Supplementary Information

Changing global cropping patterns to minimize blue water scarcity in the world's hotspots

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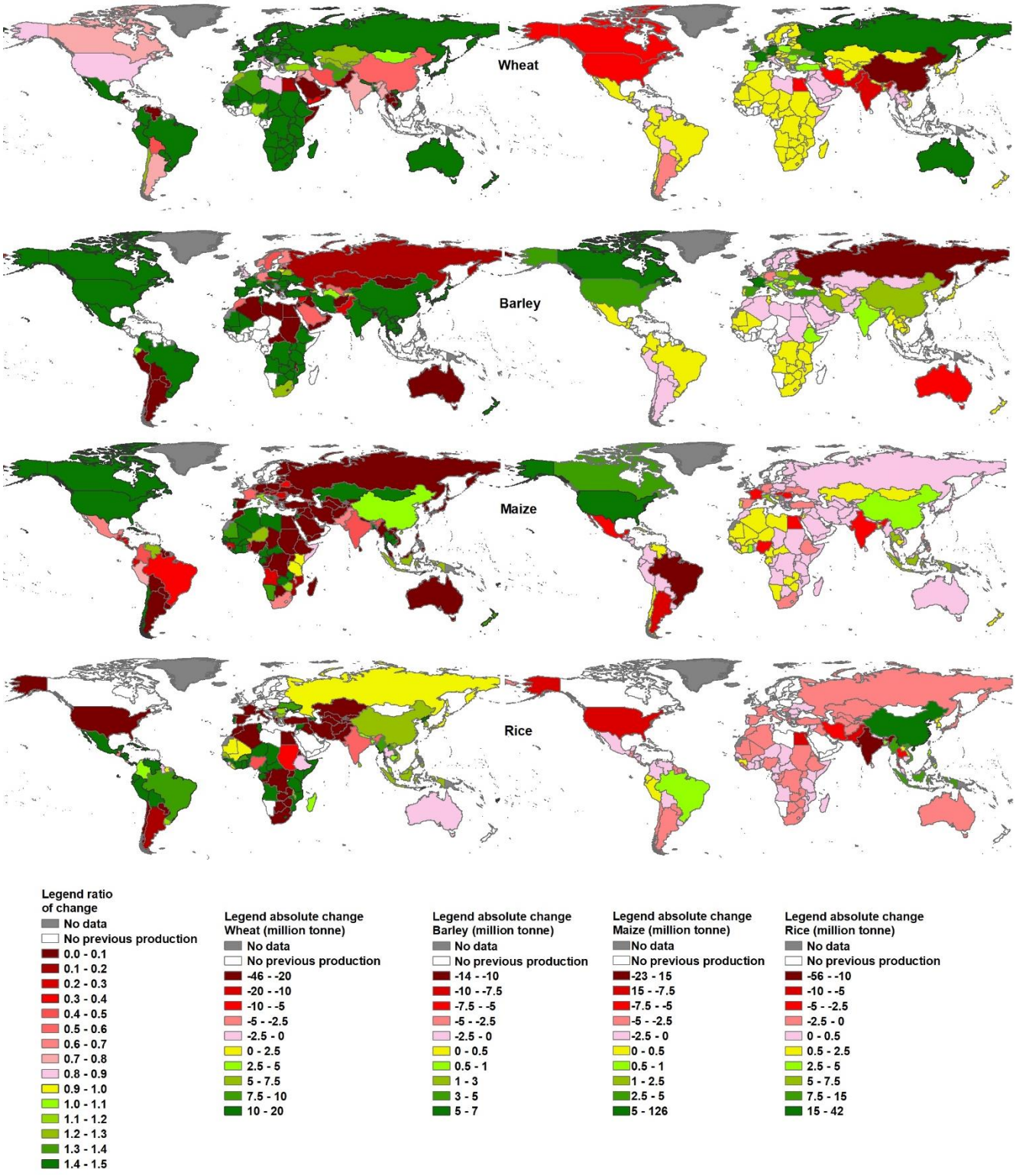
Supplemental Table 1. Change in harvested area per product group per continent in absolute terms (10^6 ha) when shifting from the cropping pattern in the reference period (1996-2005) to the optimised cropping pattern ($\alpha = 1.1$).

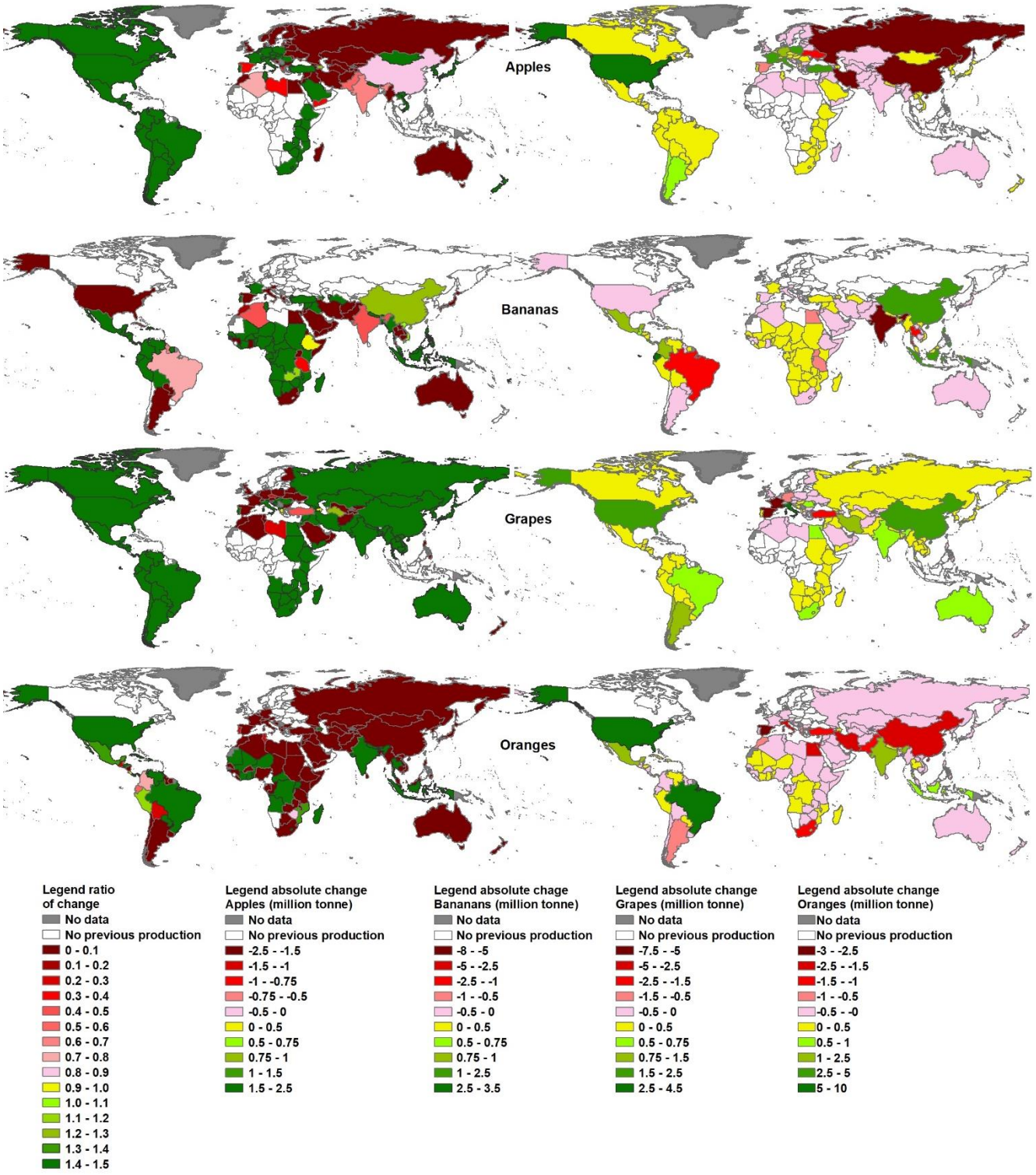
		Cereal	Fibres	Fruits	Nuts	Oil crops	Pulses	Roots	Spices	Stimulants	Sugar crops	Vegetables
Africa	Rainfed	-4.78	-0.04	-0.48	0.11	-4.82	-1.46	-1.43	-0.42	0.45	-0.17	-0.65
	Irrigated	-3.26	-0.24	-0.67	-0.06	-0.75	-0.08	-0.19	-0.04	-0.04	-0.34	-0.31
	Total	**-8.04**	**-0.27**	**-1.16**	**0.05**	**-5.57**	**-1.54**	**-1.62**	**-0.46**	**0.41**	**-0.51**	**-0.96**
Asia	Rainfed	0.75	-3.23	0.52	-0.41	-5.96	-2.45	-0.26	0.13	-0.59	0.22	0.52
	Irrigated	-3.54	-0.16	-0.83	-0.03	-2.48	-1.00	-0.93	-0.09	0.01	-0.22	-1.19
	Total	**-2.79**	**-3.39**	**-0.31**	**-0.44**	**-8.44**	**-3.45**	**-1.20**	**0.03**	**-0.58**	**0.00**	**-0.68**
Europe	Rainfed	3.71	-0.02	-1.16	-0.27	-1.13	-0.08	0.61	-0.03	0.00	-0.52	-1.11
	Irrigated	-0.79	0.05	-0.25	0.00	0.02	-0.07	-0.05	0.00	0.00	0.04	-0.06
	Total	**2.91**	**0.03**	**-1.40**	**-0.27**	**-1.10**	**-0.14**	**0.56**	**-0.03**	**0.00**	**-0.48**	**-1.18**
North America	Rainfed	-5.50	0.31	0.08	-0.01	3.58	0.45	-0.24	0.01	-0.23	0.13	-0.13
	Irrigated	-2.63	0.21	0.20	0.04	0.19	0.06	-0.01	0.00	0.00	-0.42	0.01
	Total	**-8.13**	**0.52**	**0.28**	**0.03**	**3.77**	**0.50**	**-0.25**	**0.01**	**-0.23**	**-0.29**	**-0.13**
Oceania	Rainfed	0.47	0.00	0.00	0.00	-0.21	-0.02	-0.01	0.00	0.00	-0.20	-0.02
	Irrigated	-0.11	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
	Total	**0.36**	**0.04**	**0.01**	**0.00**	**-0.21**	**-0.02**	**-0.01**	**0.00**	**0.00**	**-0.18**	**-0.02**
South America	Rainfed	-3.74	0.17	0.30	-0.51	2.82	0.38	-0.06	0.00	-0.50	0.53	-0.18
	Irrigated	-1.10	0.01	-0.03	0.01	-0.11	0.01	0.01	0.00	-0.12	0.10	-0.04
	Total	**-4.83**	**0.18**	**0.28**	**-0.50**	**2.71**	**0.39**	**-0.05**	**0.00**	**-0.61**	**0.63**	**-0.21**

Supplemental Table 2. Change in production per product group per continent in absolute terms (10^6 t/yr) when shifting from the cropping pattern in the reference period (1996-2005) to the optimised cropping pattern ($\alpha = 1.5$).

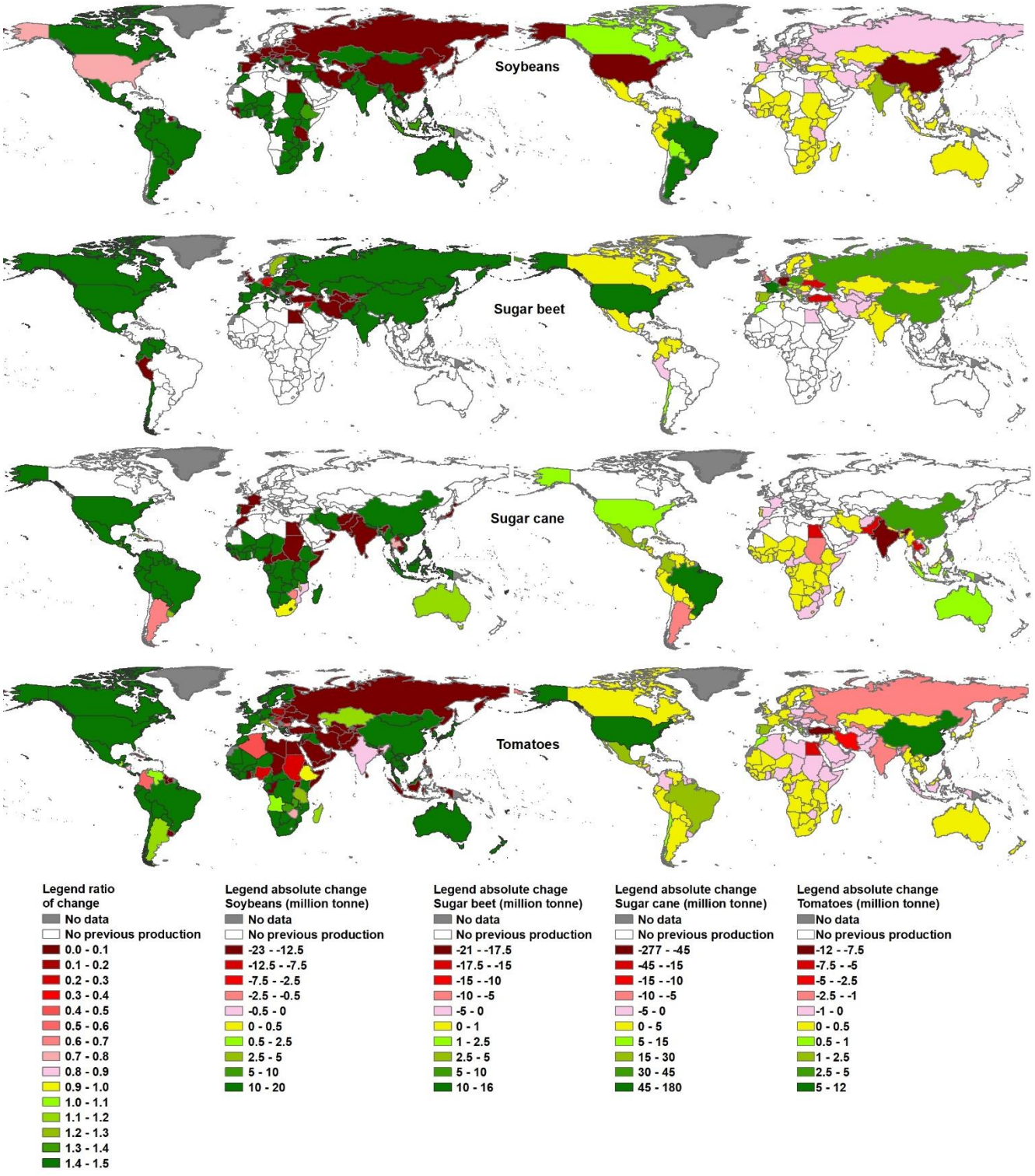
		Cereal	Fibres	Fruits	Nuts	Oil crops	Pulses	Roots	Spices	Stimulants	Sugar crops	Vegetables
Africa	Rainfed	0.4	1.7	6.0	0.2	-7.0	1.8	43.6	-0.1	0.1	11.3	-3.3
	Irrigated	-18.3	-0.9	-10.6	-0.1	-1.4	-0.5	-3.2	-0.1	0.0	-28.9	-13.2
	Total	**-17.9**	**0.8**	**-4.5**	**0.1**	**-8.3**	**1.4**	**40.4**	**-0.2**	**0.1**	**-17.6**	**-16.5**
Asia	Rainfed	15.3	5.8	29.9	0.7	8.2	-0.9	22.3	0.8	0.4	57.7	59.3
	Irrigated	-110.6	-9.7	-53.1	-0.6	-10.1	0.4	13.6	-0.8	-0.5	-326.2	-25.6
	Total	**-95.3**	**-3.8**	**-23.2**	**0.0**	**-1.9**	**-0.5**	**35.9**	**0.0**	**-0.1**	**-268.5**	**33.7**
Europe	Rainfed	48.4	-0.2	-8.1	-0.4	0.0	0.0	-72.3	0.0	0.0	-9.9	-19.8
	Irrigated	-6.7	-0.6	-6.5	-0.1	-1.5	0.3	9.0	0.0	0.0	11.0	1.1
	Total	**41.7**	**-0.8**	**-14.6**	**-0.5**	**-1.5**	**0.3**	**-63.2**	**0.0**	**0.0**	**1.1**	**-18.7**
North America	Rainfed	88.0	2.1	4.3	0.0	-18.6	1.6	2.6	0.0	0.0	41.5	-2.7
	Irrigated	18.7	0.5	20.0	0.5	-8.2	0.4	10.0	0.0	0.0	26.8	6.8
	Total	**106.7**	**2.6**	**24.3**	**0.5**	**-26.8**	**2.0**	**12.6**	**0.1**	**0.0**	**68.3**	**4.1**
Oceania	Rainfed	0.6	0.0	0.2	0.0	0.6	-0.7	0.1	0.0	0.0	-7.8	-0.6
	Irrigated	-0.8	0.7	-0.5	0.0	0.0	0.0	0.6	0.0	0.0	16.1	0.2
	Total	**-0.3**	**0.7**	**-0.3**	**0.0**	**0.6**	**-0.7**	**0.7**	**0.0**	**0.0**	**8.3**	**-0.4**
South America	Rainfed	-35.6	0.5	12.8	-0.1	37.6	-2.5	-29.0	0.0	0.1	160.5	-2.2
	Irrigated	0.7	0.1	5.5	-0.1	0.3	0.1	2.5	0.0	-0.1	48.0	0.0
	Total	**-34.9**	**0.6**	**18.4**	**-0.2**	**37.9**	**-2.4**	**-26.5**	**0.1**	**0.0**	**208.5**	**-2.2**



Supplemental Figure 1. Relative change in production for wheat, barley, maize and rice per country for the case of an optimized cropping pattern with α = 1.5 (maps on the left hand) and absolute change (in 10^6 t/yr) for the same crops (maps on the right hand), all compared to the reference cropping period (period 1996-2005).



Supplemental Figure 2. Relative change in production for apples, bananas, grapes and oranges per country for the case of an optimized cropping pattern with α = 1.5 (maps on the left hand) and absolute change (in 10^6 t/yr) for the same crops (maps on the right hand), all compared to the reference cropping period (period 1996-2005).



Supplemental Figure 3. Relative change in production for soybeans, sugar beet, sugar cane and tomatoes per country for the case of an optimized cropping pattern with α = 1.5 (maps on the left hand) and absolute change (in 10^6 t/yr) for the same crops (maps on the right hand), all compared to the reference cropping period (period 1996-2005).