



EC4MACS

Modelling Methodology

The CAPRI

Agricultural Model

European Consortium for Modelling of Air Pollution and
Climate Strategies - EC4MACS

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1. Introduction

The planned content of this deliverable should include methodology revisions taking into account the feedback from stakeholders. Due to the delay in the preparation of the EC4MACS interim baseline such feedback is not yet available but a revised baseline has been prepared based on advice by DG ENV, project partners and 'outside' observers (from the European Fertiliser Manufacturer Association, EFMA). As a consequence this interim report mainly introduced this revised baseline. The full output is available in electronic form upon request in various formats and a tailored extract for use at IIASA is annexed to this report.

2. Revised baseline methodology and assumptions

The key developments have been discussed in the Progress report of 31.07.09 such that we need to recapitulate the main points here only

- Policy assumptions from the interim report of 31.07.09 have been maintained (in particular regarding the abolition of milk quotas as of 2015) with the exception of the assumed WTO agreement in that report. Upon advice by the Commission a WTO agreement has *not* been built into the baseline anymore.
- Improved sugar market projections based on expert knowledge
- Alignment of fertiliser projections with those of EFMA
- Biofuel representation
 - Database improvements (see Progress report) have been applied in parallel but are not yet fully incorporated in these projections
 - PRIMES results of 23.07.09 have been incorporated by Member States (whereas earlier simulations were only aligned at the EU27 level)
 - The share of bio-fuels from domestic first generation (non lingo-cellulosic) feed stocks has been estimated based on results from the 'BIOPOL' project, as the breakdown exactly matching the recent PRIMES baseline could not be incorporated due to the teams modelling more or less in parallel.
- Interim points 2010 and 2015 have been simulated in addition to 2020.

3. Revised baseline results

Key results presented below refer to activity levels in the crop and livestock sectors as well as to the resulting emissions as estimated by CAPRI. Important drivers are the largely exogenous bio-fuel production quantities from domestic first generation feed stocks that will be presented before these key results therefore

Table 1: First generation bio-ethanol production by MS in the CAPRI baseline [1000 t]

	2004	2010	2015	2020
Belgium-Lux.	0	39	60	80
Denmark	0	103	114	141
Germany	72	3391	2620	2274
Greece	0	243	250	252
Spain	270	400	489	553
France	29	229	118	236
Ireland	0	71	95	130
Italy	8	957	812	958
Netherlands	12	156	227	296
Austria	0	93	97	117
Portugal	0	66	75	93
Finland	6	65	96	99
Sweden	98	7	104	157
United Kingdom	0	461	724	1082
Cyprus	0	4	7	10
Czech Republic	0	165	163	191
Estonia	0	25	22	23
Hungary	35	104	107	136
Lithuania	8	4	7	16
Latvia	12	25	23	27
Malta	0	0	0	1
Poland	53	183	275	363
Slovenia	0	27	41	51
Slovak Republic	0	28	36	48
Bulgaria	0	10	13	15
Romania	0	33	45	51
EU27	604	6886	6621	7398

Table 2: First generation bio-diesel production by MS in the CAPRI baseline [1000 t]

	2004	2010	2015	2020
Belgium-Lux.	1	142	257	338
Denmark	60	53	73	93
Germany	1127	1798	1144	766
Greece	3	31	46	62
Spain	31	1759	2089	1911
France	399	973	1203	1310
Ireland	0	39	65	88
Italy	330	418	482	636
Netherlands	0	82	140	182
Austria	58	159	209	253
Portugal	1	73	98	125
Finland	0	21	48	68
Sweden	1	221	234	222
United Kingdom	23	798	991	1047
Cyprus	1	1	2	2
Czech Republic	84	113	124	141
Estonia	7	9	10	12
Hungary	0	77	80	90
Lithuania	6	4	14	35
Latvia	5	10	12	17
Malta	2	0	1	1
Poland	69	159	213	279
Slovenia	8	9	17	21
Slovak Republic	33	6	19	30
Bulgaria	0	18	26	30
Romania	0	32	50	59
EU27	2248	7004	7649	7817

The decline in some MS such as Germany is due to second generation technologies based on ligno-cellulosic material taking over the lead (assumed to derive from waste or forestry, as dedicated energy crops are not yet included in CAPRI).

Table 3: Cereal areas by MS in the CAPRI baseline [1000 ha]

	2004	2010	2015	2020
Belgium-Lux.	342	378	373	369
Denmark	1487	1584	1634	1694
Germany	6875	7089	7376	7471
Greece	1261	1147	1115	1083
Spain	6601	6321	6391	6372
France	9147	9056	9386	9484
Ireland	297	301	295	302
Italy	4140	4149	4119	4091
Netherlands	223	232	225	220
Austria	807	810	827	823
Portugal	431	333	406	402
Finland	1203	1170	1185	1197
Sweden	1092	1099	1127	1136
United Kingdom	3050	3186	3315	3319
Cyprus	68	68	69	69
Czech Republic	1617	1619	1605	1590
Estonia	269	269	262	255
Hungary	2892	2881	2862	2864
Lithuania	900	939	931	951
Latvia	445	449	448	450
Malta	0	0	0	0
Poland	8289	8296	8163	8226
Slovenia	98	92	99	100
Slovak Republic	806	801	794	794
Bulgaria	1721	1503	1536	1502
Romania	5854	5596	5569	5497
EU27	59917	59369	60112	60262

The cereal area increase is partly due to a decline in the area for oilseeds such as rape.

Table 4: Rape areas by MS in the CAPRI baseline [1000 ha]

	2004	2010	2015	2020
Belgium-Lux.	6	6	6	5
Denmark	91	86	80	69
Germany	1020	1044	1062	1041
Greece	0	0	0	0
Spain	5	5	4	4
France	932	904	827	767
Ireland	2	2	2	2
Italy	4	3	3	2
Netherlands	1	1	1	1
Austria	33	26	23	14
Portugal	0	0	0	0
Finland	78	84	85	83
Sweden	58	31	24	20
United Kingdom	439	454	466	462
Cyprus	0	0	0	0
Czech Republic	239	229	205	170
Estonia	48	54	56	56
Hungary	103	85	64	26
Lithuania	92	94	91	85
Latvia	51	44	33	8
Malta	0	0	0	0
Poland	505	510	469	401
Slovenia	2	2	2	2
Slovak Republic	85	74	58	32
Bulgaria	12	12	12	11
Romania	52	34	22	11
EU27	3854	3784	3592	3271

Table 5: Cow herd size by MS in the CAPRI baseline [1000 hd]

	2004	2010	2015	2020
Belgium-Lux.	610	582	552	607
Denmark	578	563	539	514
Germany	4316	4212	4046	4245
Greece	150	150	139	132
Spain	1098	1040	985	1065
France	3941	3826	3645	3580
Ireland	1142	1131	1102	1205
Italy	2069	1989	1928	1933
Netherlands	1517	1485	1426	1626
Austria	552	517	480	526
Portugal	328	320	302	288
Finland	327	312	297	268
Sweden	401	391	374	334
United Kingdom	2106	2064	1971	1746
Cyprus	26	26	24	24
Czech Republic	412	384	359	350
Estonia	113	112	105	101
Hungary	288	272	254	261
Lithuania	423	428	403	391
Latvia	174	179	168	166
Malta	7	8	7	7
Poland	2656	2402	2170	2134
Slovenia	128	125	118	111
Slovak Republic	155	146	142	136
Bulgaria	363	386	370	370
Romania	1501	1520	1439	1421
EU27	25382	24572	23345	23540

The decline in cow numbers up to 2015 is due to the milk quotas and increasing yields. In 2020 we see the impacts of the abolition of milk quotas.

Table 6: Pigs slaughterings (plus net trade in live animals) by MS in the CAPRI baseline [1000 hd/year]

	2004	2010	2015	2020
Belgium-Lux.	10793	11783	12208	12423
Denmark	24332	26854	28994	31195
Germany	41172	42015	43635	46057
Greece	2065	2082	2052	2010
Spain	36577	40938	46492	50827
France	25595	27662	28730	29411
Ireland	2703	2778	2750	2716
Italy	12415	13753	14648	15542
Netherlands	16135	16009	15401	14576
Austria	4734	4795	4761	4689
Portugal	4944	5349	5889	6231
Finland	2270	2267	2348	2423
Sweden	3189	3148	3043	2940
United Kingdom	8707	8793	8646	8430
Cyprus	668	607	622	645
Czech Republic	4421	4068	3767	3640
Estonia	481	516	537	570
Hungary	4992	4953	4802	4776
Lithuania	1290	1303	1312	1334
Latvia	421	409	403	401
Malta	109	106	109	110
Poland	22780	23217	23691	24103
Slovenia	411	397	385	381
Slovak Republic	1702	1574	1454	1413
Bulgaria	1000	553	522	494
Romania	5836	3420	3438	3372
EU27	239742	249345	260642	270709

The increase in the pig population varies strongly by MS, following historical trends.

Table 7: Ammonia emissions by MS in the CAPRI baseline [1000 t]

	2004	2010	2015	2020
Belgium-Lux.	71	70	71	74
Denmark	100	101	102	102
Germany	509	520	523	533
Greece	38	34	34	34
Spain	336	343	349	359
France	513	517	512	517
Ireland	108	106	107	109
Italy	337	349	345	345
Netherlands	104	109	107	112
Austria	49	50	50	52
Portugal	56	53	53	52
Finland	22	23	23	22
Sweden	51	53	52	49
United Kingdom	253	255	256	251
Cyprus	5	5	6	6
Czech Republic	60	64	64	67
Estonia	8	8	8	8
Hungary	71	77	80	86
Lithuania	27	29	29	31
Latvia	12	13	13	13
Malta	1	1	1	1
Poland	258	284	288	306
Slovenia	13	14	14	15
Slovak Republic	19	20	21	22
Bulgaria	27	26	26	27
Romania	107	96	107	111
EU27	3156	3219	3240	3305

Table 8: Methane emissions by MS in the CAPRI baseline [1000 t]

	2004	2010	2015	2020
Belgium-Lux.	234	231	228	239
Denmark	217	206	200	194
Germany	1326	1270	1225	1246
Greece	160	151	147	144
Spain	970	988	1006	1040
France	2189	2135	2103	2083
Ireland	508	508	509	524
Italy	770	784	774	777
Netherlands	375	380	360	400
Austria	188	179	175	182
Portugal	203	203	203	208
Finland	91	85	81	76
Sweden	172	167	161	151
United Kingdom	1244	1231	1216	1173
Cyprus	14	14	15	16
Czech Republic	139	135	130	132
Estonia	27	28	27	27
Hungary	102	98	95	99
Lithuania	84	84	81	82
Latvia	40	41	41	42
Malta	3	3	3	3
Poland	560	548	539	567
Slovenia	52	54	54	55
Slovak Republic	49	49	48	47
Bulgaria	125	136	133	136
Romania	403	420	422	434
EU27	10245	10128	9974	10077

Both on ammonia as well as on methane emissions we see a modest increase after 2015 due to the increase in the dairy cow population.

4. Electronic annexes

- From_PRIMES_to_Ass.xls: Specification of assumptions on bio-fuels based on PRIMES results

- CAPRI_toGAINS_data.csv: Information on animal numbers and nutrient cycle information converted to standard format for GAINS