

Appendix 1

Biophysical macro magnitudes of Spanish agriculture (1960-2008 and Scenario without imported feed)

Table A1.1. Land uses evolution (Mha), Spain

	1960	1970	1980	1990	2000	2008
Cropland	20	21	20	20	18	17
Closed Forest	5	6	7	7	7	8
Coppice	5	5	5	5	5	5
Dehesa	3	4	4	4	4	4
Pastures and Shrubland	13	11	11	11	12	11
Unproductive	4	4	4	4	4	4
Total	50	50	50	50	50	50

Table A1.2. External inputs evolution (TJ), Spain

	1960	1970	1980	1990	2000	2008	No-import
External Inputs (EI)(a+e)	92,690	248,832	401,945	352,368	482,101	510,260	345,112
Non-industrial Inputs (a) = b+c+d	30,505	68,799	137,283	61,149	146,955	196,434	9,966
Feed (b)	10,289	53,403	124,365	51,822	136,989	187,842	0
Seed (c)	1,785	0	557	0	3,674	5,335	3,674
Human Labor (d)	18,431	15,396	12,361	9,327	6,292	3,257	6,292
Industrial Inputs (e) = f+g+h+i	62,185	180,033	264,662	291,219	335,146	313,826	335,146
Traction (f)	12,764	81,696	124,785	103,296	116,318	129,666	116,318
Irrigation (g)	9,769	20,712	37,435	58,565	77,110	75,407	77,110
Fertilizers (h)	38,768	75,241	93,842	104,988	112,039	77,618	112,039
Crop protection (i)	884	2,385	8,599	24,369	29,679	31,135	29,679

Table A1.3. NPPact evolution in cropland, pastureland and forestland (TJ), Spain

	Cropland					
	1960	1970	1980	1990	2000	2008
NPPact	1,371,287	1,426,425	1,471,174	1,715,584	1,821,935	1,793,445
Socialized Vegetable Biomass (SVB)	234,616	264,716	300,139	341,307	356,544	341,303
Reused Biomass (RuB)	415,610	456,273	528,539	628,004	686,282	719,606
Aboveground Un-harvested Biomass (AUhB)	267,260	283,029	244,192	307,763	319,000	292,004
Belowground Un-harvested Biomass (BUhB)	411,991	373,179	348,298	388,219	409,708	388,481
Accumulated Biomass (AB)	41,811	49,227	50,006	50,291	50,401	52,050
	Pastureland					
	1960	1970	1980	1990	2000	2008
NPPact	2,188,886	2,227,802	2,084,407	2,061,839	2,234,369	2,284,455
Socialized Vegetable Biomass (SVB)	0	0	0	0	0	0
Reused Biomass (RuB)	331,060	107,174	81,060	86,875	145,724	135,058
Aboveground Un-harvested Biomass (AUhB)	884,988	1,130,494	1,076,944	1,058,591	1,095,592	1,134,084
Belowground Un-harvested Biomass (BUhB)	972,838	990,134	926,403	916,373	993,053	1,015,313
Accumulated Biomass (AB)	0	0	0	0	0	0

	Forestland					
	1960	1970	1980	1990	2000	2008
NPPact	1,239,886	1,418,681	1,431,276	1,438,500	1,510,151	1,547,289
Socialized Vegetable Biomass (SVB)	190,569	147,312	96,234	136,899	135,020	164,358
Reused Biomass (RuB)	0	0	0	0	0	0
Aboveground Un-harvested Biomass (AUhB)	330,472	365,113	338,098	346,726	385,922	399,289
Belowground Un-harvested Biomass (BUhB)	433,070	529,328	546,562	543,066	559,067	569,212
Accumulated Biomass (AB)	285,775	376,927	450,383	411,809	430,142	414,430

Table A1.4. Inputs of N, P and K in Spanish cropland and pastureland (Gg)

	Crop residues			Rainfall N	Free living N fixation	Symbiotic N fixation	Irrigation			Mineral fertilizers			Manure/Excretions			Seeds		
	N	P	K		N	N	N	N	P	K	N	P	K	N	P	K	N	P
Cropland																		
1960	40	8	76	168	41	160	21	0.3	22	274	129	69	237	58	194	17	3	4
1970	37	9	88	189	42	157	25	0.4	26	602	179	180	227	58	192	23	4	5
1980	64	13	142	245	41	178	32	0.5	33	874	188	225	305	72	208	21	4	4
1990	106	18	218	261	40	170	36	0.5	38	1043	225	307	331	82	245	24	4	4
2000	153	21	266	266	37	179	30	0.5	31	1120	263	404	490	121	337	23	4	4
2008	164	22	292	248	35	140	30	0.5	37	884	162	279	528	131	355	30	5	6
No-import	153	21	266	255	37	179	30	0.5	31	1120	263	404	333	82	229	23	4	4
Pastureland																		
1960				131	64	119							219	30	154			
1970				136	60	113							121	17	88			
1980				176	59	110							108	15	76			
1990				186	58	108							169	23	123			
2000				226	62	116							219	30	153			
2008				213	59	111							221	31	152			
No-import				216	62	116							172	24	120			

Table A1.5. Outputs of N, P and K in Spanish cropland and pastureland (Gg)

	Harvest/Grazing			Denitrification	NH ₃ volatilization	Leaching
	N	P	K			
Cropland						
1960	517	83	473	107	92	74
1970	611	98	560	122	115	139
1980	716	115	654	137	148	199
1990	849	136	757	145	165	235
2000	898	144	828	150	199	263
2008	891	144	821	138	185	219
No-import	898	144	828	143	172	251
Pastureland						
1960	273	32	286	74	44	18
1970	90	10	94	66	33	10
1980	68	8	71	64	32	9
1990	73	8	76	65	37	13
2000	125	14	131	72	43	18
2008	117	14	123	69	42	18
No-import	125	14	131	70	39	14