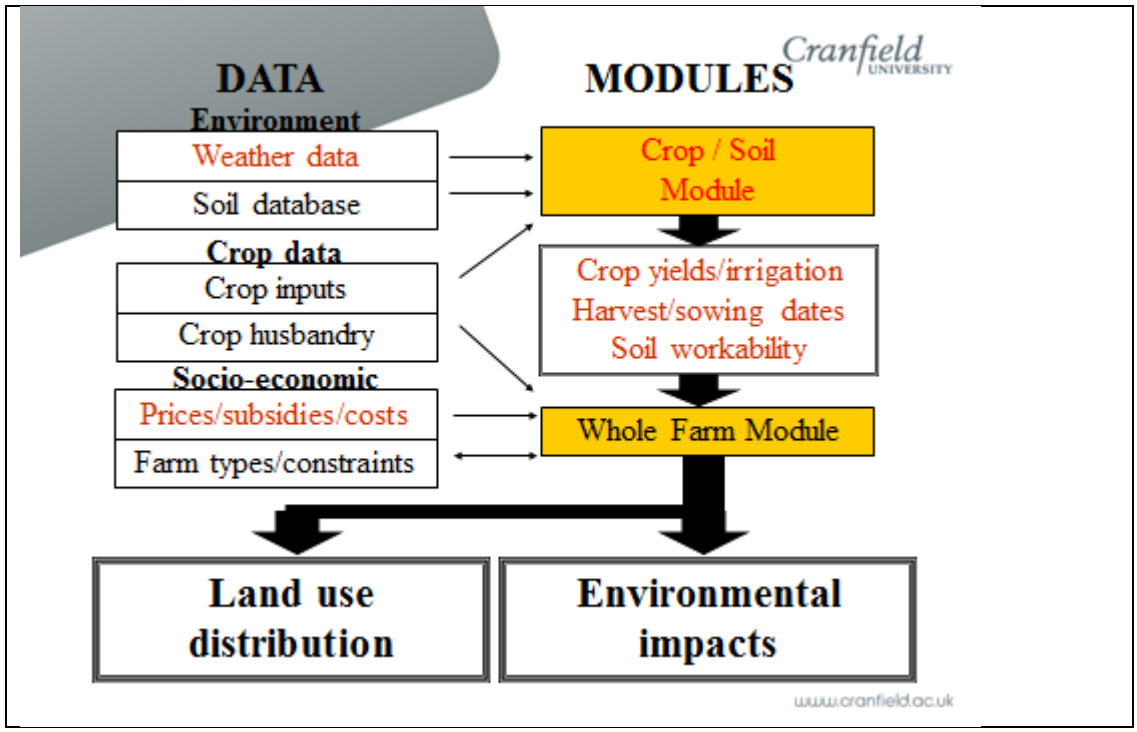
	uses 10' grids with % of soil type in a grid, ACCELERATES uses soil association polygons.
regions covered currently	UK: east Anglia and North West EU: All EU (the original ACCELERATES project was when the EU was 15 countries but was extended to the CEEC. CLIMSAVE is the current (2012) EU except for Malta.
smallest regional unit	The resolution of data extracted from the soil database (eg 0.01% of a 10' grid)
aggregation of regions	Commonly reported at NUTS2 level but maps plotted as 10' grids or 5km grids.
time horizon temporal scale: smallest - longest	Any. The model determines the steady state cropping for any given scenario. Climate data sets have been 2020, 2050, 2080.
representation of trade	Project dependent but usually defined by the scenario as an import level (and hence a level of UK or EU production required).
sectors covered	Agricultural land use – arable, grassland, other
more details on representation of agriculture:	
general notes	Ten representative farms for each soil/climate within varied price/yields. Major crops not horticulture.
farm types	Land use (ie not pigs or chicken).
farm structure	
variants of management / intensity	For land use projects all farms are profit maximizing. Multiple objective versions have considered nitrogen emissions, herbicides, risk, etc.
description of input - data	
general notes	The Model is a database of relationships between model parameters and soil, climate, machinery size.
crop production	Crops are defined by the operations required, yields, prices and rotational penalties. Operations are defined by their timing and losses and machinery system required. Machinery systems are defined by their input of labour and sizes of machinery which determines their workrate. Labour and machinery are defined by their annual and variable (fuel and repairs) costs. Rotations define losses of crop yield (if possible), nitrogen losses and carry-over and effect on herbicide use.
livestock production	Grassland (and forage maize) use is defined as dairy cows, which require energy and protein within a dry matter intake limit which results in a requirement for concentrates.
variants of management / intensity	Conventional farming is normally assumed but input level can be varied.
other	The central database in for England and the model can be used directly in that context . The Model uses climate and crop yield data to override these data to analyse other regions.
description of parameters	Scenarios define changes to input data such as climate, increasing yields and workrates over time, increased demand for production or type of production, etc.
exogeneous projection variables	

and sources	
model closure rules	
other	The land use versions iterate on price to meet a regional production target.
use and applications	
target user group	
policy makers	X
farmers / advisory services	
scientists	
other (specify)	
policies analysed in most cases	Land use as a function of future scenarios
policies analysed most recently	
policies - other aspects	Alternative objectives (reducing nitrates, herbicides, increasing biodiversity)
other analyses	
economic result indicators	
income / wealth / utility / related	Crop production
production costs related	
other	
bio-physical links and indicators	
land types	All
land uses	Agriculture and abandoned
manure management	-
water - indicators	Nitrate leaching, pesticide use
air - indicators	N emissions
soil - indicators	-
biodiversity flora	-
biodiversity fauna	-
landscape	-
other environmental aspects/indicators	-
other	-
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	CLIMSAVE: Integrates a number of models in an EU analysis of future scenarios. SFARMOD uses the RO-IMPEL model to feed crop data for 12 crops (The yield with limited N, with no irrigation and with no limit to irrigation water, plus sowing and harvest date). An urban and a flooding model take land. A Water model supplies the water available for irrigation. A forestry model supplies the potential yield of forests (managed or unmanaged). The output is used by a biodiversity model. Runs of SFARMOD are replaced by metamodels which enable an interactive display of land use with scenarios on a 10' grid scale over the EU. ACCELERATES: as CLIMSAVE without the interactive display and

	using soil polygons from the European Soil Database. REGIS: as ACCELERATES but based on 5km squares in the UK for the regions of East Anglia and North West. REGIS2: interactive version of REGIS
databases (specify)	-
GIS (specify)	-
link to climate change	CC scenarios are input to the model
link to food security	Production required is defined from the scenario and the model iterates towards it. (it may be impossible)
other	-
current state of development	
regional coverage	EU
sector coverage	Agricultural land use
methodological enhancements	Use of metamodels to enable iterative use of the model
new modules	Forestry option for land use
other	
property rights	
access to core-code of the model	None
access to scenarios (data/parameters)	The CLIMSAVE scenarios are or will be publically available. Any scenario can be defined by the user.
access to input data	Climate and soils data are publically available. The SFARMOD program and database can be downloaded from the website.
access to result data output	CLIMSAVE is interactive and web based. SFARMOD itself has an output screen.
access to parameters	Most are visible in the database
other	
recent publications	
journal papers	Audsley Eric, Pearn Kerry R, Harrison P A & Berry P M. (2008) The impact of future socio-economic and climate changes on agricultural land use and the wider environment in East Anglia and North West England using a metamodel system, *Climatic Change*, 90 57-88. (Link to DOI) Audsley Eric, Pearn Kerry R, Simota C, Cojocaru G, Koutsidou E, Rounsevell M D A, Trnka M &Alexandrov V. (2006) What can scenario modelling tell us about future European scale agricultural land use, and what not?, *Environmental Science & Policy*, 9 (2) 148-162. (Link to DOI) Holman Ian P, Nicholls R J, Berry P M, Harrison P A, Audsley Eric, Shackley S & Rounsevell M D A. (2005) A Regional, Multi-sectoral And Integrated Assessment Of The Impacts Of Climate And Socio-economic Change In The Uk: Part II. Results, *Climatic Change*. (Link to DOI) Holman Ian P, Rounsevell M D A, Shackley S, Harrison P A, Nicholls R J, Berry P M & Audsley Eric. (2005) A Regional, Multi-Sectoral And Integrated Assessment Of The Impacts Of

	Climate And Socio-Economic Change In The Uk: Part I. Methodology, *Climatic Change*. (Link to DOI)
presentations at conferences	
project reports	
technical papers on the model	
policy papers	
web-sites	www.climsave.eu http://www.eci.ox.ac.uk/research/biodiversity/accelerates.php
other	
strengths and weaknesses	
major strengths	A bottom up approach to the potential uses for land. Does not require land to have been historically used for a crop to predict it.
major weaknesses	Crop model cannot be relied upon to give good answers for all crops in all regions of the EU (a severe test), for example in north Scotland wheat yield exceeds grass yield.
other	
relevance for MACSUR	
expected benefit for TradeM	Is a model of EU agricultural production and land use under future scenarios
expected benefit for CropM	Being input to SFARMOD land use modelling is a VERY severe test of a crop model as it covers a huge range of soils and climates and requires a large number of crops to be simulated. I worked with the IMPEL crop models and the RO-IOMPEL crop models. There are many detailed crop models for, for example, wheat but how good are they outside a narrow range of soils and climates.
expected benefit for LiveM	Similar issue as with crops for grassland. Have also developed a number of grass models for other non-land use projects for dairy, beef and sheep.
expected benefit from TradeM	-
expected benefit from CropM	Improved and more generic crop model for use in land use predictions
expected benefit from LiveM	Improved grass model
expected / planned enhancements during the next three years	CLIMSAVE finishes in next year.
main challenges to be tackled to attain the planned enhancements	Suitable data to stretch the models. For example yields of a wide range of crops in situations they would not normally be grown in.
other	
other relevant aspects	

Structure of model


DATA
MODULES
Cranfield UNIVERSITY
Environment
Weather data
Soil database
Crop data
Crop inputs
Crop husbandry
Socio-economic
Prices/subsidies/costs
Farm types/constraints
Crop / Soil Module
Crop yields/irrigation
Harvest/sowing dates
Soil workability
Whole Farm Module
Land use distribution
Environmental impacts
www.cranfield.ac.uk

Model #18: MODAM

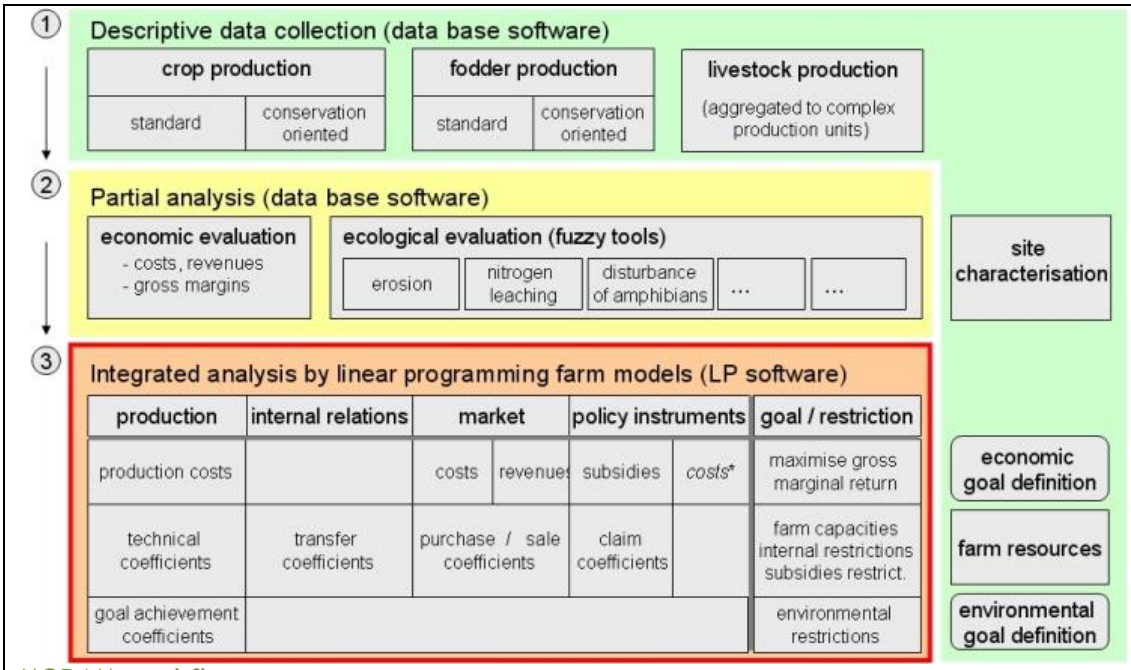
Basic Information	
information provided byName Partner-Number	Peter Zander, ZALF P147
submitted by	Katharina Helming, helming@zalf.de
time of report	June 2012
acronym of model	MODAM
name of model	Multi-Objective Decision support tool for Agro-ecosystem Management.
website	www.modam.eu
objectives of the model	Simulation of farmers´ decision making under the assumption of pure economic rationality. Elaboration of trade-off functions.Used to evaluate policy effects on the decision behaviour of farmers and on the corresponding environmental effects of the farmer chosen farm management practices. The tool allows to calculate scenarios for different goal attainment levels (so called goal driven scenarios) as well as the computation of scenarios of different policy instruments (policy driven scenarios).
major focus:	
ex-ante evaluation	X
ex-post evaluation	
specific problems of clients	
methodological development	
short description of the model	The model is a static, mixed integer, linear programming whole farm model. MODAM consists of a set of hierarchically linked modules, which can be divided up into three levels: 1. Descriptive data collection 2.Partial Economic and Ecological Impact analyses 3. Integrated farm level analyses Ecological impact analysis can be delivered by different tools: MODAM-EIA is at tool that delivers for a number of indicators of arable cropping index values; HERMES is a soil water and nitrogen model that delivers emission values and seepage water.
principal developer(s) and affiliation	Peter Zander & Harald Kächele (ZALF) Further development by KamelLouichi (core GAMS model from FSSIM replaced former MS-Access tool, INRA), Sandra Uthes, Martin Hecker, Nicole Schläfke, Vera Porwollik, Renate Wille (ZALF)
development supported by	ZALF, BMBF, DBU, EC-FP6 (MEA-Scope, SEAMLESS), BfN
maintainer(s) and affiliation	ZALF
other	
Technical Information	
type of model	Linear programming farm model, linked to a database of production activities and ecological evaluation tools
programming language	MS-Access, GAMS
dimensions	Farm level models, implemented partly as regional farms, as

	representative farm types, or individual case studies
regions covered currently	Nuts 3 regions in Brandenburg, Niedersachsen, Scotland, Sweden, Italy, Romania, …
smallest regional unit	Farm
aggregation of regions	None
time horizon temporal scale: smallest - longest	Mainly comparative static approach based on average production practices
representation of trade	no
sectors covered	Primary agricultural production
more details on representation of agriculture:	
general notes	
farm types	model farms are generated on the basis of a typology or as regional farms, sometimes as individual cases studies.
farm structure	
variants of management / intensity	mostly large number of alternative technologies
description of input - data	
general notes	Farm structural data
crop production livestock production variants of management / intensity	Average production activities at different intensity level and site conditions.
other	
description of parameters	economic data at farm level, different cooperation's with ecological evaluation tools can deliver a number of ecological indicators
exogeneous projection variables and sources	Exogenous variables are prices, subsidies and other regulations but also yields and related management data
model closure rules	n.a.
other	
use and applications	
target user group	
policy makers	X
farmers / advisory services	X
scientists	X
other (specify)	
policies analysed in most cases	Land use policies, new technologies
policies analysed most recently	Land use scenarios, including • climate change adaptation in 4 regions of northern Germany • bioenergy production and ecosystem services • potential instruments in the context of water framework regulations
policies - other aspects	
other analyses	

economic result indicators	
income / wealth / utility / related	agricultural production on-farm income on-farm employment
production costs related	costs of all machinery, implements etc.
other	land use structure
bio-physical links and indicators	
land types	agro-environmental zones
land uses	arable crops and grassland
manure management	fertilization management
water - indicators	water used for irrigation
air - indicators	Depending on the linked ecological evaluation tools different indicators are available. -
soil - indicators	
biodiversity flora	
biodiversity fauna	
landscape	
other environmental aspects/indicators	
other	
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	cooperation with HERMES (ZALF, Kersebaum)
databases (specify)	Postgresql / Access
GIS (specify)	
link to climate change	alternative production activities
link to food security	
other	
current state of development	
regional coverage	cases in numerous European regions mostly at NUTS3 level
sector coverage	
methodological enhancements	
new modules	
other	
property rights	
access to core-code of the model	open access
access to scenarios (data/parameters)	depends on projects
access to input data	
access to result data output	
access to parameters	
other	
recent publications	
journal papers	Uthes, S. ; Piorr, A. ; Zander, P. ; Bienkowski, J. ; Ungaro, F. ; Dalgaard, T. ; Stolze, M. ; Moschitz, H. ; Schader, C. ; Happe, K. ; Sahrbacher, A. ; Damgaard, M. ; Toussaint, V. ; Sattler, C. ; Reinhardt, F.-J. ; Kjeldsen,

	C. ; Casini, L. ; Müller, K. (2011): Regional impacts of abolishing direct payments: an integrated analysis in four European regions . - Agricultural Systems.104 (2): 110-121 Uthes, S. ; Ndah, H. T. ; Triomphe, B. ; Schuler, J. ; Zander, P. (2011): Report on inventory of bio-physical and bio-economic models and conceptual models of innovation systems for assessment of agricultural (innovative) practices : submission date: 2011/02/28 [ElektronischeRessource Janssen, S. ; Louhichi, K. ; Kanellopoulos, A. ; Zander, P. ; Flichman, G. ; Hengsdijk, H. ; Meuter, E. ; Andersen, E. ; Belhouchette, H. ; Blanco, M. ; Borkowski, N. ; Heckelei, T. ; Hecker, J.-M. ; Li, H. ; Oude Lansink, A. ; Stokstad, G. ; Thorne, P. ; Keulen, H. van ; Ittersum, M. K. van (2010): A generic bio-economic farm model for environmental and economic assessment of agricultural systems. - Environmental Management.46 (6): 862-877 Nautiyal, S. ;Rao, K. S. ; Kächele, H. ; Zander, P. (2010): Conceptual model development for landscape management in the mountains of the Indian Himalayan region: an approach for sustainable socio-ecological development. - Landscape Online [ElektronischeRessource] (18): 1-19 Sattler, C. ; Nagel, U. J. ; Werner, A. ; Zander, P. (2010): Integrated assessment of agricultural production practices to enhance sustainable development in agricultural landscapes. - Ecological Indicators.10 (1): 49-61 Zander, P., Kächele, H., 1999. Modelling multiple objectives of land use for sustainable development. Agricultural Systems 59, 311-325
presentations at conferences	
project reports	MEA-Scope: see http://project1.zalf.de/meascope/reports.php
technical papers on the model	
policy papers	
web-sites	www.modam.eu
other	
strengths and weaknesses	
major strengths	• reusable farm model, • database of production activities • established links to ecological evaluation tools • economic analysis is flexible with respect to detail of production data
major weaknesses	• high level of detail required to feed ecological evaluation tools
other	
relevance for MACSUR	
expected benefit for TradeM	allows detailed analysis at farm level
expected benefit for CropM	fits well to the approach of crop growth and soil water models
expected benefit for LiveM	allows the analysis of alternative technologies at farm level
expected benefit from	establish links to trade models to obtain e.g. prices

TradeM	(exogenous in MODAM)
expected benefit from CropM	establish links to further ecolocial evaluation tools
expected benefit from LiveM	availability of higher diversity of livestock production systems
expected / planned enhancements during the next three years	establish interfaces to crop models develop submodel for risk analysis
main challenges to be tackled to attain the planned enhancements	
other	
other relevant aspects	



MODAM workflow

Model #19: FoPIA

Basic Information	
information provided by Name Partner-Number	Katharina Helming, ZALF P147
submitted by	Katharina Helming, helming@zalf.de
time of report	June 2012
acronym of model	FoPIA
name of model	Framework for Participatory Impact Assessment
website	
objectives of the model	The FoPIA provides a structured sequence of methods that allows conducting stakeholder-inclusive and ex-ante impact assessment of alternative policy and land use scenarios.
major focus:	
ex-ante evaluation	X
ex-post evaluation	
specific problems of clients	X
methodological development	
short description of the model	The FoPIA is a qualitative impact assessment tool for scenario analysis. FoPIA is a formalized procedure covering the full cycle of ex-ante sustainability assessment: problem definition, scenario development, stakeholder selection, identification of sustainability issues, indicators selection, scenario impact assessment, delineation of policy recommendations. Focus is on a balanced analysis of the social, economic, environment impacts of (policy induced) land use changes following the concept of land use functions. The advantage of the sustainability impact assessment with the FoPIA approach is its structured and transparent nature that can be used to facilitate a regional discourse towards sustainable development. It has a high potential to raise awareness about possible sustainability trade-offs, which in turn could be taken up by responsible decision makers to implement sustainable oriented land use strategies.
principal developer(s) and affiliation	UK forest research (Jake Morris) originally, ZALF (Hannes König) further development and adaption to the context of developing countries
development supported by	European Commission, through the 6th Framework Programme (SENSOR, LUPIS)
maintainer(s) and affiliation	ZALF Hannes König (hkoenig@zalf.de)
other	
Technical Information	
type of model	qualitative
programming language	n.a.
dimensions	All questions related to land use changes; thee sustainability dimensions (economic, social, environmental). Spatial scale variable but mainly at regional, i.e. administrative level

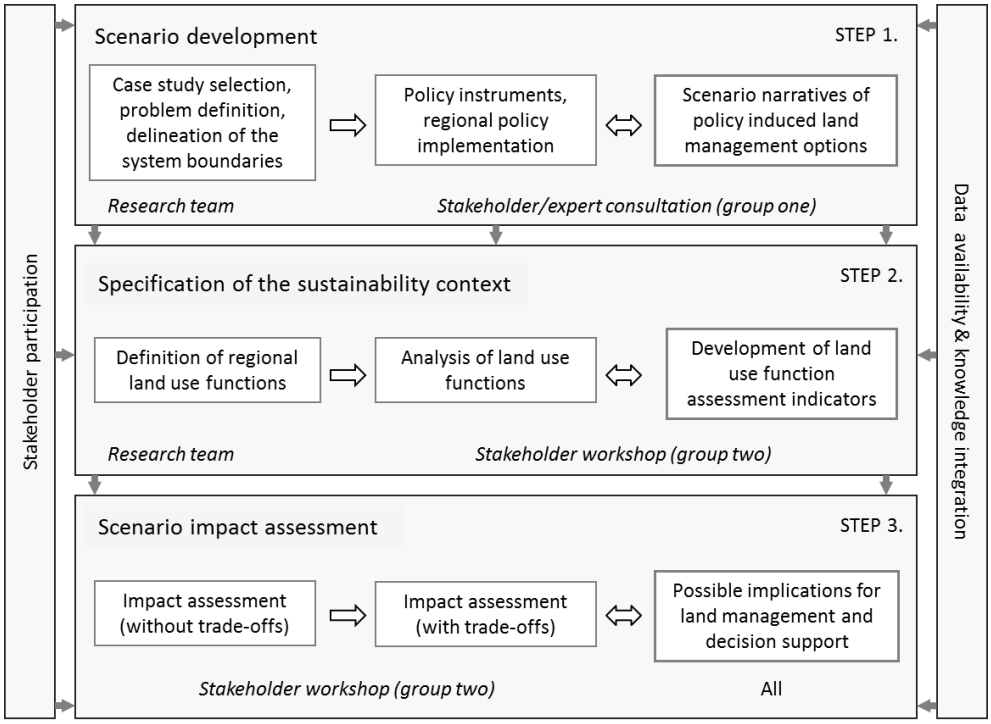
regions covered currently	Application examples for EU (Malta, Poland), China, India, Indonesia, Kenya, Tunisia,
smallest regional unit	Regional level: district/province (tested) Watershed level: tested Household level: not tested yet: but would generally applicable
aggregation of regions	No aggregation approach implemented
time horizon temporal scale: smallest - longest	flexible
representation of trade	Can indirect taken into consideration into the scenario development Qualitative if any
sectors covered	Any land use sectors (e.g., agriculture, forestry, tourism, urban, energy, transport, nature conservation) or specific sub-units within one sector
more details on representation of agriculture:	
general notes	flexible
farm types	n.a.
farm structure	n.a.
variants of management / intensity	flexible
description of input - data	
general notes	Qualitative: stakeholder/expert knowledge Quantitative: any, if available
crop production	n.a.
livestock production	n.a.
variants of management / intensity	n.a.
other	
description of parameters	Indicators assigned to land use functions of the provision of economic functions (e.g., land based products, space for industry, services and infrastructure), the provision of social functions (e.g., food security, the provision of work, the provision of health, cultural identity and heritage), and the provision of environmental functions (e.g., the provision of abiotic and biotic resources, and ecosystem functions).
exogeneous projection variables and sources	flexible
model closure rules	n.a.
other	
use and applications	
target user group	
policy makers	X
farmers / advisory services	X

scientists	(X)
other (specify)	general public and stakeholders; higher education
policies analysed in most cases	Land use policy/management scenarios
policies analysed most recently	Land use scenarios, including • agriculture: traditional farming systems, organic agriculture, market-oriented agriculture, livestock • forestry: natural forests, plantations • bioenergy production • ecotourism • expansion of urban areas • soil and water conservation measures
policies - other aspects	
other analyses	
economic result indicators	
income / wealth / utility / related	economic production from land on-farm income built-up activities off-farm income regional investments access to financial services road density and quality access to markets regional employment working conditions human health life expectancy regional income food availability / food from farm traditional land use
production costs related	-
other	water availability soil structure and erodibility habitat and biodiversity vegetation cover conservation area undisturbed land soil health water quality
bio-physical links and indicators	
land types	Flexible
land uses	Flexible
manure management	Flexible
water - indicators	Flexible
air - indicators	Flexible
soil - indicators	Flexible
biodiversity flora	Flexible

biodiversity fauna	Flexible
landscape	Flexible
other environmental aspects/indicators	Flexible
other	Flexible
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	n.a.
databases (specify)	Loose/complementary
GIS (specify)	Intended/possible
link to climate change	Possibly as scenarios
link to food security	Yes (land use function assessment criteria)
other	Sustainable development
current state of development	
regional coverage	Applied to regional cases across Europe, Asia, Africa
sector coverage	n.a.
methodological enhancements	To be integrated with quantitative modeling; currently we also develop a method for virtual integration of international expertise to back up stakeholder perceptions and views
new modules	
other	
property rights	
access to core-code of the model	n.a.
access to scenarios (data/parameters)	
access to input data	
access to result data output	
access to parameters	
other	
recent publications	
journal papers	König, H. J., Sghaier, M., Schuler, J., Abdeladhim, M., Helming, K., Tonneau, J. P., Ounalli, N., Imbernon, J., Morris, J., Wiggering, H., 2012. Participatory Impact Assessment of Soil and Water Conservation Scenarios in Oum Zessar Watershed, Tunisia. Environmental Management 50: 153-165. König, H. J., Zhen, L., Helming, K., Uthes, S., Yang, L., Cao, X., Wiggering, H., (in press). Assessing the Impact of the Sloping Land Conversion Programme on Rural Sustainability in Guyuan, Western China. Land Degradation and Development König, H. J., Schuler, J., Suarma, U., McNeill, D., Imbernon, J., Damayanti, F., Dalimunthe, S. A., Uthes, S., Sartohadi, J., Helming, K., Morris, J., 2010. Assessing the Impact of Land Use Policy on Urban-Rural Sustainability Using the FoPIA Approach in Yogyakarta, Indonesia. Sustainability 2:

	1991-2009. Morris, J. B., V. Tassone, R. de Groot, M. Camilleri,and S. Moncada. 2011. A Framework forParticipatory Impact Assessment (FoPIA): involvingstakeholders in European policy making, a casestudy of land use change in Malta. Ecology andSociety 16(1): 12
presentations at conferences	e.g., Planet Under Pressure 2012, London http://www.planetunderpressure2012.net/pup_session.asp?19186
project reports	König, H.J. et al. 2008. D 4.3.1 SIAT Expert knowledge systems to translate scenarios of general development trends and relevant policies into spatially explicit scenarios of land use change. LUPIS, EU 6th Framework Programme (www.lupis.eu).
technical papers on the model	
policy papers	
web-sites	LUPIS data portal: http://lupis.cirad.fr
other	
strengths and weaknesses	
major strengths	- participatory; - fully flexible and adaptable to user question; - covers social, economic, environmental issues in a balanced way; - quick to apply - tested and peer reviewed - transparant
major weaknesses	- no numbers. FoPIAshould not be seen as a tool that can replace a comprehensive quantitative modelling, and should, whenever possible, be accompanied by analytical tools.
other	
relevance for MACSUR	
expected benefit for TradeM	Support problem framing (could be applied prior to simulation model application to better frame modeling design and parameter selection) Integrate 3 sustainability dimensions improve user orientation
expected benefit for CropM	See above
expected benefit for LiveM	See above
expected benefit from TradeM	tbd
expected benefit from CropM	
expected benefit from LiveM	
expected / planned enhancements during the next three years	See above
main challenges to be	

tackled to attain the planned enhancements	
other	
other relevant aspects	



WorksflowofFoPIA

Model #20: SIAT

Basic Information	
information provided by Name Partner-Number	ZALF e.V. Dirk Pohle, Stefan Sieber P147
submitted by	Stefan Sieber, Stefan.Sieber@zalf.de
time of report	August 2012
acronym of model	SIAT
name of model	Sustainability Impact Assessment Tools SIAT (SENSOR)
website	http://siat.cgi-systems.nl/SiatGUI/
objectives of the model	Support of*ex ante* assessment of new policies on six land use sectors: agriculture, forestry, nature conservation, transport infrastructure, energy and tourism. By integrating cross-sector knowledge at a European level, the project will provide decision makers with scientifically sound information on regional impacts of land uses changes and policy effects on sustainable development.
major focus:	
ex-ante evaluation	X
ex-post evaluation	
specific problems of clients	
methodological development	X
short description of the model	SIAT is a meta model that allows the user to conduct an integrated analysis of global change and policy scenarios across the sectors agriculture, forestry, energy, transport, infrastructure, nature conservation and tourism. Simulations for ex-ante impact assessment can be carried out for the target year 2025 covering 569 European regions of the EU27. Each simulation computes about 40 indicators and nine Land Use Functions that illustrate the policy impact on social, economic and environmental goods and services at a national as well as regional level.
principal developer(s) and affiliation	SENSOR consortium includes 33 partner institutions from 15 European countries and 6 partner institutions from China and South America
development supported by	Commission, through the 6th Framework Programme
maintainer(s) and affiliation	ALTERRA, WURL, ZALF
other	-
Technical Information	
type of model	Meta-model

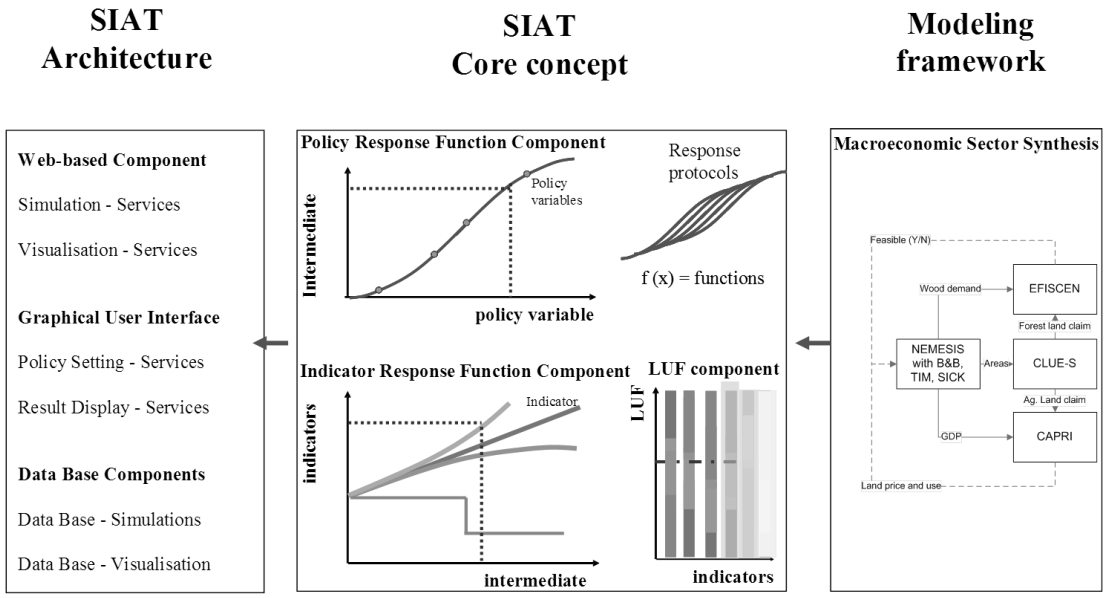
programming language	Adobe Flex, Java
dimensions	EU27, Norway, Switzerland and Iceland on NUTS X level (about 570 administrative regions, which are harmonized in size) , Impacts of six sectors are implicitly illustrated by about 40 indicators depending on indicator definition Results can be illustrated at NUTS X, national and EU-level
regions covered currently	Europe (EU 27, Norway,Switzerland, Iceland): NUTS X, NUTS 0, EU
smallest regional unit	NUTSX
aggregation of regions	NUTS2/3, NUTS1, NUTS0, Europe
time horizon temporal scale: smallest - longest	target year 2025
representation of trade	Implicitly via CAPRI model
sectors covered	agriculture, tourism, transport, biodiversity, energy, forestry
more details on representation of agriculture:	
general notes	
farm types	
farm structure	Definition via CAPRI
variants of management / intensity	Definition via CAPRI
description of input - data	policy changes for the pre-calculated case on Common Agricultural Policy (CAP)
general notes	
crop production	Definition via CAPRI
livestock production	Definition via CAPRI
variants of management / intensity	Definition via CAPRI
other	
description of parameters	• EU market interventions / market support (intervention sales, export subsidies, subsidies to consumption) • Changes in subsidies of direct support (pillar 1) to agricultural producers
exogeneous projection variables and sources	
model closure rules	
other	
use and applications	
target user group	
policy makers	X
farmers / advisory services	
scientists	X
other (specify)	desk officers, stakeholders
policies analysed in most cases	CAP implementation in Member States
policies analysed most recently	Common Agricultural Policy (CAP)
policies - other aspects	• Biodiversity (computed, but so far not

	available) • Biofuel (computed, but so far not available)
other analyses	
economic result indicators	
income / wealth / utility / related	income indicators for each region, unemployment and employment indicator separated by age and gender classes
production costs related	
other	sectorial gross added value and deviation indicators, discharge urban waste tourism, recreational tourism pressure, Social tourism pressure
bio-physical links and indicators	
land types	
land uses	built-up land, permanent crops, irrigated arable land, arable land (non-irrigated), forest, pasture, natural vegetation, abandoned pasture land, abandoned arable land
manure management	Nitrogen, Phosphorus, balances and pesticide use
water - indicators	
air - indicators	Ammonia, Methane, N_2O and NH_3 emission from agriculture
soil - indicators	erosion water, soil sealing, soil organic carbon content, water retention capacity
biodiversity flora	deadwood
biodiversity fauna	farmland birds
landscape	continuity of appreciated landscape heritage, visual attractivity
other environmental aspects/indicators	forest fire risk, carbon sequestration, greenhouse gas inventories for agriculture according to international standards (IPCC)
other	
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	NEMESIS: New Econometric Model for Environmental and Sustainable development and Implementation Strategies CAPRI: Common Agricultural Policy Regionalised Impact Modelling System CLUE: Conversion of land use and its effects EFISCEN: European Forest Information Scenario Model
databases (specify)	Databases integrated in single models as

	well as additional data used at indicators level
GIS (specify)	
link to climate change	
link to food security	specific indicators
other	
current state of development	
regional coverage	Europe (EU 27, Norway,Switzerland, Iceland): NutsX, Nuts0, EU
sector coverage	Agriculture , Biodiversity, Landscape, Energy, Land Use, Forest, Socio-Economy
methodological enhancements	
new modules	
other	
property rights	
access to core-code of the model	The source code of the available web-applicationis restricted.
access to scenarios (data/parameters)	See deliverable (www.sensor-ip.eu)
access to input data	
access to result data output	See publications (www.sensor-ip.eu)
access to parameters	
other	
recent publications	
journal papers	See deliverables and publications (www.sensor-ip.eu)
presentations at conferences	
project reports	
technical papers on the model	
policy papers	
web-sites	
other	
strengths and weaknesses	
major strengths	Broad scope of analysis (80 sustainability indicators) Operational effort to run the model chain is relatively high
major weaknesses	
other	
relevance for MACSUR	
expected benefit for TradeM	
expected benefit for CropM	
expected benefit for LiveM	
expected benefit from TradeM	
expected benefit from CropM	
expected benefit from LiveM	
expected / planned enhancements during the next three years	Further validation of existing scenario assessments
main challenges to be tackled to attain the planned enhancements	Enhancements only through possible thought further involvement of model experts thought additional partners
other	

other relevant aspects	

Structure of model		
Meta-Model Application [Tool for integrated Impact Assessment]	Meta-Model Components [Post-processing of modelling results]	Model linkages [external processing of modelling results]



Model #21: IGEM

Basic Information	
information provided by Name Partner-Number	 Dr. RuslanaPalatnik 186
submitted by	Ruslana Rachel Palatnik, rusalik@gmail.com
time of report	August 2012
acronym of model	IGEM
name of model	Israeli General Equilibrium Model
website	http://nrerc.haifa.ac.il/
objectives of the model	Assessing the impact of external factors on the entire Israeli economy with special focus on the Agriculture, Water and Energy sectors
major focus:	
ex-ante evaluation	X
ex-post evaluation	X
specific problems of clients	X
methodological development	X
short description of the model	IGEMis a Computable General Equilibrium Model (GGE) thatprovides a complete

programming language	General Algebraic Modeling System (GAMS)/ Mathematical Programming System for General Equilibrium analysis (MPSGE)
Dimensions	22 Sectors, government, an investment agent, a foreign agent and a single representative household
regions covered currently	Israel
smallest regional unit	Israel
aggregation of regions	N/A

	description of the Israeli economy, accounting for the interaction between different markets, sectors and agents. It isbased on the underlying economic theory of general equilibrium. This equilibrium is attained assuming microeconomic behavior of producers and consumers. The model reflects all the sectors in the economy,collectively forming a closed cycle of monetary flows in the economy. The production processes in the various sectors are defined by nested Constant Elasticity of Substitution (CES) functions.
principal developer(s) and affiliation	Dr. RuslanaPalatnik, NRERC, Haifa University
development supported by	– Israel's Ministry of Energy and Water Resources – The Israeli Governmental Authority for Water and Sewage
maintainer(s) and affiliation	Zvi Baum, AyeletDavidovich and Helena Faitelson, NRERC, Haifa University
other	
Technical Information	
type of model	Static, Computable General Equilibrium (CGE) Model

time horizon temporal scale: smallest - longest	Counter-factual analysis
representation of trade	– An Armington assumption is applied in combining domestic production and imports using a Constant Elasticity of Substitution (CES) function. – A Constant Elasticity of Transformation (CET) function determines the scope for choice between domestic demand and export.
sectors covered	– Agriculture (to be expanded to multiple sectors) – Energy (4 and planned to be expanded) – Manufacturing – Electricity – Water(4) – Construction – Wholesale and retail trade repairs – Accommodation services and restaurants – Transport storage and communications – Banking insurance and other financial institutions – Real estate renting and business activities – Public administration – Education – Health services and welfare and social work – Community social personal and other services – Imputed bank services and general expenses
more details on representation of agriculture:	
general notes	1 sector (to be expanded to multiple sectors within nearby future – according to availability of new Input-Output tables for 2006)
farm types	-
farm structure	-
variants of management / intensity	The agriculture production process is defined by a nested Constant Elasticity of Substitution (CES) function

description of input - data	
general notes	Balanced Social Accounting Matrix (SAM) based on data provided by the Israeli Central Bureau of Statistics
crop production	
livestock production	
variants of management / intensity	
other	
description of parameters	– Elasticity parameters are either empirically based or taken from the literature (see below re deriving water elasticities from VALUE). – Numerical values for economic parameters are obtained by calibration and include all the technical coefficients of the production functions, tax rates and utility function.
exogeneous projection variables and sources	World prices and local trade barriers, climate variables (climatic models), demographic variables (Central Bureau of Statistics).
model closure rules	the price of aggregate private consumption, the consumer price index, is chosen as the numéraire, the price relative to which all price changes are evaluated
other	
use and applications	
target user group	
policy makers	X
farmers / advisory services	
scientists	X
other (specify)	General public and stakeholders
policies analyzed in most cases	Water policies, Energy and Environmental policies
policies analyzed most recently	Energy
policies - other aspects	Impact of climate change on insurance sector and the Israeli economy
other analyses	Assessing of climate change mitigation policies
economic result indicators	
income / wealth / utility / related	GDP, income, unemployment
production costs related	Labor, capital, water as primary inputs and intermediate inputs to production
other	
bio-physical links and indicators	
land types	N/A
land uses	N/A
manure management	N/A
water - indicators	– Production costs for different water types (to be implemented); quantities of different water types used. – Salinity and wastewater treatment indicators related to irrigation constraints (to be implemented)
air - indicators	Sectoral GHG emissions
soil - indicators	N/A

biodiversity flora	N/A
biodiversity fauna	N/A
landscape	N/A
other environmental aspects/indicators	N/A
other	
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	Vegetative Agricultural Land Use Economic (VALUE). Current link is based on deriving IGEM water substitution elasticities from VALUE waterdemand elasticities. Other links are being considered.
databases (specify)	
GIS (specify)	
link to climate change	GHG emissions coefficients linked to sectoralfuels' consumption
link to food security	
other	
current state of development	
regional coverage	Israel
sector coverage	22 sectors
methodological enhancements	Dynamic model
new modules	
other	
property rights	
access to core-code of the model	
access to scenarios (data/parameters)	V
access to input data	V
access to result data output	V
access to parameters	V
other	
recent publications	
journal papers	1. **Palatnik** R.and M. Shechter, (2008), "Assessing the Impact of Greenhouse Gas Emission Controls within the Framework of a General Equilibrium Model of the Israeli Economy", The Economic Quarterly 55(4) pp. 545-573. [Hebrew]. 2. **Palatnik** R. and M. Shechter, (2010), "The Israeli Economy and Potential Post-Kyoto Targets", Israel Economic Review Vol. 8, No. 1 (2010), 21–43. See also F2 3. **Palatnik**, Ruslana Rachel and Mordechai Shechter (2010) Assessing the Economic Impacts of Climate Change Using a CGE Model with Decentralized Market Instruments. Journal of Siberian Federal University. Humanities & Social Sciences 6 (2010 3) 912-923. 4. **Palatnik** Ruslana R., Helena Faitelson and Mordechai Shechter (2012). "Israeli policy towards reaching Cancun pledge: A comparison of actions in plan and economically efficient measures" Finance and Business 2012:1.

presentations at conferences	1. **Palatnik**, Ruslana Rachel and MordechaiShechter (2009) "Israeli Economy and Potential Post-Kyoto Targets" Presented at the Annual Conference of European Association of Environmental and Resource Economists (EAERE), Amsterdam, Holland. June 25-27, 2009. 34 pages. Published, see D5 2. **Palatnik**, Ruslana Rachel and MordechaiShechter (2008) "Can Climate Change Mitigation Policy Benefit the Israeli Economy? A Computable General Equilibrium Analysis" Environmental EconomcisAbstarcts-WPS -Vo. 13, No.31; Presented at the 11th Annual Conference on Global Economic Analysis, Helsinki, Finland. 33 pages. 3. **Palatnik** R., and Shechter M. (2008) "Analyzing the Impacts of Potential Post-Kyoto Targets on the Israeli Economy." Paper presented at Annual Conference of European Association of Environmental and Resource Economists (EAERE), June 25-27, 2009. Amsterdam, Netherlands
project reports	1. **Palatnik** R. R, Shechter, M. Ayalon O., Goldrath, T., Davidoviz A., Kapeluto G., Shternberg M., Kutiel, H., (2011). Adaptation to Climate Change: Review and Knowledge gaps. Israel Climate Change Information Center, Ministry of Environmental Protection, Israel. 2. Ayalon O., Goldrath, T., Nachmany, M., Lev On Group, **Palatnik** R. R., Faitelson H., Kivun Ltd., 2011. "National Priorities for the Environment in Israel - Position Paper VII- greenhouse gases mitigation plan in Israel, 2011". S. Neaman Publ. 85 pp (Hebrew).
technical papers on the model	
policy papers	
web-sites	http://nrerc.haifa.ac.il/
other	
strengths and weaknesses	
major strengths	– Based on a sound microeconomic foundation. – Complete description of the Israeli economy, accounting for the interaction between different markets, sectors and agents. – Framework for assessing the impact of climate changes on the economy and specifically on trade. – Overall view of the country water system. – Provides a framework to represent water, energy and agriculture policy and its influence on other markets and the economy as a whole.
major weaknesses	– Need to expand the agriculture sector into multiple sectors. – Linkage to VALUE needs to be enhanced. – Need to obtain more recent data for the Social Accounting Matrix (SAM).
other	

relevance for MACSUR	
expected benefit for TradeM	Analysis of country and international level trade impacts on the agricultural, water,energy sectors and the economy as a whole. Case study of small open economy with water shortages to become more extreme due to climate change
expected benefit for CropM	Can provide scenarios for changes in food demands
expected benefit for LiveM	
expected benefit from TradeM	– Integration with VALUE and other models. – Building scenarios for model comparison. – Learning from approaches employed by other models. – Comparing results from case studies of other small open countries
expected benefit from CropM	Scenarios of technological change and the bundle of inputs to agriculture
expected benefit from LiveM	
expected / planned enhancements during the next three years	– Integration and synchronization with the bottom-up VALUE model. – Expansion of the agriculture sector into multiple sectors. – Enhancement of the energy and water production functions. – Incorporating more recent market data
main challenges to be tackled to attain the planned enhancements	– Obtaining more recent market data from the Israeli central bureau of statistics which is not yet available. – Finding effective mechanisms for convergence of the two models (IGEM + VALUE).
other	
other relevant aspects	

Model #22: VALUE

Basic Information	
information provided by Name Partner-Number	 Iddo Kan 186
submitted by	Ruslana Rachel Palatnik, rusalik@gmail.com
time of report	August 2012
acronym of model	VALUE
name of model	Vegetative Agricultural Land Use Economic
website	
objectives of the model	Evaluating the impacts on the farming sector stemming from changes in external factors and policies related to international trade, water management, waste management, etc.
major focus:	
ex-ante evaluation	X
ex-post evaluation	X
specific problems of clients	
methodological development	X
short description of the model	VALUE is a positive mathematical programming (PMP) model of agricultural land use. It incorporates crop-specific production functions that account for water applications under saline conditions, detailed production costs and demand functions for agricultural products. The model is calibrated and run to explore changes under partial equilibrium conditions.
principal developer(s) and affiliation	Iddo Kan, Hebrew University of Jerusalem, Mickey Rapaport-Rom, NRERC, Haifa University
development supported by	BMBF, EU Commission (FP6), Israel Ministry of Agriculture, Israel Ministry of Environmental Protection, Israel Governmental Authority for Water and Sewage, DFG.
maintainer(s) and affiliation	Mickey Rapaport-Rom, NRERC, Haifa University
other	
Technical Information	
type of model	Static, partial, multiregional, multi-agricultural markets equilibrium
programming language	Excel-Visual Basic (under transformation to GAMS)
dimensions	Crops (45), water types (4), regions (21)
regions covered currently	Israel, Italy
smallest regional unit	Administrative zones
aggregation of regions	bottom up by aggregation of regional

	models
time horizon	year
temporal scale: smallest - longest	
representation of trade	Local demand functions + world price functions of agricultural products in a small country with trade barrier.
sectors covered	Vegetative agriculture
more details on representation of agriculture:	
general notes	one representative farm per region
farm types	-
farm structure	-
variants of management / intensity	standard production
description of input - data	
general notes	Database of annual crop acreage, prices of agricultural outputs and inputs, production budgets, water types (fresh, recycled, brackish), climate and soil data
crop production	Detailed crop production budgets
livestock production	
variants of management / intensity	standard production
other	
description of parameters	Calibrated parameters of water production functions and PMP cost functions for each crop in each region; econometrically estimated local demand functions for agricultural products.
exogeneous projection variables and sources	World prices and local trade barriers (Israel Ministry of Agriculture), climate variables (climatic models), demographic variables (Central Bureau of Statistics), soil data (literature)
model closure rules	Maximization of consumer and producer surpluses
other	
use and applications	
target user group	
policy makers	X
farmers / advisory services	X
scientists	X
other (specify)	general public and stakeholders
policies analyzed in most cases	Water allotments and prices, waste management, land use
policies analyzed most recently	Regional water allocation systems
policies - other aspects	
other analyses	
economic result indicators	
income / wealth / utility / related	producer and consumer surplus
production costs related	Labor, capital and production inputs
other	

bio-physical links and indicators	
land types	arable land, agricultural open spaces
land uses	Crops and irrigation technologies
manure management	Production level by compost application (VALUE separate version)
water - indicators	Salinity and wastewater treatment indicators related to irrigation constraints
air - indicators	Potential evapotranspiration (for calibration of production functions)
soil - indicators	Heavy / light (for calibration of production functions)
biodiversity flora	
biodiversity fauna	-
landscape	External landscape benefits (VALUE separate version)
other environmental aspects/indicators	Annual rainfall
other	
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	IGEM – a CGE model (link is under construction); MYWAS (water management model, under construction)
databases (specify)	
GIS (specify)	
link to climate change	
link to food security	
other	
current state of development	
regional coverage	
sector coverage	
methodological enhancements	
new modules	
other	
property rights	
access to core-code of the model	Free
access to scenarios (data/parameters)	
access to input data	
access to result data output	
access to parameters	
other	
recent publications	
journal papers	Agricultural Economics, Ecological Economics, Water Resources Research
presentations at conferences	EAERE annual conference, IWREC meeting, local conferences and workshops
project reports	Various reports for the above-mentioned funding sources
technical papers on the model	
policy papers	
web-sites	

other	
strengths and weaknesses	
major strengths	- Reproduces observed agricultural land and water use, - Production functions incorporate water salinity and climate factors; - Enables easily incorporation of inputs, at least in the cost function.
major weaknesses	- Currently built in Excel; - Needs calibration of water production functions
other	
relevance for MACSUR	
expected benefit for TradeM	Analyses of country level trade barrier impacts on the agricultural sector, Impact on local prices of vegetative agricultural products
expected benefit for CropM	Response of crops production levels under external shocks (e.g., climate conditions)
expected benefit for LiveM	
expected benefit from TradeM	integration with IGEM and other models, concise scenario for model comparison, learn from approaches of other models and benefit from better data.
expected benefit from CropM	parameters for production functions
expected benefit from LiveM	
expected / planned enhancements during the next three years	Integration with CGE model (IGEM), incorporation of additional factors in the agricultural production and cost functions
main challenges to be tackled to attain the planned enhancements	Data collection and calibration
other	
other relevant aspects	

Model #23: MAGNET

Basic Information	
information provided by Name Partner-Number	Irina Bezlepkina and Geert Woltjer LEI Partner P192
submitted by	Floor Brouwer, Floor.Brouwer@wur.nl
time of report	August 2012
acronym of model	MAGNET
name of model	**M**odular **A**pplied **G**e**N**eral**E**quilibrium **T**ool
website	No
objectives of the model	MAGNET model analyses the effect of changes in trade and agricultural policies on international trade, production, consumption, prices and use of production factors.
major focus:	
ex-ante evaluation	X
ex-post evaluation	X
specific problems of clients	
methodological development	X
short description of the model	MAGNET model analyses the effect of changes in trade and agricultural policies on international trade, production, consumption, prices and use of production factors. The model is mainly used to simulate long-term scenarios and to analyse policy options within these scenarios.
principal developer(s) and affiliation	The MAGNET model is based on the general equilibrium model GTAP (Hertel and Tsigas, 1997), which was developed at Purdue University in the US. Main MAGNET developers at LEI, Wageningen UR, The Netherlands: - Geert Woltjer - Marijke Kuiper Other MAGNET modellers at LEI: - Lindsay Chant - Andrzej Tabeau - Hans van Meijl - Aikaterini Kavallari - Heleen Bartelings - Martine Rutten Software developers at LEI - Barbara van der Hout - John Doornbos
development supported by	Various International, European, and national projects
maintainer(s) and affiliation	Geert Woltjer (geert.woltjer@wur.nl)
other	Marijke Kuiper (marijke.kuiper@wur.nl), Hans van Meijl (hans.vanmeijl@wur.nl)
Technical Information	
type of model	multi-regional, recursive dynamic, applied general equilibrium model

programming language	GEMPACK
dimensions	GTAP database distinguishes 57 sectors and 5 endowment sectors (skilled/unskilled labour, capital, natural resources, land). In order to have a model that can be calculated within a day, sectors and countries have to be aggregated, for example to 36 regions and 25 sectors. A programme has been developed to create these aggregations easily from the original database. https://www.gtap.agecon.purdue.edu/databases/contribute/concordinfo.asp https://www.gtap.agecon.purdue.edu/databases/v8/v8_sectors.asp
regions covered currently	See link: https://www.gtap.agecon.purdue.edu/databases/regions.asp?Version=8.211
smallest regional unit	Country, although there is a downscaling method towards EU NUTS2 regions available.
aggregation of regions	bottom up by aggregation of country-level data in the main database
time horizon temporal scale: smallest - longest	2020, 2030, 2050 Year
representation of trade	Armington assumption A representative producer for each sector of a country or region maximises profits by choosing outputs and inputs of labour, capital, natural resources, land and intermediate goods. Each sector produces one type of output. The producer has a nested CES production function with constant returns to scale, where in the standard GTAP model only endowments have elasticities of substitution that are different from zero. Perfect competition is assumed in all sectors within a country. On an international scale goods from the same sector are not homogenous, which is represented by Armingtonelasticities for import of goods. Primary production factors land, labour and capital cannot move between sectors. Supply of labour, capital, and natural services is exogenous and these production factors are always fully employed.
sectors covered	57 sectors , see https://www.gtap.agecon.purdue.edu/databases/v8/v8_sectors.asp
more details on representation of agriculture:	
general notes	one representative farm per agricultural sector per country
farm types	-
farm structure	-
variants of management / intensity	Not explicit, only changes in inputs through production inputs
description of input - data general notes	the GTAP Data Base is a cross-section of consistent data on consumption, production, and trade
	New macro-economic data for 2004 and 2007 New trade data for 2004 and 2007 New protection data for 2007 New Time-Series Bilateral Trade data from 1995-2009 Improved bilateral services trade data for 2004 and 2007 Improved energy data for 2004 and 2007 Revised OECD domestic support for 2004 and 2007

	New export subsidies data for 2007 Revised treatment of taxes in the agricultural and energy sectors Additional information on contributed I-O tables Decomposition of tariff (into ad valorem and specific) and OECD domestic support payments data (into different types of payments based on the extent of decoupling and base) CO2 emissions dataset integrated into core data base Next to the GTAP database MAGNET uses also directly data from FAO, WorldBank, UN, IEA, ILO, etc.
crop production	Primary production (Paddy rice, Wheat, Cereal grains not wheat, Oil seeds (incl. olive oil), Sugar cane and beet, Horticulture (Vegetables, fruit, nuts (incl. Wine), plant based fibres, Other crops) and processing (rice),
livestock production	Primary production (Cattle (Cattle, sheep, goats, horses), Other animals, Raw milk) and processing (Dairy products processed, Sugar processed Vegetable oils and fats, Food nec mainly compound feed, Other agr-food products, Beverages and tobacco)
variants of management / intensity	Not explicit, only changes in inputs through production inputs
other	
description of parameters	- Consumption function parameters; - Armington trade elasticities; - Elasticities and relevant product sets for the input nests; - CET elasticities for land supply, and parameters for the dynamic or static labour/capital flows between agriculture and non-agriculture; - For the land supply module: Parameters for the land supply function and the function that determines the marginal productivity of land; - For the biofuels directive: initial share of petroleum use in the transport sector; and energy content of different energy inputs in the petroleum and/or electricity sector; - For international capital flows: shares of wealth reallocated per year, and the adjustment coefficients in dynamic capital flow equation; - The EU agricultural policy model requires some specific parameters about allocation of second pillar funds and the productivity effect of investments in human and physical capital.
exogeneous projection variables and sources	- Population growth; - Productivity growth (or GDP growth, where technology is distributed over sectors and inputs according to fixed proportions); - Growth of production factor supply - Land productivity growth based on FAO - Other factors can also be used as exogenous variables to calibrate the model
model closure rules	Standard GTAP closure Closure by dynamic investment module
other	
use and applications	
target user group	
policy makers	X
farmers / advisory services	
scientists	X
other (specify)	general public and stakeholders
policies analysed in most cases	CAP (first and second pillar), Trade policies, biofuel policies,

policies analysed most recently	National policies of Vietnam, Malaysia, India, Nile Delta, European biofuels directive, worldwide biofuel policies, influence of meat demand on land use and biodiversity
policies - other aspects	Production quota, Biofuel directive, WTO, FTA,
other analyses	
economic result indicators	
income / wealth / utility / related	gross value added per sector, country, equivalent variation, etc.
production costs related	Land use, input-output structure, income per sector, country
other	Employment, labour supply
	calculates macro-economic impacts (GDP, employment, value added, land use, trade, prices,…), proxied environmental impacts (emissions, partly based on bottom up analyses), allocation of resources (land, labour, capital).
bio-physical links and indicators	
land types	Yes Land_use_V7.HAR: Land cover and land use data for 226 countries, 175 crops and 7 types of land cover. DGTM_DATA.HAR: DGTM timberland area, forest carbon stock and land rent data. GTPLU18V7.HAR: GTAP land rents, by 18 AEZ. FAO land use data.
land uses	Yes
manure management	No, but planned to include fertilizers in the near future
water - indicators	No
air - indicators	No, but planned to include Greenhouse gasses in the near future
soil - indicators	No
biodiversity flora	No
biodiversity fauna	No
landscape	Forest area
other environmental aspects/indicators	No
other	
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	Verburg et al. (2009) present the results of linking MAGNET (former LEITAP) and the Integrated Model to Assess the Global Environment (IMAGE) is assessing impacts of trade liberalisation policies through economic and environmental indicators. MAGNET-CAPRI models have been conceptually linked in SEAMLESS project (Jansson et al., 2009) and further used to e.g. investigate the effectiveness of post-2013 CAP measures as proposed in the Dutch Outlook (focusing on competitiveness, valuable areas and ecosystem services) as well as the effectiveness of base premiums (Helming et al., 2010). AGMEMOD has been used in combination with DRAM and MAGNET in prospecting the Dutch agrofood sector in 2025 (Berkhout, 2011). For the various scenarios considered in that study, MAGNET provided a set of world price projections, which served as input for AGMEMOD.
databases (specify)	FAO (through concordances) world energy statistics (IEA heading: WBES)

	USDA-ERS website, projections of GDP and population for constructing macro scenarios World Development Indicators (WDI) and projections UN, World Population Prospects
GIS (specify)	No
link to climate change	Linked to IMAGE model (see Verburg, R.W.; Stehfest, E.; Woltjer, G.B.; Eickhout, B. (2009) The effect of agricultural trade liberalisation on land-use related greenhouse gas emissions*Global environmental change : human and policy dimensions 19 (4). - p. 434 - 446.*
link to food security	Yes
other	
current state of development	
regional coverage	Splitting Nile Basin region Country aggregates into countries, a general procedure is being developed to split countries for aggregate GTAP regions.
sector coverage	See above under Sectors (primary and processing). A general procedure is being developed to split sectors from the GTAP database
methodological enhancements	Introducing multiple households, international capital dynamics
new modules	Forestry, fishery, etc.
other	
property rights	
access to core-code of the model	A license agreement has to be made with LEI
access to scenarios (data/parameters)	
access to input data	
access to result data output	
access to parameters	
other	
recent publications	
journal papers	Banse, M.; Meijl, H. van; Tabeau, A.A.; Woltjer, G.B.; Hellmann, F.; Verburg, P.H. (2010). Impact of EU biofuel policies on world agricultural production and land use *Biomass and Bioenergy 35 (6). - p. 2385 - 2390.* Banse, M., H. van Meijl, A. Tabeau and G. Woltjer, 'Will EU biofuel policies affect global agricultural markets?' In: *European Review of Agricultural Economics* 35 (2008) 2: pp. 117-141. Van Meijl, H., van Rheenen, T., Tabeau, A. and B. Eickhout (2006). The impact of different policy environments on land use in Europe, Agriculture, Ecosystems and Environment, Vol. 114, pp. 21-38.
presentations at conferences	Tabeau, A., Eickhout, B. and van Meijl, H., 2006. Endogenous agricultural land supply: estimation and implementation in the GTAP model. Conference Paper,9th Annual Conference on Global Economic Analysis, Addis Ababa, Ethiopia. https://www.gtap.agecon.purdue.edu/resources/download/2731.pdf

	Tabeau, A. and Woltjer, G. (2010). Modelling the agricultural employment development within the CGE framework: the consequences for policy responses. Paper prepared for the Thirteenth Annual Conference on Global Economic Analysis, Bangkok, Thailand, June 9-11, 2010. https://www.gtap.agecon.purdue.edu/resources/download/4729.pdf Banse. M. A. Tabeau, H. van Meijl, G. Woltjer and A Prins (2011) *Global impact of multinational biofuel mandates on land use, feedstock prices, international trade and greenhouse gas emissions*. Paper prepared for the 14th Annual Conference on Global Economic Analysis, "Governing Global Challenges: Climate Change, Trade, Finance and Development", Venice, June 16-18, 2011. Available from www.gtap.org.
project reports	Berkhout, P., *In perspectief; Over de toekomst van de Nederlandse agrosector*. LEI, part of Wageningen UR, Den Haag, 2011. Helming, J., S. Janssen, H. van Meijl and A. Tabeau, *European farming and post-2013 CAP measures: a quantitative impact assessment study*. LEI, part of Wageningen UR, The Haque, 2010. Jansson, T., M. Kuiper and M. Adenäuer, Linking CAPRI and GTAP. SEAMLESS Report no. 39, SEAMLESS integrated project, EU 6th Framework Programme, contract no. 010036-2. 100 p., 2009. <www.seamless-ip.org/Reports/Report_39_D3.8.3.pdf>
technical papers on the model	Project ENGAGE (IPTS): Further development of the MAGNET model" Specific contract No 152039.X2 Woltjer, G.B. (2011), Meat consumption, production and land use: model implementation and scenarios, WOT-werkdocument 269, Wageningen. A complete MAGNET documentation is under construction
policy papers	Nowicki, P., V. Goba, A. Knierim, H. van Meijl, M. Banse, B. Delbaere, J. Helming, P. Hunke, K. Jansson, T. Jansson, L. Jones-Walters, V. Mikos, C. Sattler, N. Schlaefke, I. Terluin and D. Verhoog (2009). Scenar 2020-II – Update of Analysis of Prospects in the Scenar 2020 Study, Contract No. 30-CE-0200286/00-21. European Commission, Directorate-General Agriculture and Rural Development, Brussels. http://ec.europa.eu/agriculture/analysis/external/scenar2020ii/report_en.pdf Nowicki, P., C. Weeger, H. van Meijl, M. Banse, J. Helming, I. Terluin, D. Verhoog, K. Overmars, H. Westhoek, A. Knierim, M. Reutter, B. Matzdorf, O. Magraffand R. Mnatsakanian (2006). Scenar 2020 – Scenario study on agriculture and rural development, Contract No 30-CE-0040087/00-08. European Commission, Directorate-General Agriculture and Rural Development, Brussels. http://ec.europa.eu/agriculture/agrista/2006/scenar2020/final_report/scenar2020final.pdf
web-sites	
other	
strengths and weaknesses	
major strengths	-consistent database - user-friendly interface to run scenarios, process data and view outputs-
major weaknesses	- Aggregation level relatively high - No detail within countries
other	
relevance for MACSUR	
expected benefit	

for TradeM	
expected benefit for CropM	
expected benefit for LiveM	
expected benefit from TradeM	
expected / planned enhancements during the next three years	
main challenges to be tackled to attain the planned enhancements	
other	
other relevant aspects	

Structure of model MAGNET

Figure 0.1 A simplified representation of the GTAP model

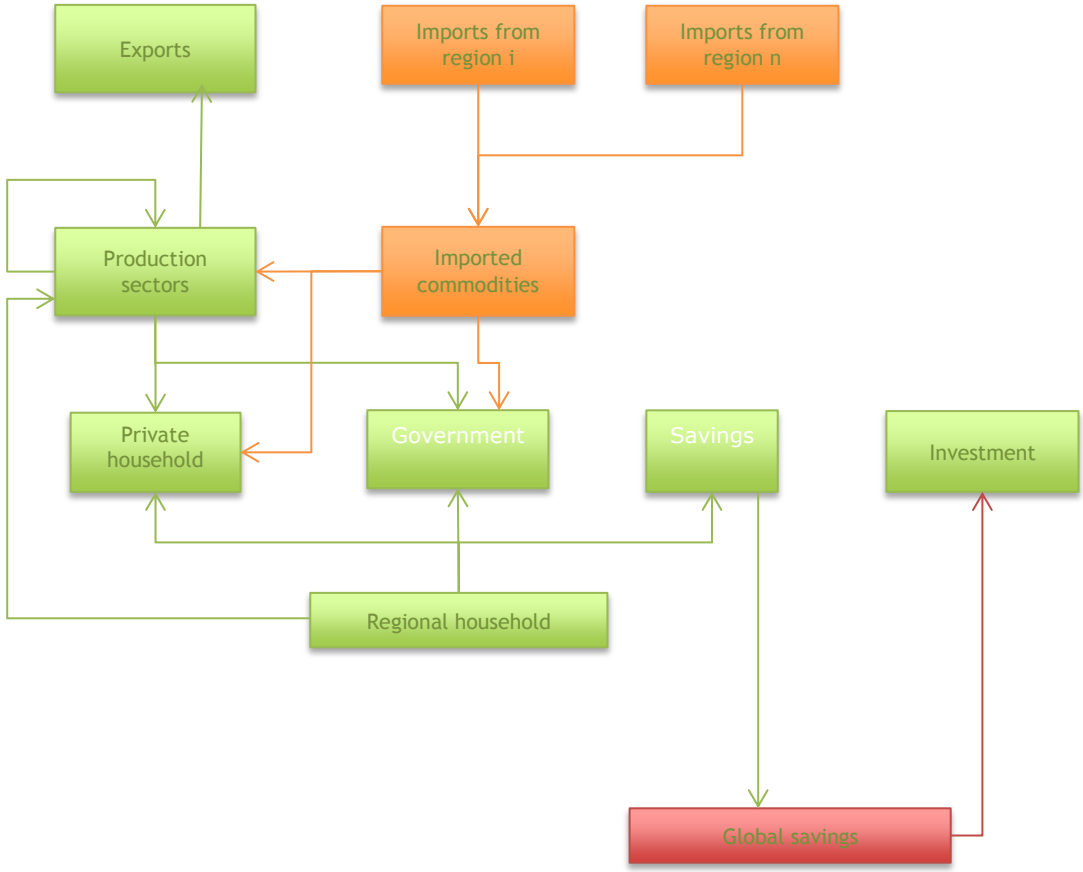


Figure 0.2 A simplified illustration of a regional model within the GTAP model

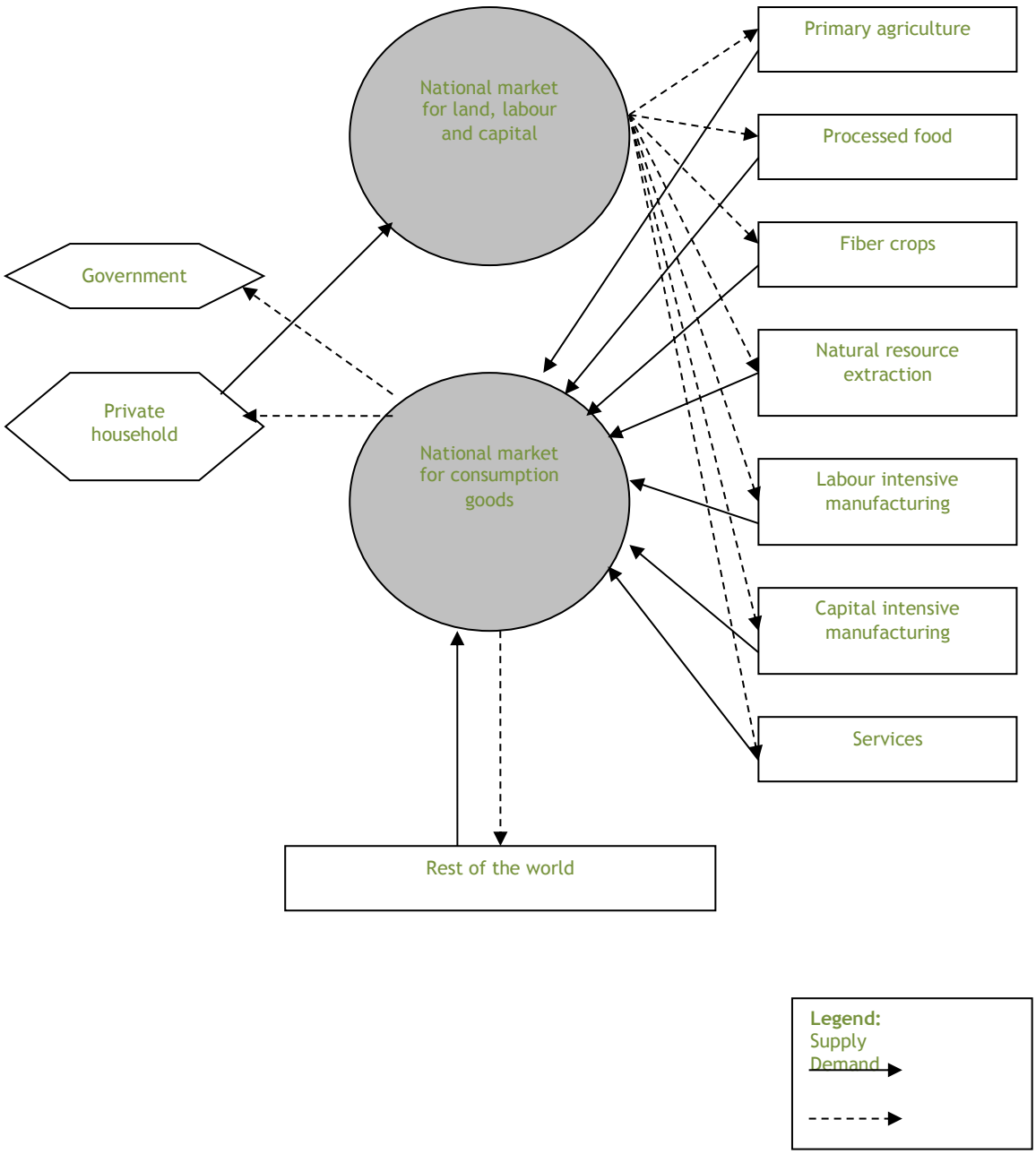
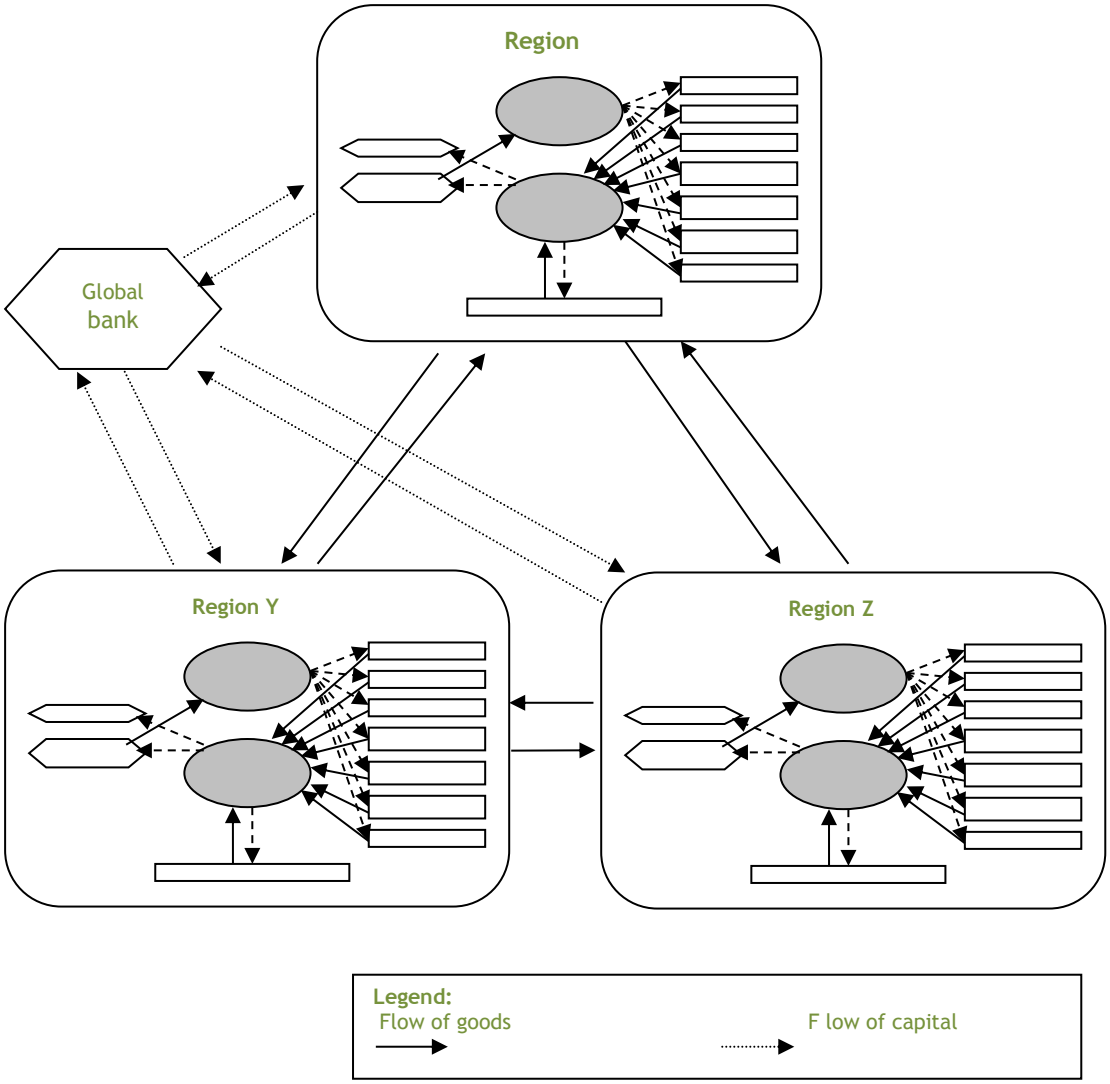


Figure 0.3 Simplified illustration of links between regional models in the GTAP model



Model #24: CropRota

Basic Information	
information provided by Name Partner-Number	Erwin Schmid
submitted by	Martin Schönhart, martin.schoenhart@boku.ac.at
time of report	September2012
acronym of model	CropRota
name of model	Crop rotation model
website	
objectives of the model	CropRota is a generic linear programming model to generate typical crop rotationsand their relative shares for single farms up to regions to support bio-physical and economic modeling.
major focus:	
ex-ante evaluation	-
ex-post evaluation	-
specific problems of clients	-
methodological development	-
short description of the model	CropRota generates typical crop rotationsand their relative shares based on crop mix input data from single farms up to regions. Crop mixes represent the relative shares of crops grown on a farm orin a region over one to several years and are derived from observed farm data,regional land use statistics or expert knowledge. The generated typical crop rotationsfrom CropRota maximize the total agronomic value (Z) on a farm or in a region.Z is the sum over the agronomic value (Y) of each single pre-crop – maincrop sequence in all crop rotations. Y is derived from a crop rotation table (CRT)and is normalized by the relative share of a particular sequence. In the model, Y can be further adjusted by a correctionfactor to take into account agronomically less favorable crop rotations such asmonocultures. CropRota is constrained to reproduce the observed crop mix. Thus,the total share of each crop summed over all typical crop rotations has to equal theobserved crop mix, which implies that crop rotations only include crops representedin the crop mix input data.
principal developer(s) and affiliation	Erwin Schmid; Martin Schönhart; University of Natural Resources and Life Sciences, Vienna.
development supported by	National funds;
maintainer(s) and affiliation	Erwin Schmid; Martin Schönhart; University of Natural Resources and Life Sciences, Vienna.
other	
Technical Information	
type of model	Mathematical programming model
programming language	GAMS

dimensions	Farm to regional level
regions covered currently	Generic model
smallest regional unit	Farm
aggregation of regions	-
time horizon temporal scale: smallest - longest	One to several years
representation of trade	-
sectors covered	Arable production
more details on representation of agriculture:	
general notes	-
farm types	-
farm structure	-
variants of management / intensity	-
description of input - data	
general notes	IACS database or land use statistics and expert-based agronomic data
crop production	-
livestock production	-
variants of management / intensity	-
other	
description of parameters	Agronomic value of pre-crop – main crop sequences as well as frequencies of single crops or groups of crops in a rotation,
exogeneous projection variables and sources	-
model closure rules	-
other	
use and applications	
target user group	
policy makers	-
farmers / advisory services	-
scientists	X
other (specify)	-
policies analysed in most cases	-
policies analysed most recently	-
policies - other aspects	-
other analyses	Provision of input data for PASMA and FAMOS
economic result indicators	
income / wealth / utility / related	No economic indicator
production costs related	No cost parameters
other	-
bio-physical links and indicators	
land types	arable land
land uses	Generic at the level of single crops
manure management	-
water - indicators	-
air - indicators	-
soil - indicators	-

biodiversity flora	-
biodiversity fauna	-
landscape	-
other environmental aspects/indicators	-
other	-
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	EPIC, PASMA, FAMOS,
databases (specify)	-
GIS (specify)	-
link to climate change	-
link to food security	-
other	
current state of development	
regional coverage	generic
sector coverage	Agriculture
methodological enhancements	-
new modules	-
other	
property rights	
access to core-code of the model	Yes
access to scenarios (data/parameters)	Yes
access to input data	Yes
access to result data output	Yes
access to parameters	Yes
other	
recent publications	
journal papers	Schönhart, M., Schmid, E., Schneider, U.A. (2011). CropRota – A crop rotation model to support integrated land use assessments. *European Journal of Agronomy*. 34(**4**), 263-277.
presentations at conferences	Lorenz, M., Thiel, E., Schönhart, M. (2012). The choice of crop rotations as an important model input – a case study from Saxony. In: Seppelt, R., Voinov, A.A., Lange, S., Bankamp, D., Proceedings of the International Congress on International Environmental Modelling and Software (iEMSs 2012), http://www.iemss.org/society/index.php/iemss-2012-proceedings.
project reports	
technical papers on the model	
policy papers	
web-sites	
other	
strengths and weaknesses	
major strengths	- provides crop rotation input data, which are frequently not available from other sources - crop rotation input data required for bio-physical modeling
major weaknesses	- limited validation options due to lack of

	empirical data - limitation to 6-year rotations due to numerical constraints
other	
relevance for MACSUR	
expected benefit for TradeM	
expected benefit for CropM	Provision of crop rotations
expected benefit for LiveM	
expected benefit from TradeM	
expected benefit from CropM	
expected benefit from LiveM	
expected / planned enhancements during the next three years	
main challenges to be tackled to attain the planned enhancements	
other	
other relevant aspects	

Structure of model

Model #25: FAMOS

Basic Information	
information provided by Name Partner-Number	Erwin Schmid
submitted by	Erwin Schmid, erwin.schmid@boku.ac.at
time of report	July 2012
acronym of model	FAMOS / FAMOS[space]
name of model	Farm Optimization System
website	
objectives of the model	FAMOS / FAMOS[space]is an integrated farmproduction optimization model for Austria. It integrates bio-physical impacts from agricultural and forestry ecosystem models and portrays Austrian farming in detail. Particularly, the 1st and 2nd pillars of the Common Agricultural Policy (CAP) are considered including the Single Farm Payments and other direct payments, measures of the agri-environmental program, and less favored area payments. It also provides a rich indicator set (farm economic, environmental and ecological indicators) for field-farm-landscape impact analysis. Typical farm impact analyses are performed for CAP reform proposals and evaluations as well as climate change and land use policy changes.
major focus:	
ex-ante evaluation	X
ex-post evaluation	X
specific problems of clients	X
methodological development	X
short description of the model	It is a typical farm model system of Austrian farming with exogenous prices. The farms are portrayed in detail with respect to natural, structural, economic, and policy conditions. More than 5500 real farms are selected from IACS database and modeled in detail (all major crop, livestock and forestry commodities as well as measures of the 1st and 2nd pillars of CAP). Commodity prices are exogenous and price forecasts are usually extracted from OECD-FAO outlooks. • 5500 individual (real) farms (stratified sample drawn from IACS) • 8 main production areas, 8 farm

	size classes, 5 LFA classes, 2 production systems (conventional & organic), 40 farm production types (e.g. dairy, vineyards, crop), 2 acquisition types (part/full-time farming) mixed integer programming model • decreasing AVC and farm labor req. in crop, grassland and livestock production by farm/livestock housing size • input system, tillage system, livestock housing system • farm factor/capacity adjustments (land, livestock stand equivalent, labor, milk quota) specific model features ▪ convex set of historical land use / livestock / management choices ▪ all major land covers (cropland, grassland, perm. cultures, forest land), crops, and livestock categories ▪ organic and conventional farming systems with 3 intensity levels for conventional farming (i.e. mutually exclusive choices) ▪ detailed feed and fertilizer balances ▪ all major crop and livestock products ▪ tillage systems (i.e. conventional, reduced tillage, minimum tillage) ▪ livestock housing & manure handling systems by livestock category (i.e. w/o straw) ▪ 1st and 2nd pillar instruments (DP, DDP, LFA, AEP, set aside, quota) FAMOS[space] - additions ▪ all fields-farms in a landscape region (including structural elements) ▪ transportation costs between field and farmstead ▪ production costs depending on field size ▪ crop rotations (CropRota model; Schönhart et al., 2011) ▪ input from bio-physical process model (yields, environmental outcomes)rich indicator system (landscape metrics, farm

	production, intensity, etc.) ▪ field size & structure as well as land use & land use intensity => biodiversity indicators at field and landscape level
principal developer(s) and affiliation	Erwin Schmid; Martin Schönhart; University of Natural Resources and Life Sciences, Vienna.
development supported by	National funds;
maintainer(s) and affiliation	Erwin Schmid; Martin Schönhart; University of Natural Resources and Life Sciences, Vienna.
other	
Technical Information	
type of model	Full farm production model using mathematical programming techniques.
programming language	GAMS
dimensions	Austrian farms; land covers; land use; livestock; forestry; soil management systems; 1st and 2nd pillar measures;
regions covered currently	Austria
smallest regional unit	county
aggregation of regions	No aggregation
time horizon temporal scale: smallest - longest	static year
representation of trade	
sectors covered	agriculture and forestry
more details on representation of agriculture:	
general notes	crop, livestock and forestry sector; feed and fertilizer balances
farm types	Major Austrian farm types
farm structure	Farm sizes; Alpine farming systems; part-time farming;
variants of management / intensity	conventional production, organic production; land use intensities
description of input - data	
general notes	IACS database and economic accounts of agriculture (EAA) as well as the standard gross margins
crop production	IACS crops as well as differentiated by organic and conventional production methods
livestock production	IACS livestock as well as differentiated by organic and conventional production methods
variants of management / intensity	Conventional and organic production methods as well as agri-environmental measures
other	
description of parameters	IACS farm endowments and production activities. Standard gross margins including labor requirements by farm

	type and size for all crop, livestock and forestry commodities. Commodity prices from Statistics Austria and forecasts from OECD-FAO outlooks. gaseous emission coefficients are consistent with national reporting standards on greenhouse gas
exogeneous projection variables and sources	OECD-FAO outlook
model closure rules	Farm production model – quantity adjustments to exogenous prices.
other	
use and applications	
target user group	
policy makers	X
farmers / advisory services	X
scientists	X
other (specify)	general public and stakeholders
policiesanalysed in most cases	CAP impacts of reform proposals and evaluation
policiesanalysed most recently	CAP reform proposal;
policies - other aspects	Climate and biodiversity policies;
other analyses	output response to capacity constraints
economic result indicators	
income / wealth / utility / related	farm surplus gross value added factor income
production costs related	Average/marginal costs land rents
other	annual working units
bio-physical links and indicators	
land types	arable land, grassland, forest land
land uses	organic and conventional farming systems with 3 intensity levels for conventional farming (i.e. mutually exclusive choices)
manure management	Livestock housing and manure management systems; regional fertilizer balances (N, P, K);
water - indicators	N-balance, mm irrigation water
air - indicators	NH3, CH4, N2O
soil - indicators	Sediment losses in t/ha; land cover
biodiversity flora	rich indicator system (landscape metrics, farm production, intensity, etc.) field size & structure as well as land use & land use intensity => biodiversity indicators at field and landscape level
biodiversity fauna	-
landscape	Shannon diversity index, inventory of structures
other environmental	

aspects/indicators	
other	
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	Environmental Policy Integrate Climate (EPIC) – biophysical process model; CropRota – crop rotation model
databases (specify)	Climate data (GCMS/RCMs; AcLiRem), digital soil database, digital elevation model, IACS, CORINE. (GIS)-IACS (BMLFUW), several years Agricultural Structural Census, several years Economic Accounts of Agriculture (EAA),several years Standard Gross Margin Catalogue (BMLFUW) Labor requirements in the Austrian agriculture (Greimel et al., 2002) Prices (Statistics Austria, OECD-FAO Outlook) Farm Bookkeeping Data (LBG, FADN), several years Natural conditions (i.e. soil, topographical, climate data) • HRU concept (homogenous response units) • geo-referencing of data and model outputs • bio-physical process model output
GIS (specify)	GIS-IACS; CORINE, digital soil database, digital elevation model;
link to climate change	Yes
link to food security	Yes
other	
current state of development	
regional coverage	Austria / county level
sector coverage	Agriculture and forestry
methodological enhancements	-
new modules	Crop rotations; Farm Risk Management
other	
property rights	
access to core-code of the model	consortium agreement
access to scenarios (data/parameters)	Yes
access to input data	-
access to result data output	Yes
access to parameters	-
other	
recent publications	
journal papers	Schönhart, M., T. Schauppenlehner, E. Schmid, and A. Muhar (2011). Integration of bio-physical and economic models o analyze management intensity and landscape

	structure effects at farm to landscape level. *Agricultural Systems*. 104(**2**), 122-134. Schönhart, M., T. Schauppenlehner, E. Schmid, and A. Muhar (2011). Analyzing maintenance and establishment of orchard meadows at farm and landscape levels applying a spatially explicit integrated modeling approach. *Journal of Environmental Planning and Management*. 54(**1**), 115-143. Schönhart, M., E. Schmid, and U.A. Schneider (2011). CropRota – A crop rotation model to support integrated land use assessments. *European Journal of Agronomy*. 34(**4**), 263-277.
presentations at conferences	
project reports	
technical papers on the model	
policy papers	
web-sites	
other	
strengths and weaknesses	
major strengths	- strong panel database behind the model; - linkage with other models i.e. bio-physical process model EPIC and CropRota; - detailed representation of the Austrian farming in different regional, natural, structural, economic and policy contexts - land cover/use competition i.e. agriculture and forestry - transparent structure in GAMS model code, which leads to relatively low entry costs for new model users; - researcher-friendly programming tool, which helps to run scenarios and to compare scenario results;
major weaknesses	- static
other	
relevance for MACSUR	
expected benefit for TradeM	Detailed farm impact analysis for an EU Member State i.e. Austria
expected benefit for CropM	
expected benefit for LiveM	
expected benefit from TradeM	concise scenario for model comparison learn from approaches of other models
expected benefit from CropM	parameters for future crop-yields
expected benefit from LiveM	parameters for future livestock-yields
expected / planned enhancements during the next three years	Including a risk module
main challenges to be tackled to attain the planned enhancements	Modeling risk management

other	
other relevant aspects	

Structure of model

Model #26: PASMA

Basic Information	
information provided by Name Partner-Number	Erwin Schmid
submitted by	Erwin Schmid, erwin.schmid@boku.ac.at
time of report	July 2012
acronym of model	PASMA
name of model	Positive Agricultural and Forestry Sector Model Austria
website	
objectives of the model	PASMA is an integrated economic production optimization model for the agricultural and forestry sectors in Austria. It integrates bio-physical impacts from agricultural and forestry ecosystem models and portrays the regional, natural, structural, economic, and policy contexts of Austrian agriculture and forestry in detail. Particularly, the 1st and 2nd pillars of the Common Agricultural Policy (CAP) are considered including the Single Farm Payments and other direct payments, measures of the agri-environmental program, and less favored area payments. Typical impact analyses are performed for CAP reform proposals and evaluations as well as climate change and land use policy changes.
major focus:	
ex-ante evaluation	X
ex-post evaluation	X
specific problems of clients	X
methodological development	X
short description of the model	It is a typical bottom-up mathematical programming model for the Austrian agricultural and forestry sectors withexogenous prices. The sectors are portrayed in detail with respect tonatural, regional, structural, economic, and policy conditions: representation of regions is NUTS3; of natural conditions are homogenous response units (HRU); of farm structures are farm size classes, of economic and policy conditions are all major crop, livestock and forestry commodities as well as measures of the 1st and 2nd pillars of CAP. The model builds convex sets of observed and policy relevant land use and livestock mixesas well as using the pmp calibration method. Commodity prices are exogenous and price forecasts are usually extracted from OECD-FAO outlooks. Specific model features: ▪ NUTS3-regions and HRU representation ▪ Same land cover types (cropland,

	grassland, permanent cultures, forests), land uses (crops), and livestock categories as in FAMOS ▪ detailed feed and fertilizer balances by farm size classes ▪ all major crop and livestock products and transfers between farm size classes ▪ Farm structural elements (declining AVC, labor req.) i.e. sizes: ▪ agriculture: 0-10ha,>10-20ha, >20-30ha,>30-50ha, >50-100ha, >100ha ▪ forestry:≤200ha,>200-1000ha,>1000ha,CommunityFor, StateFor ▪ HRU: elevation, slope
principal developer(s) and affiliation	Erwin Schmid; Martin Schönhart; Mathias Kirchner; University of Natural Resources and Life Sciences, Vienna. Franz Sinabell; Austrian Institute of Economic Research
development supported by	National funds;
maintainer(s) and affiliation	Erwin Schmid; Martin Schönhart; Mathias Kirchner; University of Natural Resources and Life Sciences, Vienna.
other	Franz Sinabell; Austrian Institute of Economic Research
Technical Information	
type of model	Bottom-up mathematical programming model of agricultural and forestry production
programming language	GAMS
dimensions	Austria; NUTS3; HRU, farm size classes, land covers; land use; livestock; forestry;soil management systems; 1st and 2nd pillar measures;
regions covered currently	Austria
smallest regional unit	NUTS3
aggregation of regions	bottom up by aggregation of HRU, and NUTS3 regions
time horizon temporal scale: smallest - longest	static& recursive dynamic mode year
representation of trade	Regional trade balances
sectors covered	agriculture and forestry
more details on representation of agriculture:	
general notes	crop, livestock and forestry sector; feed and fertilizer balances
farm types	-
farm structure	Farm size classes
variants of management / intensity	conventional production, organic production; Land use intensities
description of input - data	
general notes	IACS database and economic accounts of

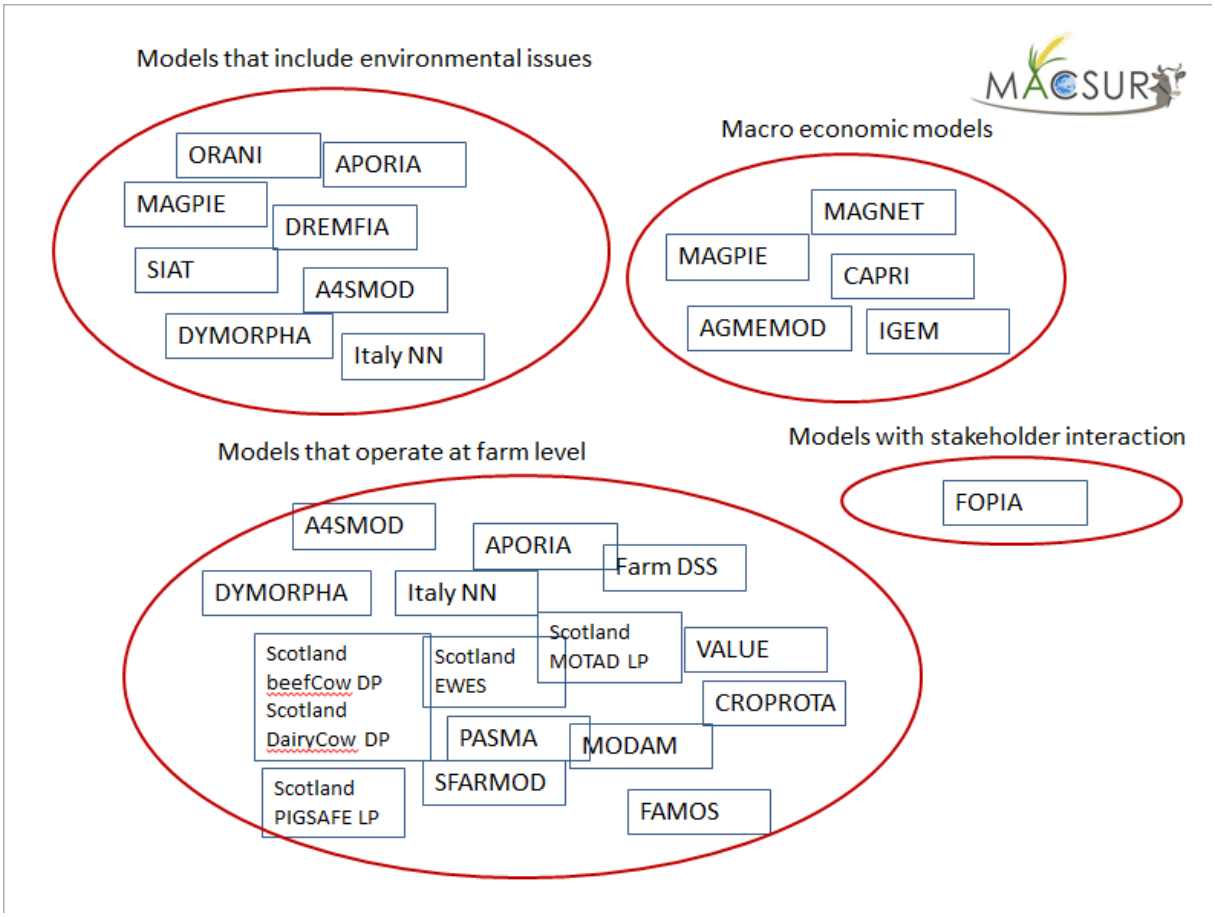
	agriculture (EAA) as well as the standard gross margins ▪ (GIS)-IACS (BMLFUW), several years ▪ Agricultural Structural Census, several years ▪ Economic Accounts of Agriculture (EAA), several years ▪ Standard Gross Margin Catalogue (BMLFUW) ▪ Labor requirements in the Austrian agriculture (Greimel et al., 2002) ▪ Prices (Statistics Austria, OECD-FAO Outlook) ▪ Farm Bookkeeping Data (LBG, FADN), several years ▪ Natural conditions (i.e. soil, topographical, climate data) ▪ HRU concept (homogenous response units) ▪ geo-referencing of data and model outputs ▪ bio-physical process model output
crop production	IACS crops as well as differentiated by organic and conventional production methods
livestock production	IACS livestock as well as differentiated by organic and conventional production methods
variants of management / intensity	Conventional and organic production methods as well as agri-environmental measures
other	
description of parameters	Standard gross margins including labor requirements by farm size classes for all crop, livestock and forestry commodities. Commodity prices from Statistics Austria and forecasts from OECD-FAO outlooks. gaseousemission coefficients are consistent with national reporting standards on greenhouse gas
exogeneous projection variables and sources	OECD-FAO outlook
model closure rules	Bottom-up regional ag&for sector production model – quantity adjustments to exogenous prices.
other	
use and applications	
target user group	
policy makers	X
farmers / advisory services	X
scientists	X
other (specify)	general public and stakeholders
policiesanalysed in most cases	CAP impacts of reform proposals and evaluation
policiesanalysed most recently	CAP reform proposal;
policies - other aspects	Climate and bioenergy policies;

other analyses	output response to capacity constraints
economic result indicators	
income / wealth / utility / related	producer surplus gross value added factor income
production costs related	marginal costs land rents
other	annual working units
bio-physical links and indicators	
land types	arable land, grassland, forest land
land uses	organic and conventional farming systems with 3 intensity levels for conventional farming (i.e. mutually exclusive choices)
manure management	Livestock housing and manure management systems; regional fertilizer balances (N, P, K);
water - indicators	N-balance, mmirrigation water
air - indicators	NH3, CH4, N2O
soil - indicators	Soil sediment in t/ha; land cover
biodiversity flora	-
biodiversity fauna	-
landscape	-
other environmental aspects/indicators	
other	
integration: models, tools, data	
names and acronyms of other models and technical aspects of model-link	Environmental Policy Integrate Climate (EPIC) – biophysical process model; CropRota – crop rotation model
databases (specify)	Climate data (GCMS/RCMs; AcLiRem), digital soil database, digital elevation model, IACS, CORINE.
GIS (specify)	GIS-IACS; CORINE, digital soil database, digital elevation model;
link to climate change	Yes
link to food security	Yes
other	
current state of development	
regional coverage	NUTS3
sector coverage	Agriculture and forestry
methodological enhancements	-
new modules	Crop rotations; Biodiversity Indicators
other	
property rights	
access to core-code of the model	consortium agreement
access to scenarios (data/parameters)	Yes
access to input data	-
access to result data output	Yes
access to parameters	-
other	
recent publications	
journal papers	Schmidt, J., M. Schönhart, M Biberacher, T.

	Guggenberger, S. Hausl, G. Kalt, S. Leduc, I. Schardinger, and E. Schmid (2012). Regional energy autarky: potentials, costs and consequences for an Austrian region. *Energy Policy*, **47**, 211-221. Stürmer, B., J. Schmidt, E. Schmid, and F. Sinabell (2013). Implications of agricultural bioenergy crop production in a land constrained economy – the example of Austria. *Land Use Policy,***30**, 570-581. Schönhart, M., E. Schmid, and U.A. Schneider (2011). CropRota – A crop rotation model to support integrated land use assessments. *European Journal of Agronomy*. 34(**4**), 263-277.
presentations at conferences	
project reports	
technical papers on the model	
policy papers	
web-sites	
other	
strengths and weaknesses	
major strengths	- strong panel database behind the model; - linkage with other models i.e. bio-physical process model EPIC, energy system model BeWhere, and region input/outpuit model MultiReg; - detailed representation of the Austrian agricultural and forestry sector - land cover/use competition i.e. agriculture and forestry - transparent structure in GAMS model code, which leads to relatively low entry costs for new model users; - researcher-friendly programming tool, which helps to run scenarios and to compare scenario results;
major weaknesses	- no feedback of the Austrian sector with EU and the Rest of the World (small country assumption); - exogenouscommodity and land prices
other	
relevance for MACSUR	
expected benefit for TradeM	Detailed impact analysis for an EU Member State i.e. Austria
expected benefit for CropM	
expected benefit for LiveM	
expected benefit from TradeM	concise scenario for model comparison learn from approaches of other models
expected benefit from CropM	parameters for future crop-yields
expected benefit from LiveM	parameters for future livestock-yields
expected / planned enhancements during the next three years	Including crop rotations and biodiversity indicators
main challenges to be tackled to attain the planned enhancements	

other	
other relevant aspects	

Structure of model



Acknowledgments

We thank all TradeM partners for sharing data, models and tools and their willing to create synergic effects based on integrated knowledge obtained from TradeM partners.

References

http://macsur.eu/index.php/internal-documents/func-startdown/112/
http://www.macsur.eu/index.php/internal-documents/func-startdown/115/
http://www.macsur.eu/index.php/internal-documents/TradeM/MACSUR-Hub-Meeting-Berlin-2013/
http://www.macsur.eu/index.php/internal-documents/TradeM/TradeM-Workshop-Haifa-2013/