



*Supplement of*

## **Changing global cropping patterns to minimize national blue water scarcity**

**Hatem Chouchane et al.**

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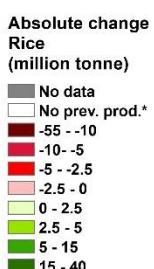
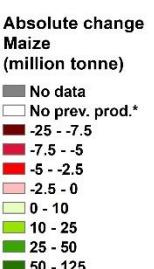
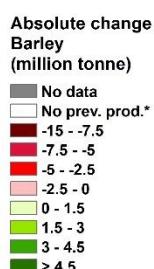
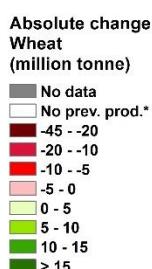
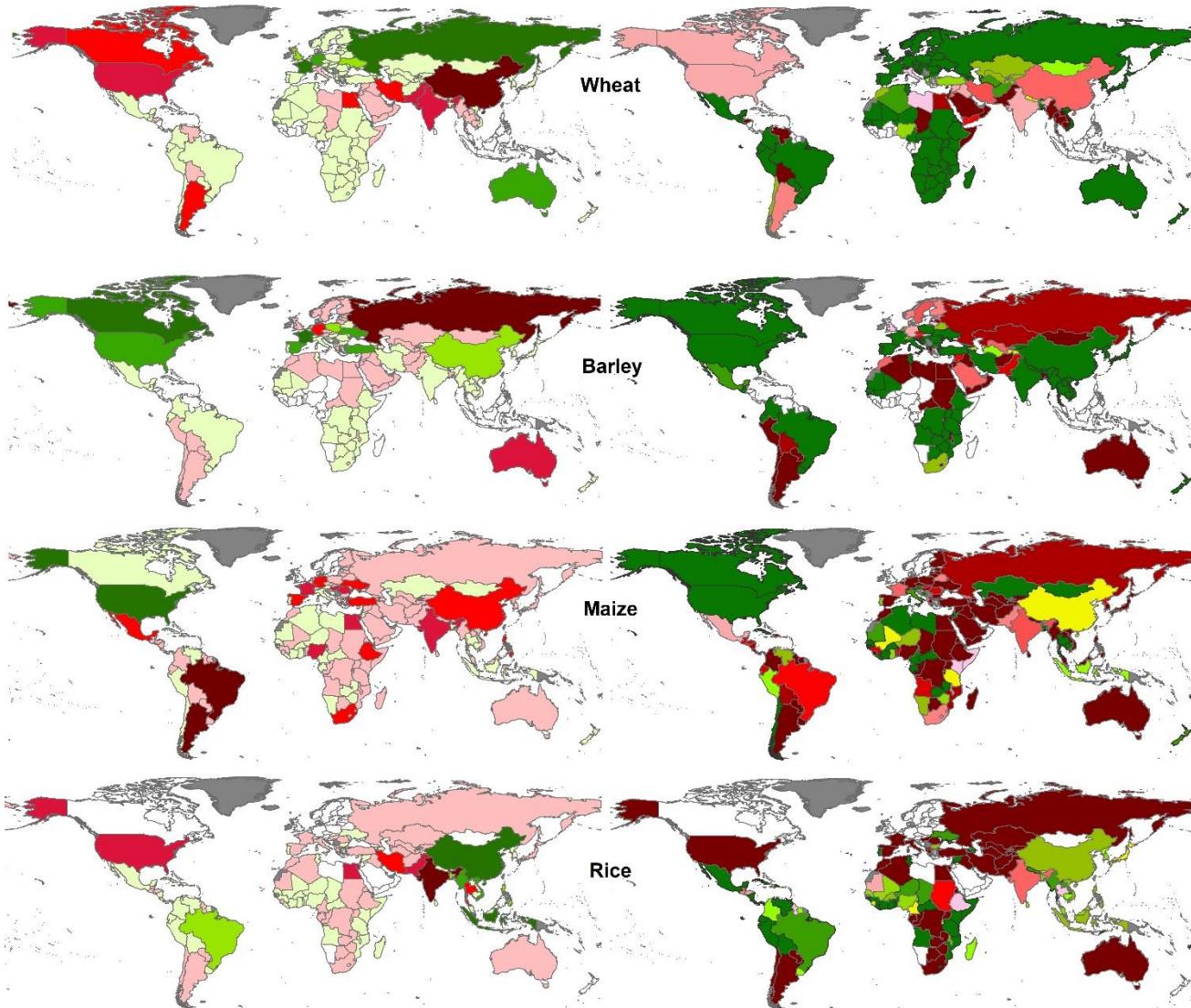
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**Table S1.** Change in harvested area per product group per continent in absolute terms ( $10^6$  ha) when shifting from the cropping pattern in the reference period (1996-2005) to the optimised cropping pattern (with  $\alpha = 1.1$ ).

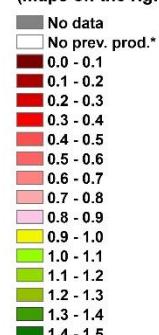
		Cereal	Fibres	Fruits	Nuts	Oil crops	Pulses	Roots	Spices	Stimulants	Sugar crops	Vegetables
Africa	Rainfed	2.6	0.2	0.4	0.1	-2.9	-0.5	-0.4	-0.1	0.6	0.1	-0.3
	Irrigated	-3.0	-0.3	-0.4	0.0	-0.7	-0.1	-0.2	0.0	0.0	-0.2	-0.5
	<b>Total</b>	<b>-0.4</b>	<b>0.0</b>	<b>0.0</b>	<b>0.1</b>	<b>-3.6</b>	<b>-0.6</b>	<b>-0.6</b>	<b>-0.1</b>	<b>0.6</b>	<b>-0.1</b>	<b>-0.7</b>
Asia	Rainfed	1.5	0.9	1.0	-0.5	-1.7	-2.2	-0.1	0.2	-0.4	0.2	1.4
	Irrigated	-9.7	-2.7	-2.2	-0.1	-5.1	-0.3	-0.3	-0.2	-0.2	-1.2	-1.1
	<b>Total</b>	<b>-8.2</b>	<b>-1.8</b>	<b>-1.2</b>	<b>-0.6</b>	<b>-6.8</b>	<b>-2.5</b>	<b>-0.5</b>	<b>0.0</b>	<b>-0.6</b>	<b>-1.0</b>	<b>0.3</b>
Europe	Rainfed	1.3	-0.1	-0.3	0.0	-0.1	-0.2	0.0	0.0	0.0	0.1	-0.8
	Irrigated	0.0	0.1	-0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.1	-0.3
	<b>Total</b>	<b>1.3</b>	<b>0.0</b>	<b>-0.3</b>	<b>0.0</b>	<b>0.1</b>	<b>-0.2</b>	<b>0.1</b>	<b>0.0</b>	<b>0.0</b>	<b>0.2</b>	<b>-1.1</b>
North America	Rainfed	-1.4	0.3	0.1	0.0	1.4	0.4	-0.2	0.0	-0.6	0.2	-0.2
	Irrigated	-0.5	0.2	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.1	-0.1
	<b>Total</b>	<b>-1.9</b>	<b>0.5</b>	<b>0.2</b>	<b>0.0</b>	<b>1.5</b>	<b>0.4</b>	<b>-0.2</b>	<b>0.0</b>	<b>-0.6</b>	<b>0.3</b>	<b>-0.3</b>
Oceania	Rainfed	0.1	0.0	0.0	0.0	0.1	-0.2	0.0	0.0	0.0	0.0	0.0
	Irrigated	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	<b>Total</b>	<b>0.1</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.1</b>	<b>-0.2</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
South America	Rainfed	-2.3	0.2	0.2	-0.2	2.8	0.1	-0.8	0.0	-0.4	0.5	-0.1
	Irrigated	0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
	<b>Total</b>	<b>-2.3</b>	<b>0.2</b>	<b>0.2</b>	<b>-0.3</b>	<b>2.8</b>	<b>0.2</b>	<b>-0.8</b>	<b>0.0</b>	<b>-0.5</b>	<b>0.6</b>	<b>-0.1</b>

**Table S2.** Change in production per product group per continent in absolute terms ( $10^6 \text{ t yr}^{-1}$ ) when shifting from the cropping pattern in the reference period (1996–2005) to the optimised cropping pattern (with  $\alpha = 1.5$ ).

		Cereal	Fibres	Fruits	Nuts	Oil crops	Pulses	Roots	Spices	Stimulants	Sugar crops	Vegetables
Africa	Rainfed	1.5	1.7	5.5	0.2	-7.3	1.7	42.6	-0.1	0.1	11.3	-3.3
	Irrigated	-18.5	-0.9	-10.3	-0.1	-1.4	-0.5	-2.6	-0.1	0.0	-29.8	-13.2
	<b>Total</b>	<b>-17.0</b>	<b>0.8</b>	<b>-4.7</b>	<b>0.1</b>	<b>-8.7</b>	<b>1.3</b>	<b>40.0</b>	<b>-0.2</b>	<b>0.0</b>	<b>-18.5</b>	<b>-16.5</b>
Asia	Rainfed	10.5	5.8	31.8	0.7	8.1	-0.6	22.2	0.9	0.4	57.7	73.9
	Irrigated	-106.5	-9.7	-51.8	-0.6	-10.0	0.4	13.6	-0.8	-0.5	-331.5	-41.4
	<b>Total</b>	<b>-96.0</b>	<b>-3.9</b>	<b>-20.0</b>	<b>0.1</b>	<b>-1.9</b>	<b>-0.2</b>	<b>35.9</b>	<b>0.1</b>	<b>-0.1</b>	<b>-273.8</b>	<b>32.5</b>
Europe	Rainfed	49.6	-0.2	-7.9	-0.3	-0.5	0.0	-68.5	0.0	0.0	-11.1	-17.4
	Irrigated	-5.4	-0.7	-4.5	-0.1	-2.0	0.3	6.2	0.0	0.0	12.3	-0.5
	<b>Total</b>	<b>44.2</b>	<b>-0.9</b>	<b>-12.4</b>	<b>-0.4</b>	<b>-2.5</b>	<b>0.3</b>	<b>-62.3</b>	<b>0.0</b>	<b>0.0</b>	<b>1.1</b>	<b>-18.0</b>
North America	Rainfed	85.1	2.8	4.6	0.0	-17.3	1.7	2.5	0.0	0.0	44.0	-2.5
	Irrigated	20.9	-0.1	10.5	0.5	-8.0	0.5	10.0	0.0	0.0	23.2	7.2
	<b>Total</b>	<b>106.0</b>	<b>2.7</b>	<b>15.1</b>	<b>0.4</b>	<b>-25.3</b>	<b>2.1</b>	<b>12.5</b>	<b>0.0</b>	<b>0.0</b>	<b>67.1</b>	<b>4.7</b>
Oceania	Rainfed	0.6	0.0	0.2	0.0	0.5	-0.7	0.2	0.0	0.0	-6.2	-0.6
	Irrigated	-1.3	0.7	-0.3	0.0	0.0	0.0	0.6	0.0	0.0	7.0	-0.4
	<b>Total</b>	<b>-0.7</b>	<b>0.7</b>	<b>-0.1</b>	<b>0.0</b>	<b>0.5</b>	<b>-0.7</b>	<b>0.8</b>	<b>0.0</b>	<b>0.0</b>	<b>0.8</b>	<b>-1.0</b>
South America	Rainfed	-37.5	0.6	20.0	-0.1	37.6	-2.8	-28.4	0.0	0.2	177.0	-2.2
	Irrigated	1.0	0.0	2.0	-0.1	0.3	0.1	1.6	0.0	-0.1	46.3	0.4
	<b>Total</b>	<b>-36.5</b>	<b>0.6</b>	<b>22.0</b>	<b>-0.2</b>	<b>37.9</b>	<b>-2.8</b>	<b>-26.8</b>	<b>0.1</b>	<b>0.1</b>	<b>223.3</b>	<b>-1.8</b>

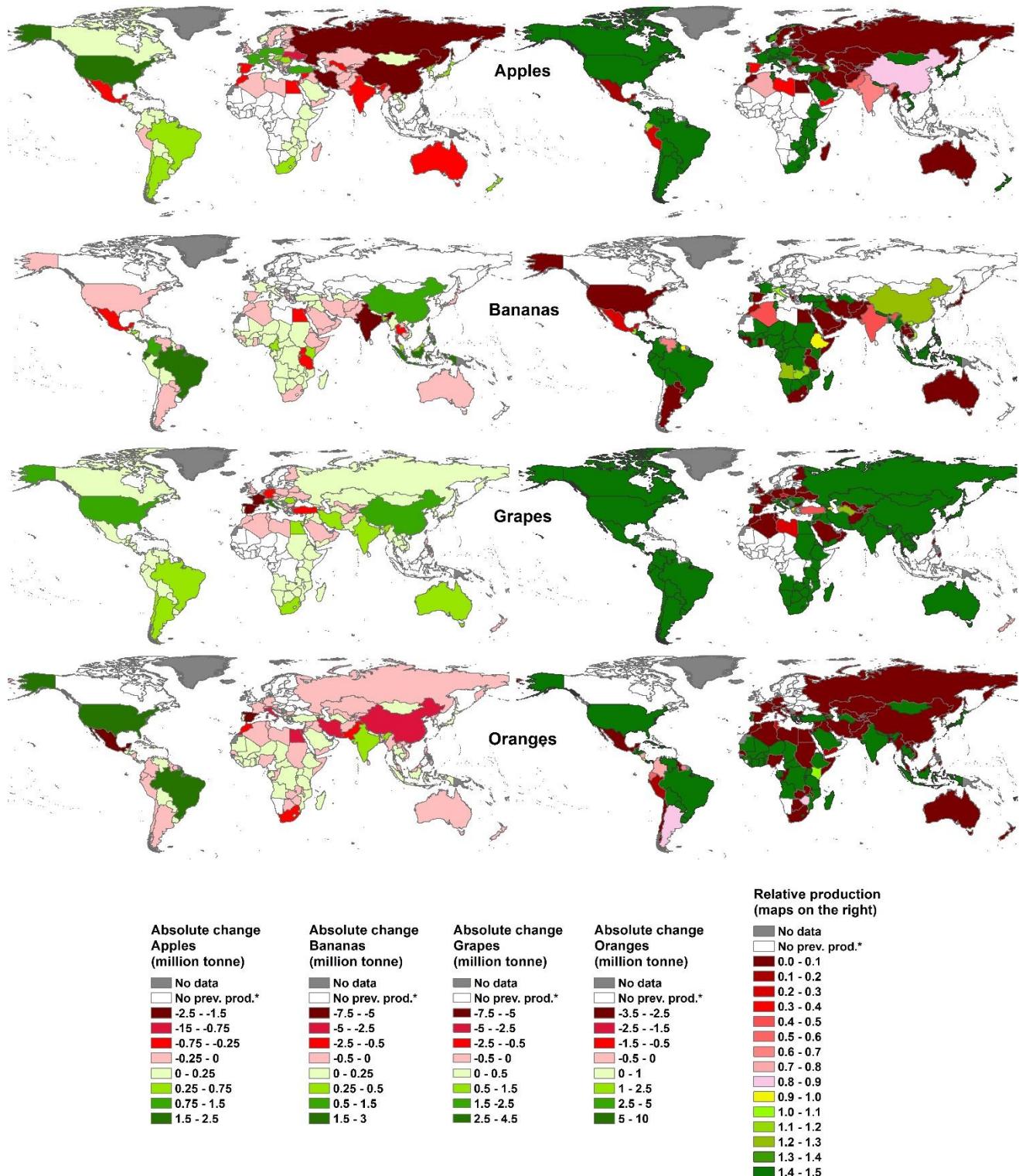


**Relative production  
(maps on the right)**

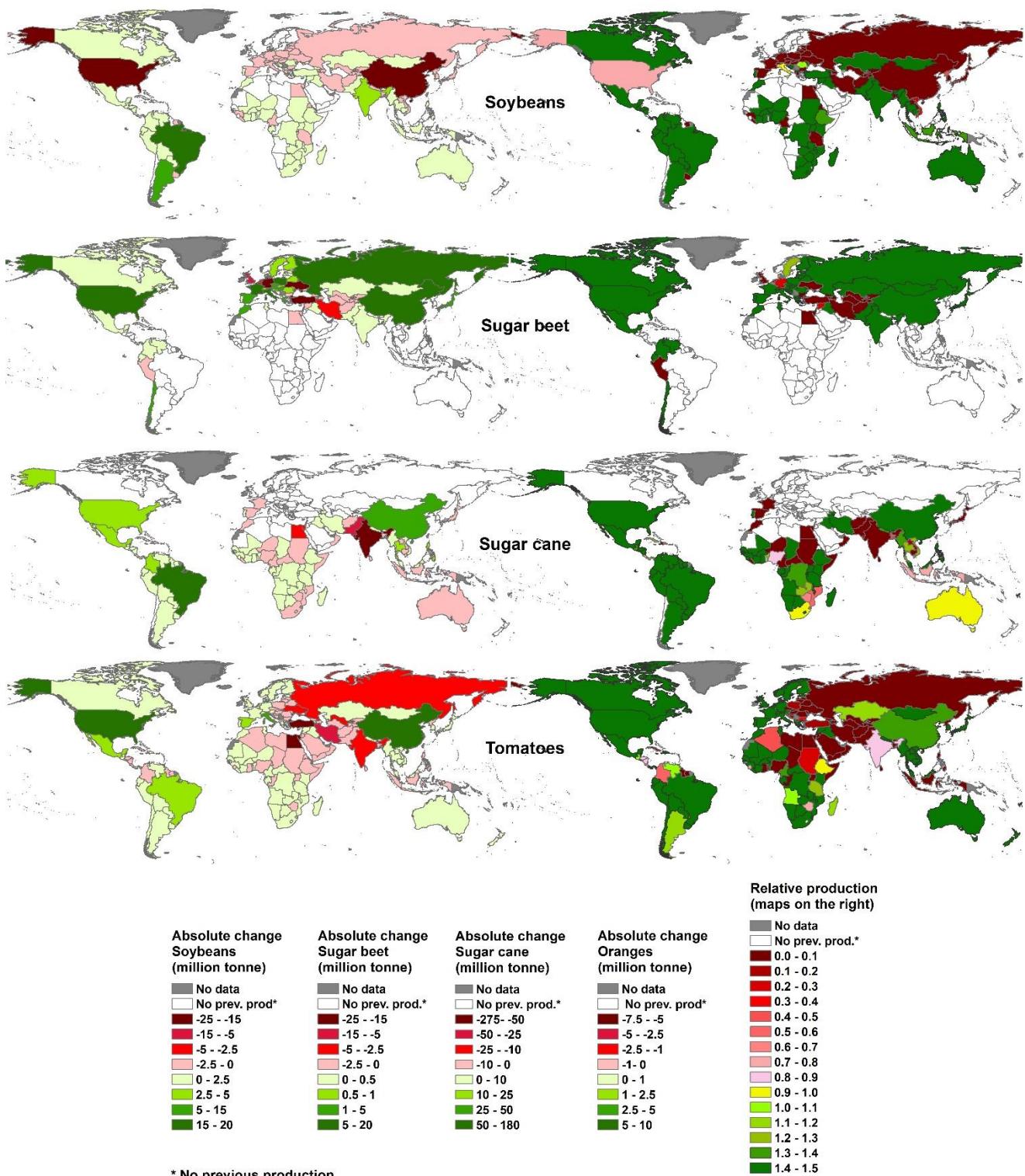


\* No previous production

**Figure S1.** Absolute change in production for wheat, barley, maize and rice per country (in  $10^6 \text{ t yr}^{-1}$ ; maps on the left) and relative production (ratio of production in optimized and reference situation) for the same crops groups for the case of an optimized cropping pattern with  $\alpha=1.5$  (maps on the right), all compared to the reference cropping period (1996-2005). Relative production = 1: no change; relative production < 1: national production is reduced; relative production > 1: national production is expanded.



**Figure S2.** Absolute change in production for apples, bananas, grapes and oranges per country (in  $10^6 \text{ t yr}^{-1}$ ; maps on the left) and relative production (ratio of production in optimized and reference situation) for the same crops groups for the case of an optimized cropping pattern with  $\alpha=1.5$  (maps on the right), all compared to the reference cropping period (1996-2005). Relative production = 1: no change; relative production < 1: national production is reduced; relative production > 1: national production is expanded.



**Figure S3.** Absolute change in production for soybeans, sugar beet, sugar cane and tomatoes per country (in  $10^6 \text{ t yr}^{-1}$ ; maps on the left) and relative production (ratio of production in optimized and reference situation) for the same crops groups for the case of an optimized cropping pattern with  $\alpha=1.5$  (maps on the right), all compared to the reference cropping period (1996-2005). Relative production = 1: no change; relative production < 1: national production is reduced; relative production > 1: national production is expanded.