CAP reform scenario calculations for the German Neckar river basin and England – a transfer of the regional model ACRE

Martin Henseler

Contact: martin.henseler@uni-hohenheim.de
University of Hohenheim, Institute for Farm Management, Section Production Theory and Resource Economics, 70593 Stuttgart, Germany

Abstract
In 2003, the new CAP reform for EU member states (MS) was decided by the European Commission. CAP reform scenarios have been calculated here for Southern Germany using the regional model ACRE. By using statistical data found for agricultural production in England ACRE was calibrated for England and CAP reform scenarios have been calculated. This study presents the calibration of ACRE to England and results of CAP reform scenario calculations for the Southern German Neckar river basin and England.

1 Introduction

The model ACRE (Agro-eConomic pRoduction model at rEgional level) was developed as regional model for two Southern German river basins for simulation of political scenarios. Because CAP reform 2003 measures are similar in Germany and England and agricultural statistic data are provided for England we tried to transfer ACRE to England and calculate CAP reform scenarios.
In 2003, the new CAP reform for EU member states (MS) was determined by the European Commission. MS were allowed to choose a single payment scheme (SPS) (implying decoupled payments) between flat rate (regional) approach, historic approach and hybrid models. England and Germany chose to implement dynamic hybrid models and regional payments, with the final stage of transition to be completed in 2012 in England and in 2013 in Germany.
In Southern Germany, the model ACRE has been used to calculate impacts of CAP reform 2003 on agricultural production for two major German river basins: the Upper Danube river basin and the Neckar river basin. ACRE is an Agro eConomic pRoduction model at rEgional level and was developed within the context of two interdisciplinary projects, GLOWA-Danube and RIVERTWIN-Neckar[1], in order to simulate agricultural production in these river basins.[1]
ACRE was first developed as ACRE-Danube for the Danube catchment, whose area covers parts of the German Federal States Bavaria and Baden-Wuerttemberg, including 68 municipal districts, see Winter (2005), as well as Austria, totalling 3,900,000 ha utilised agricultural area (UAA). ACRE was also transferred to 30 districts in Baden-Wuerttemberg for calculation of agricultural production in the Neckar river basin as ACRE-Neckar, with a total area of 1,100,000 ha UAA. It is planned to merge both river basin models and extend the model area to include more districts and form ACRE-Southern-Germany, which will represent the total area of Bavaria and Baden-Wuerttemberg. Table 1 gives an overview of ACRE versions and their implementation in various projects.
Due to the similarities of CAP reform measures in England and those in the ACRE model regions and a good data availability of English agricultural production we transfer ACRE to

[1] GLOWA-Danube projects is in the framework of GLOWA (Global Change in the Hydrological Cycle) and funded by the German Federal Ministry of Education and Research (BMBF). URL: www.glowa.org
The project RIVERTWIN (A regional model for integrated water management in twinned river basins) was funded by the European Commission, No. GOCE-CT-2003-505401. URL: www.rivertwin.de The corresponding models are called ACRE-Danube and ACRE-Neckar, while 'ACRE' means both models e.g. in cases of description of features universal features applied for both or the basic algebraic structure.

England. This paper describes the calibration of ACRE to the model region England and presents the results of CAP reform 2003 scenarios calculated with ACRE for the Neckar river basin and England.

Table 1: Overview of current and planned ACRE versions. Source: own presentation

Name	Model region	Calibration year	Publications	Project/Status implemented in
ACRE	Term which means general features and all ACRE versions		Winter (2005)	
ACRE-Danube	Upper Danube river basin (DRB) includint districts of Bavaria (BY), Baden-Wuerttemberg (BW) and Austria (AT)	1995	Henseler et al. (2005a,b)	GLOWA-Danube since 2003
ACRE-BYBW	Upper Danube river basin (DRB) districts in German Federal States Bavaria (BY) and Baden-Württemberg	1995	Winter (2005)	GLOWA-Danube since 2005
ACRE-Danube-AT	16 districts in Austria (AT) of the DRB	1995	Wirsig et al. (2006)	GLOWA-Danube since 2004
ACRE-Neckar	Neckar river basin (NRB)	2000	Henseler et al. (2006)	RIVERTWIN-Neckar from 2004 to 2007
ACRE-SouthGermany				planned

2 Method

2.1 Model characteristics of ACRE

ACRE is a comparative-static optimisation model. The shortest simulation period is one year. The production process is based on a process analytical approach; model algorithms represent different production procedures of crop and animal production.

ACRE is based on an extended version of the Positive Mathematical Programming (PMP) approach, according to Röhm and Dabbert (2003). ACRE maximises the total gross margin (TGM) in NUTS-3 districts by optimising agricultural production. Using the regional farm approach, statistical data of agricultural production are used to calibrate the model. The quality of these aggregated crop and animal production data is high enough to calculate valid results in ex-post analysis, see Winter (2005).

Figure 1 illustrates the processes of agricultural production in ACRE and their interaction. Optimisation takes place simultaneously for the complete system by maximising the total gross margin of the region. Depending on natural conditions ACRE includes cultivation of food, non-food crops and grassland. For production of these crops agricultural premiums are received. Cash crops are sold for producer prices and the return flows into the total gross margin. Animals are fed from fodder crops. In ACRE premiums are also received for animals and animal products sold. Animals produce manure which is used for crop production. This circle of nutrients allows e.g. simulations with respect to nitrogen applied in agricultural production. Several input factors can be purchased within ACRE: water, mineral fertiliser, feed concentrate and livestock for herd replacement. Trade between the districts is not modelled.

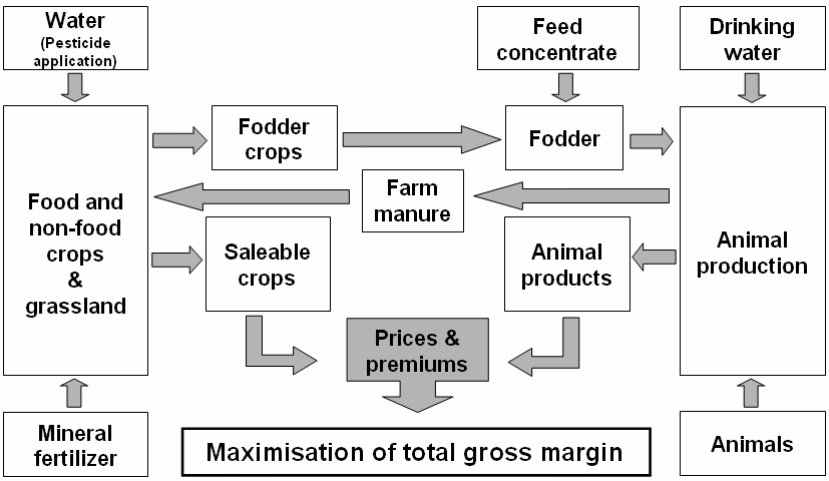

Figure 1: Scheme of agricultural production processes in ACRE. Source: own presentation

2.2 Calibration data required by ACRE

For calibration ACRE needs regional data of crop and animal production for the reference period being the year 2000. ACRE requires data for acreage of crop cultivation and regional yields. Using a regional yield measure index (e.g. LVZ i.e. 'Landwirtschaftliche Vergleichszahl' or EMZ i.e. 'Ertragsmesszahl') the regional proportions of crop intensity (intensive crop production and extensive crop production) were derived according to Winter (2005). Simulation of livestock production requires the number of animals and regional livestock performance, represented by milk performance. Production costs and the formulation of production processes is based on German standard values from data collected by KTBL (The Association for Technology and Structures in Agriculture). The modification of these standard values with respect to regional characteristics of agricultural production ensures a regional representation of agricultural production processes. Producer prices were collected from corresponding data collections. Regional agricultural subsidies according to the simulated CAP reform of reference period (i.e. Agenda 2000) represent payments for the first pillar of CAP, while payments from the second pillar include agro-environmental programs (e.g. for reduced intensive production) and compensatory allowance (e.g. for production on Less Favoured Areas).

2.3 Calibration data provided by DEFRA

The crop and livestock production data required by ACRE for calibration are provided by agricultural census survey published in the internet database of DEFRA (Department of Environment, Food and Rural Affairs). For June 2000 complete census data is available (DEFRA 2007), which could provide a representative basis for calibration. Data for regional yield and livestock performance were collected from Farm Business Survey and could be retrieved at NUTS-1 scale for the years 2002 to 2004. Data on regional prices and subsidies are also collected in the Farm Business Survey at NUTS-1 level and published in the internet database for 2002 to 2006. Due to time constraints, we did not investigate data on production costs. Subsidies for the reference year according to Agenda 2000 and CAP reform 2003 are provided by DEFRA (2005, 2007).

2.4 Dealing with missing data

Most of the regional data of acreage of crop and number of livestock could be easily found in the DEFRA data base for the chosen reference year 2000. Because this study is the first consideration of transfer of the ACRE model to another region, we concentrated on data which were most easily available, rather than investigating all possible sources. Missing data were dealt according to following methods:

(1) Proxy data of other scales or periods. For some of these data (e.g. regional yields and milk performance) suitable statistical proxies for years other than 2000 or another region than NUTS-3 level could be retrieved. Their representative quality should be high enough to represent the calculated situation (calibration or scenario situation) with only a few deviations.
(2) Assumptions for missing data. Missing data were replaced by data based on assumptions. These data are transferred directly from ACRE model (e.g. production costs) or they were derived from statistical data (e.g. acreages of intensive and extensive grassland were derived from grassland data provided by DEFRA). A further assumption was the not considering of missing data (e.g. because of missing data of production intensities the production was assumption only for intensive production).
(3) Adaptation of production processes. For some missing data, it is possible that this information is not collected due to minor importance in English agriculture. For example: data on arable fodder crops, such as silage maize and clover, were not found in the farm survey database of DEFRA. Dairy production formulated in ACRE is based on feeding by forage. Consequently, this formulation has to be adapted to agricultural production in England without forage crops. Table 2 summarises the data required by ACRE with data available for England and data replacements, respectively.

Table 2: Data requirements for calibration of ACRE, available data for England and replacements of missing data.

	Data requirement	**Data availability**	**Used data / data replacements**
	ACRE	England	England
Production data			
Arable crop yield data	NUTS 3 (1998 to 2000)	NUTS 1 (2002 to 2006)	NUTS 1 (2002 to 2006)
Arable crop acreages	NUTS 3 (2000)	NUTS 3 / no data of fodder crops	NUTS 3 (2000)/ adaptation of stock feeding process
Acreages of crop intensities	NUTS 3	No	Not considered
Grassland yields	NUTS 3	No	Data from ACRE
Grassland acreages	NUTS 3	NUTS 3	NUTS 3 (2000)
Grassland intensities acreages	NUTS 3	No	Derived from statistics
Milk performance	NUTS 3	NUTS 1	NUTS 1 (2000)
Livestock numbers	NUTS 3	NUTS 3	NUTS 3 (2000)
Economic data			
Producer prices	reference year 2000	year 2002 to 2004	NUTS 1 (2002 to 2004)
Production costs	KTBL	No	Data from ACRE: KTBL
Political data			
CAP payments	Agenda 2000 CAP reform 2003	Agenda 2000 CAP reform 2003	Agenda 2000 CAP reform 2003
Environmental programs	2000 to 2003	No	Not considered
Compensatory allowance	2000	No	Not considered

2.5 Results of calibration

Calibration of ACRE for England to the calibration year 2000 results in 66% (61 districts out of 93 districts) sufficient exactly calibrated districts, representing 90% of total UAA. Thus, the initial calibration run of the transferred model can be evaluated as sufficiently good. Table 3 presents the number of districts with problematic or insufficient exactly calibration in NUTS-1 regions. The shares of districts with problems in calibration are found in every NUTS-1 region with high share ranging from 15% to 58%. Most of these districts are districts with major grassland and only few arable land. From this results North West and London and South East are valued as the NUTS-1 regions with the highest exactness of the represented reference scenario.

Table 3: Number and percentage of calibrated districts in NUTS-1 regions. Source: own calculations

	Not exactly calibrated	All districts	Percent of districts
	Number of districts		%
North East and Yorkshire and the Humber	7	17	41%
North West	2	13	15%
East Midlands	3	10	30%
West Midlands	4	12	33%
East	4	10	40%
London and South East	5	19	26%
South West	7	12	58%
England	32	93	34%

3 Scenario calculations

3.1 Simulation of CAP reform 2003 scenarios

CAP reform in Germany and England comprises three important elements: Decoupling of premiums, cross compliance and modulation. Assuming that the decoupling of premiums has the greatest effect on agricultural production, we focused this study on these subsidies.

Decoupling in both states means that subsidies which are received are decoupled of production, according to a single payment scheme (SPS). SPS in Germany and England are both dynamic hybrid models, with different dynamic developments in the period from 2005 to 2012, as shown in Table 5. The German dynamic hybrid model keeps subsidies constant over the first 5 years and then changes dynamically. Payments consist of different subsidies for arable land and permanent pasture and a historical payment, calculated by the livestock production over a reference period. Between 2010 and 2013, the flat rate subsidies for arable area and permanent pasture are unified and historical subsidies are reduced to zero. The English model differs from the German model by a different dynamic of the historical and the flat rate subsidies. Also, flat rate subsidies are unified for arable land and grassland, see Table 5.

Table 5: Payments according to the Single payment scheme (SPS) of the dynamic hybrid model in England and Neckar River basin (NRB). Source: DEFRA (2005), own calculations according to BMVEL (2005)

	Payments for arable land (AL) or grassland (GL)		2005	2006	2007	2008	2009	2010	2011	2012	2013
			% of payments in the final state								
Neckar river basin	Flat rate	AL	105	105	105	105	105	104	103	102	100
	Flat rate	GL	20	20	20	20	20	28	44	68	100
	Historic	AL + GL	100	100	100	100	100	90	70	40	0
England	Flat rate	AL + GL	10	15	30	45	60	75	90	100	100
	Historic	AL + GL	90	85	70	55	40	25	10	0	0

In NRB and in England, subsidies in the final stage are done according to a regional approach. In Germany, subsidies depend on the federal state. In this study ACRE considers subsidies being published for the federal state Baden-Wuerttemberg

In England, the monetary amounts differ between Less Favoured Areas (LFA) and non-LFA. The three land classes in England are: UAA in moorland, UAA in several disadvantaged areas (SDA) and elsewhere. In this study we assume the upper limit of non-moorland and non SDA published in DEFRA (2005: 5).

Table 6 shows the subsidies of SPS in the calibration year and in the CAP reform 2003 scenario years for England and Baden-Wuerttemberg. Obviously, in both regions decoupled subsidies in the final state of the reform for cereals are equal to subsidies received in reference year according to Agenda 2000; the payments for other arable crops are less than in Agenda 2000. An important aspect is the payment for grassland (GL), which is received as part of UAA subsidies, according to CAP reform 2003. In both regions, these subsidies increase significantly and therefore an increase of TGM in districts with high shares of grassland is

expected. The additional (coupled) aid for protein crops and energy crops are assumed to be equal in both regions.
Payments for LFA and environmental programs are simplified in ACRE as payments of compensatory allowance and according to intensity of grassland production. Both payments are region specific and of importance for several districts in England. "Less Favoured Areas include some 1.8 million hectares of farmed land in England…" (Head of Conservation and Land Management 2003: 2), which make up 20% of UAA, collected from DEFRA data base.
However, we estimate that the most important changes would result from decoupled subsidies, rather than from the payments schemes for LFA and environmental programs; thus for this initial model transfer we did not consider the payments for LFA and environmental programs.

Table 6: Payments according to first pillar of CAP reform 2003 expected for England and Bavaria. Source: DEFRA 2007, DEFRA 2005:5, BMVEL 2005, ACRE-source code, own calculations

	England				Neckar river basin			
	Agenda 2000	CAP reform 2003			Agenda 2000	CAP reform 2003		
Year	**2000**	**2005**	**2010**	**2012**	**2000**	**2005**	**2010**	**2013**
	EUR ha^{-1}				EUR ha^{-1}			
Subsidies for AL and GL [a, b]								
Cereals	371	37	278	371	302	317	316	302
Oilseeds rape	534	37	278	371	499	317	316	302
Linseed /Sunflowers	566	37	278	371	499	317	316	302
Proteins	463	37	278	371	384	317	316	302
Set-aside[c]	376	37	278	371	310	317	316	302
Grassland	--	37	278	371	--	59	83	302
Additional aid								
Energy crops	0	45	45	45	--	45	45	45
Proteins crops	0	56	56	56	--	56	56	56

a) AL = arable land, GL = grassland. Assuming the upper limit of estimation for UAA of 230 GBP and an assumed exchange rate of 0.57 GBP per EUR. Note that these exchange rate is not quite excact, however the resulting difference of decoupled premiums does not effect the reaction of the model. "By 2012 the flat rates could fall in the range 20 GBP to 40 GBP per hectare for the moorland, 110 GBP to 130 GBP per hectare in the non-moorland SDA and 210 GBP to 230 GBP elsewhere." (DEFRA 2005: 5). b) Excluding: moorland and non-moorland (SDA). c) Excluding guaranteed set-aside and additional voluntary set-aside.

3.2 Results of CAP reform 2003 scenario calculations

We analysed the results of CAP reform scenarios by the economic indicator of total gross margin (TGM) and as indicator for landuse the share of winter wheat. Both indicators were investigated for the years 2005, 2010 and the final state of CAP reform 2013 in Neckar river basin (NRB) and 2012 in England.

Figure 2 to 5 present results of CAP scenario calculation for NRB and for England. The diagrams show the development of TGM (Figure 2 and 3) and the acreage of winter wheat (Figure 4 to 5) in dependency of share of grassland of utilised agricultural area (UAA). The symbols represent the districts in different scenario years. Correspondingly to the share of grassland (GL) the figures show on the left hand side (lower than 50% grassland of UAA) the arable land (AL) districts and on the right hand sides the grassland (GL) districts.

Figures 2 and 3 present the development in TGM by percent of TGM in the reference year 2000. In NRB the TGM tend to decrease in the AL districts. The symbols ly below the 100% line which represents the reference scenario in the year 2000. Correspondingly, GL districts, with 60% to 70% GL of UAA tend to increase in TGM. A similar increasing trend of TGM with increasing GL share of UAA is detected for English districts in the years 2005, 2010 and 2012. According to Table 6 subsidies assumed in both model regions increase from zero to more than 300 EUR in final state of reference year. Thus the result of increasing TGM in GL districts is plausible.

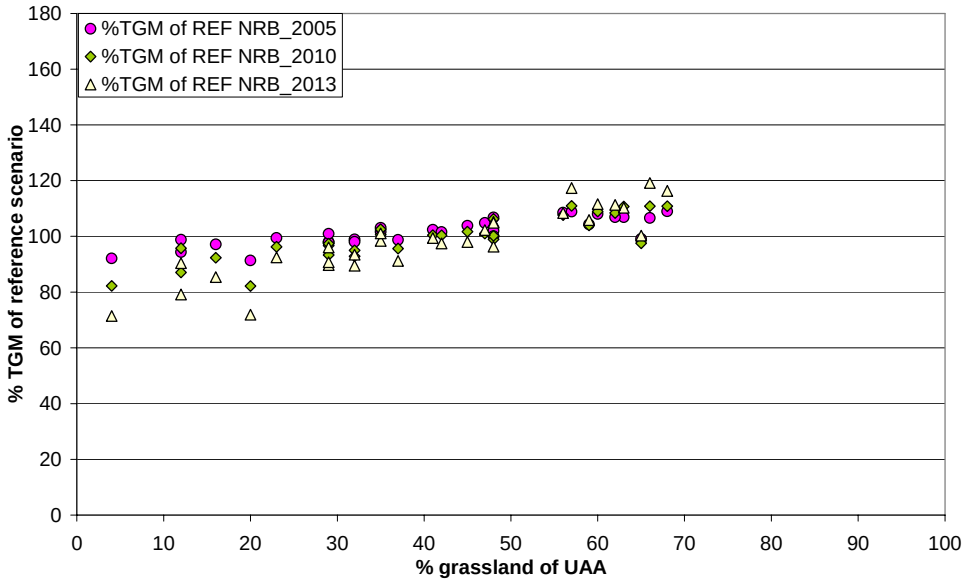

Figure 2: Development of total gross margin (TGM) in CAP reform scenario in relation to grassland share of utilised agricultural area (UAA) for the Neckar river basin (NRB). The symbols represent the districts in the three scenario years 2005, 2010 and 2013. Source: ACRE calculations

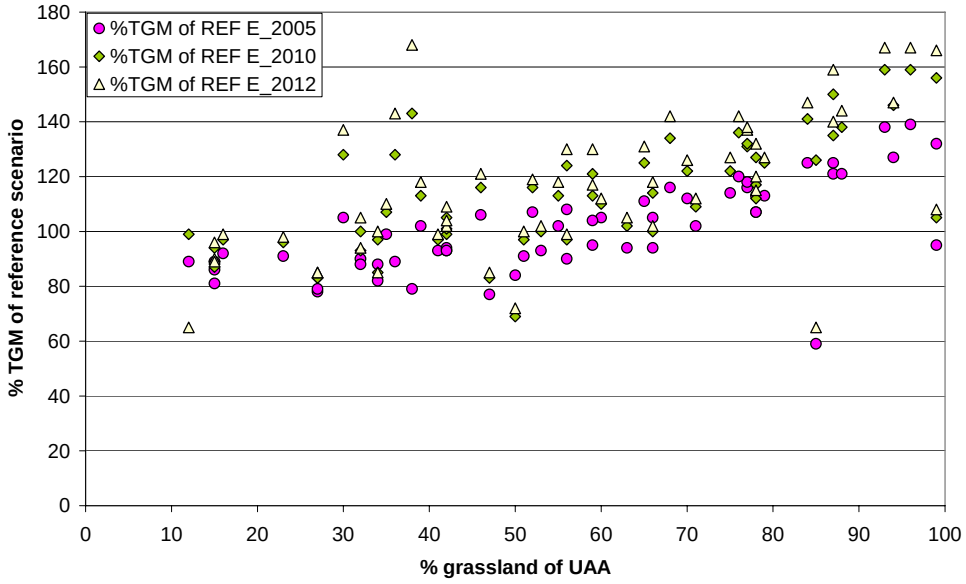

Figure 3: Development of total gross margin (TGM) in CAP reform scenario in relation to grassland share of utilised agricultural area (UAA) for the England (E) The symbols represent the districts in the three scenario years 2005, 2010 and 2012. Source: ACRE calculations

Figure 4 and 5 illustrates the development of winter wheat in both regions by share of UAA in reference year 2000 and in scenario years. In NRB (Figure 3) the share of winter wheat lies between 10% and 20% and tend to keep constant. The triangles, representing the year 2013 are located next to the squares, representing the reference year 2000. In England (Figure 5) the development is different. In AL districts on the left hand side, where winter wheat has a high share of UAA, the share of winter wheat tend to decrease. In GL districts with small shares of winter wheat is lower. The subsidies in the year 2012 are assumed as equal to the reference year with 371 EUR ha^{-1}, see Table 6, and result in a similar gross margin of winter wheat, which means winter wheat does not change in absolute profitability. The subsidies of all other crops tend to decrease. Therefore, also the relative profitability of wheat is expected to increase. This means that the reaction of decreasing is not plausible from the economical point of view. The deviations should be explainable by insufficient representative modelled

crop production processes in ACRE for the model region England. These insufficiencies are caused by wrong assumptions or not adequate formulation of production processes. Therefore, it could be expected that these implausible reactions can be corrected by better adapteation of ACRE to English agricultural production.

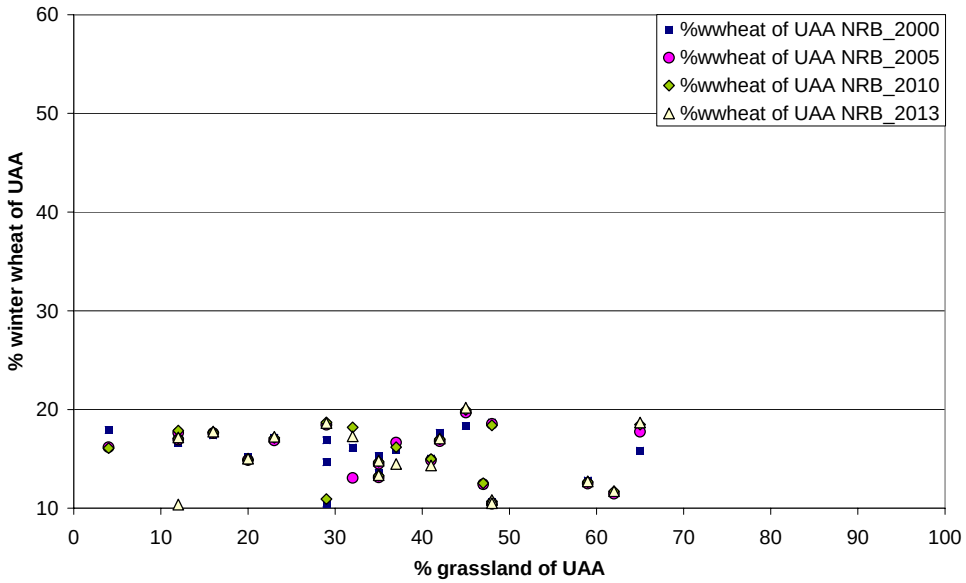

Figure 4: Development of winter wheat acreages in CAP reform scenario in relation to grassland share of utilised agricultural area (UAA) for the Neckar river basin (NRB) The symbols represent the districts in the reference year 2000 and the three scenario years 2005, 2010 and 2013. Source: ACRE calculations

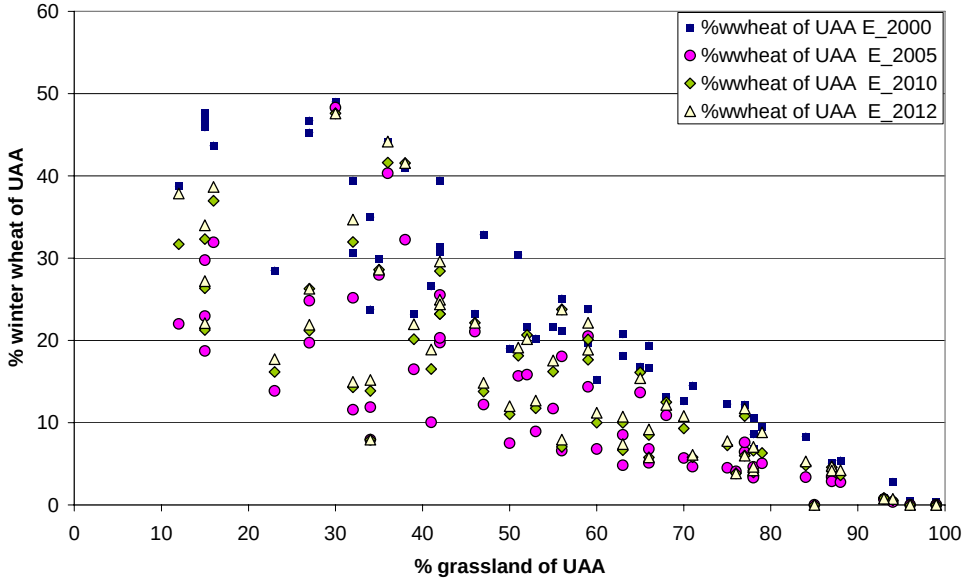

Figure 5: Development of winter wheat acreages in CAP reform scenario in relation to grassland share of utilised agricultural area (UAA) for England (E). The symbols represent the districts in the reference year 2000 and the three scenario years 2005, 2010 and 2012. Source: ACRE calculations

An ex post comparison between scenario results for the year 2005 with statistics published by DEFRA provides a first evaluation of prognosis quality. Table 7 presents the percent of acreages of crop groups calculated by ACRE in the year 2005 related to crop acreages published in statistics for 2005. The figures represent the average of districts in the NUTS 1 regions. Cereals as arable crop with the largest extension tend to be underestimated by ACRE in all NUTS 1 regions. The decreasing tendency for all arable crops is provoked by increasing of AL which falls abandoned in CAP reform scenario. Grassland is simulated rather exactly with differences of about 10% to 20%.

Table 7: Percent of calculated acreages of statistics in the year 2005. Figures represent the average of the districts. Source: own calculations according to DEFRA 2007 and ACRE calculations

	Cereals	Maize	Leg-umes	Root crops	Oil seeds	Special crops	Set aside	Grass-land
	% of acreage published in statistics							
North East and Yorkshire and the Humber	45	9	59	180	9	2867	28	93
North West	61	60	95	200	36	731	39	81
East Midlands	53	50	63	153	5	1862	30	99
West Midlands	48	106	67	111	6	810	35	96
East	43	20	45	134	6	202	31	87
London and South East	97	133	79	400	20	386	33	99
South West	50	191	60	161	28	370	33	90
England	61	81	67	199	16	1080	33	92

4 Summary, conclusions and outlook

ACRE was calibrated for agricultural production in England. Agricultural statistic data required by ACRE were researched in DEFRA data base. Not available data were substituted or simplified. The calibration with the available data provides sufficient exact results. A scenario CAP reform scenario was calculated for three years. The results of development of TGM in England are plausible, whereas the development of winter wheat production is not plausible. This implausibility and an ex post investigation raises the suspicion that formulation in ACRE for England are wrong with respect to assumptions of crop production. This error could result from not adapted production processes, which were transferred originally from ACRE. Therefore a further adaptation of ACRE model is necessary to simulate agricultural production in England.

This study describes the initial run of the regional model ACRE for England. From results of calibration and scenario calculation follows the necessity of further adaptations to England. The quality of results of this initial run let conclude that an adaptation of England to a region in England is possible without much effort (for the initial run model calibration is quite exactly and not plausibility of scenario results seem to be systematically). It is estimated that the required data are available for England. Therefore, an adaptation of ACRE to a region in England is estimated to be easily possible.

Agricultural production in England is quite heterogeneous, e.g. in Northern regions with extensive grassland farming and in Eastern regions with intensive crop farming. Therefore, it is useful to focus with an adaptation of ACRE to English agriculture on a specific region. The region should be selected with respect (1) to the availability of data and (2) effort of adaptations, i.e. the comparability of agricultural practise. From the results of calibration and ex post investigation, the regions London and South East and North West seem to be the best suitable districts for a transfer.

Thus, in order to adapt ACRE to agriculture in England, further research in literature will be undertaken for more information with respect:

- to regional modelling in England (e.g. Garforth and Rehman 2006a)
- to impacts of CAP reform 2003 (e.g. EC 2003, DEFRA 2005, Lobley and Butler 2004)
- to payments of the second pillar (e.g. Head of Conservation and Land Management 2003),
- to agricultural praxis, production costs and outcomes (e.g. University of Cambridge – The Rural Business Unit 2007a and 2007b).

References

Bernhards, U.; Klockenbring, C.; Plankl, R; Rudow, K. (2003): Pilotfallstudie zur Bewertung der Ausgleichszulage in benachteiligten Gebieten im Landkreis Freyung-Grafenau, Arbeitsbericht 04/2003, FAL, Braunschweig, Germany. URL: http://www.fal.de/nn_791232/SharedDocs/10__LR/DE/Publikationen/BAL/download__ab__04__2003__de,templateId=raw,property=publicationFile.pdf/download_ab_04_2003_de.pdf [18.03.2007].

BMLF (2000): Bayrischer Agrarbericht 2000, Bayerisches Staatsministerium für Ernährung, Landwirtschaft und forsten, http://www.agrarbericht.bayern.de/agrarbericht2000.pdf [19.03.2007].

BMVEL (Federal Ministry of Consumer Protection Food and Agriculture) (2000a): Agenda 2000 - Pflanzlicher Bereich Agrarumweltmaßnahmen, Bundesministerium für Ernährung, Landwirtschaft und Forsten, Bonn.

BMVEL 2005. Meilensteine der Agrarpolitik – Umsetzung der europäischen Agrarreform in Deutschland, Ausgabe 2005, Bundesminister, Federal Ministry of Food, Agriculture and Consumer Protection (BMVEL).

DEFRA (2005): CAP single payment scheme: basis for allocation of entitlement, Homepage of DEFRA (Department for Environment, Food and Rural Affairs), last modified 05.05.2005, p.1, URL: http://www.defra.gov.uk/farm/capreform/background/pdf/webnoterev16.pdf [13.11.2006].

DEFRA (2007): Super Output Areas - and the June Agricultural Survey: Data search - Government Office Region to Ward – 2003 – The June Agricultural Survey, URL: http://farmstats.defra.gov.uk/cs/farmstats_data/DATA/nuts_data/nuts_query.asp [19.03.2007] and http://statistics.defra.gov.uk/ esg/publications/fab/2005/table_13.xls [19.03.2007].

EC (European Commission) Directorate-General for Agriculture (2003): Reform of the Common Agricultural Policy – A Long-Term Perspective for Sustainable Agriculture. (European Commission) Directorate-General for Agriculture , URL: http://europa.eu.int/comm/agriculture/publi/reports/reformimpact/index_en.htm [14.09.2005].

Francesco, B.; Carlo Gipponi, C.; Povellato, A. (2007): A Review of Recent Studies on Cost Effectiveness of GHG Mitigation Measures in the European Agro-Forestry Sector. The Fondazione Eni Enrico Mattei, http://www.feem.it/NR/rdonlyres/2E2C4912-4913-4758-B9FD-A3A71BDD9DB8/2244/1407.pdf [22.3.2007].

Garforth, C. and Rehman, T. (2006)a: Research to Understand and Model the Behaviour and Motivations of Farmers in Responding to Policy changes (England) – Full report URL: http://statistics.defra.gov.uk/esg/reports/farmer%20behaviour/default.asp. [22.03.2007].

Garforth, C. and Rehman, T. (2006)b: Research to Understand and Model the Behaviour and Motivations of Farmers in Responding to Policy changes (England) - Project report No.5: Review of Models for Agricultural Policy Analysis, Annex F, URL: http://statistics.defra.gov.uk/esg/reports/farmer%20behaviour/default.asp. [22.03.2007].

Head of Conservation and Land Management (2003): Consultation on the review of the hill farm allowances, Exmoor National Park Authority, Report of the Head of Conservation and Land Management. URL: http://www.exmoor-nationalpark.gov.uk/ar-enpa-01.07.03-papere.pdf [18.03.2007].

Henseler, M. A. Wirsig and T. Krimly (2005a): Introduction of ACRE: an agro-economic production model on regional level. International Conference on Policy Modeling (EcoMod2005), Istanbul (Turkey), 29.06.-02.07.2005. URL: http://www.ecomod.net/conferences/ecomod2005/ecomod2005_papers/955.pdf, [18.09.2006].

Henseler, M. A. Wirsig and T. Krimly (2005b): Development, Testing and Application of ACRE: An Agro-Economic Production Model on Regional Level, poster paper prepared for presentation at the 11th International Congress of the EAAE (European Association of Agricultural Economists) "The Future of Rural Europe in the Global Agri-Food System" Copenhagen (Denmark), 24.-27.08. 2005, URL: http://www.eaae2005.dk/POSTER_PAPERS/SS28_555_Henseler.pdf [18.09.2006].

Henseler, M., Krimly, T. and A. Wirsig (2006): An agro-economic production model for a Middle European river basin – first results of CAP reform scenario calculations, Poster paper prepared for presentation at the 26th International Association of Agricultural Economists Conference (IAAE 2006), Gold Coast, (Queensland, Australia), 12.-18.08.2006, published on CD "IAAE 2006 Australia – Conference Materials".

Lobley, M.; Butler, A.(2004): The Impact of the CAP Reform on Devon's AgricultureFinal Report to Devon County Council , University of Exeter, URL: http://www.centres.ex.ac.uk/crr/pdf1/reports1/capreform.pdf [23.03.2007].

OECD (2004): Analysis of the 2003 CAP Reform, Organisation for Economic Cooperation and Development (OECD), URL: http://www.oecd.org/dataoecd/62/42/32039793.pdf [23.03.2007].

Röhm, O. and Dabbert, S. (2003). Integrating Agri-Environmental Programs into Regional Production Models An Extension of Positive Mathematical Programming. American Journal of Agricultural Economics 85: 254-265.

StaLa BW (2007), Data base of regional statistics, Statistical office Baden-Wuerttemberg, URL: http://www.statistik.baden-wuerttemberg.de/SRDB/ [19.03.2007].

Winter, T. (2005): Ein Nichtlineares Prozessanalytisches Agrarsektormodell für das Einzugsgebiet der Oberen Donau - Ein Beitrag zum Decision-Support-System Glowa-Danubia. PhD-Thesis. University of Hohenheim, Stuttgart.

Wirsig, A., Henseler, M., Krimly, T. and S. Dabbert (2006): Impact of Global Change on agricultural land use in the Austrian Upper Danube catchment – first results of ACRE-Danube. Presentation on the 16th Annual Conference of the Austrian Society of Agricultural Economics (ÖGA), 28.10.2006, Vienna (Austria).

University of Cambridge – The Rural Business Unit 2007a: Farm Business Survey Government Office Region Reports Website. URL: http://www.farmbusinesssurvey.co.uk/ [11.04.2007].

University of Cambridge – The Rural Business Unit 2007b: Report on Farming in the Eastern Counties (2004/2005).