

Table S1: Overview of yield per crop group from 2016-2019.

crop group	assigned crops (German original class names)	average yield per year in dt ha <sup>-1</sup>				source
		year 1 (2016)	year 2 (2017)	year 3 (2017)	year 4 (2019)	
permanent grassland	Wiesen	59.40	64.90	29.70	40.30	[43–46]
	Mähweiden	59.00	66.00	27.80	35.50	Data available for Northern Saxony
	Weiden und Almen	59.00	66.00	27.80	35.50	
	Hutungen	59.20	65.45	28.75	37.90	Average value of „Wiesen“ (meadow/ grassland) and „Mähweiden“ (mowing meadow)
	Streuobstfläche mit Grünlandnutzung	59.20	65.45	28.75	37.90	
	Nicht DZ-beihilfefähige Hutungen	59.20	65.45	28.75	37.90	
	Stilllegung für Naturschutz und Landschaftspflege (5-Jahresprogramm) (auf GL)	59.20	65.45	28.75	37.90	
	nach Art. 22 bis 24 der VO (EG) Nr. 1257/99 stillgelegte Dauergrünlandfläche	59.20	65.45	28.75	37.90	
	Dauergrünland aus der Erzeugung genommen iSd. Art. 4 Abs. 1 Buchst. c) ii) VO 1307/2013	59.20	65.45	28.75	37.90	
	Grünland ohne landw. Nutzung	59.20	65.45	28.75	37.90	
Set-aside	Vorübergehende, unbefestigte Mieten, Stroh-, Futter- oder Dunglagerplätze auf DGL	59.20	65.45	28.75	37.90	average value based on data in [50, 51]
	Stilllegung für Naturschutz und Landschaftspflege (5-Jahresprogramm) (auf AL)	100.0	100.0	100.0	100.0	
	nach Art. 22 bis 24 der VO (EG) Nr. 1257/99 stillgelegte Ackerfläche	100.0	100.0	100.0	100.0	
	Blühfläche (MSL-Maßnahme)	100.0	100.0	100.0	100.0	
	Brache mit Einsaat von einjährigen Blühmischungen	100.0	100.0	100.0	100.0	
	Ackerland aus der Erzeugung genommen iSd. Art. 4 Abs. 1 Buchst. c) ii) VO 1307/2013	100.0	100.0	100.0	100.0	
	Bienenweide pollen- und nektarreiche Arten - einjährig	100.0	100.0	100.0	100.0	
	Bienenweide pollen- und nektarreiche Arten - mehrjährig	100.0	100.0	100.0	100.0	
Wheat	Winter-Emmer/ -Einkorn	81.20	75.10	65.40	70.70	[43–46]
	Winterhartweizen/Durum	55.20	50.70	41.00	52.50	Data available for Saxony
	Sommerhartweizen/Durum	55.20	50.70	41.00	52.50	
	Sommerweichweizen	52.10	54.10	39.30	45.60	
	Winterweichweizen	81.20	75.10	65.40	70.70	
Sugar beets	Zuckerrüben	639.9	773,7	424,9	555,5	[43–46] Data available for Northern Saxony
Barley	Wintergerste	79.20	70,10	58,00	64,80	
	Sommergerste	56.30	49,20	23,20	44,40	
Maize	Silomais (als Hauptfutter)	377.4	430,2	211,0	256,50	
	Mais (ohne Silomais)	79.60	91,50	46,20	55,70	
Rapeseed	Winterraps	37.50	32.80	26.90	29.20	
	Sudangras	468.0	443.0	286.0	338.5	
	Ackergras	468.0	443.0	286.0	338.5	

<b>Grass and clover</b>	Kleegras	447.5	412.0	284.0	314.5	Calculation for Freshmatter: multiplied with factor 5 based on [47], For control purpose: [48]
	Klee-Luzerne-Gemisch	447.5	412.0	284.0	314.5	
	Rot-/Weiß-/Alexandrinier-/Inkarnat-/Erd-/Schweden-/Persischer Klee	447.5	412.0	284.0	314.5	
	Luzerne, Hopfenklee/Gelbklee, Bastardluzerne/Sandluzerne	447.5	412.0	284.0	314.5	
	Luzerne-Gras	447.5	412.0	284.0	314.5	
<b>Triticale</b>	Wintertriticale	57.10	51.4	34.40	44.70	[43–46]
	Sommertriticale	57.10	51.4	34.40	44.70	Data available for Northern Saxony
<b>Oats</b>	Winterhafer	47.60	44.60	25.90	32.30	
	Sommerhafer	47.60	44.60	25.90	32.30	
<b>Rye</b>	Winterroggen	58.90	50.90	47.40	53.30	
	Winterroggen, Winter-Waldstaudenroggen	58.90	50.90	47.40	53.30	
	Sommerroggen	58.90	50.90	47.40	53.30	
	Sommerroggen, Sommer-Waldstaudenroggen	58.90	50.90	47.40	53.30	
<b>other arable crops</b>	Gemenge Leguminosen / Getreide	89.50	82.40	56.80	62.90	
	Sonnenblumen	23.80	24.70	14.90	16.30	[43–46], Data available for Saxony;
	Sojabohnen	24.30	31.20	8.40	18.40	Calculation of dt/ha for vegetables:
	Gemüse	134.8	142.6 4	84.06	101.98	"Gemüse insgesamt"/ Anbaufläche insgesamt
	Weißer Senf, Gelber Senf	40.00	40.00	40.00	40.00	[49]
	Gemüse-Kürbisgewächse	174.2	179.3	141.7	162.70	[43–46]
	Möhre (Möhre/Karotte, Futtermöhre)	420.0	540.9	351.0	300.20	Data available for Saxony
	Vorübergehende, unbefestigte Mieten, Stroh-, Futter oder Dunglagerplätze (AL)	59.20	65.45	28.75	37.90	see permanent grassland
<b>Legumes</b>	Körnererbsen	35.01	35.69	22.4	21.42	[43–46]
	Gemüseerbse	35.01	35.69	22.40	21.42	Data available for Northern Saxony
	Ackerbohne/Puffbohne/Pferdebohne/Dicke Bohne	35.01	35.69	22.40	21.42	Calculation: weighted average of the values of "Erbsen" and „Ackerbohnen“
	Wicken D	35.01	35.69	22.40	21.42	
	Lupinen (Süßlupine, weiße Lupine, blaue/schmalblättrige Lupine, gelbe Lupine, Anden-Lupine)	35.01	35.69	22.40	21.42	
	Erbsen/Bohnen	35.01	35.69	22.40	21.42	
	Serradella (auch Vermehrung)	35.01	35.69	22.40	21.42	
<b>Potatoes</b>	Stärkekartoffeln	389.3	422.9	235.6	319.1	[43–46]
	Kartoffeln	389.3	422.9	235.6	319.1	Data available for Northern Saxony
	Gemüse-Nachtschattengewächse	775.0 0	830.0 0	620.0 0	560.00	[43–46] Data available for Saxony; average value for pepper and tomato
<b>Other roots and tubers</b>	Futterrübe/Runkelrübe	287.9	457.1	335.1	382.3	[43–46]
	Mangold, Rote Beete/Rote Rübe					Data available for Saxony
		287.9	457.1	335.1	382.3	
<b>Other cereals</b>	Winter-Dinkel	81.20	75.10	65.40	70.70	
	Sommernenggetreide	33.30	39.20	24.80	25.60	

Table S2: Overview of management data (area shares) per crop group from 2016-2019 (for sources please refer to the descriptions in text).

Crop group	Average % of total area	Area with reduced tillage		Area with organic manure		Area with mineral fertilizer	Irrigat ed area	Area with crop residues incorporated
		2016	2018	liquid	solid			
Barley	14.22%	52.0%	52.0%	32.9%	10.7%	71%	-	80%
Grass and clover	2.37%	60.9%	61.9%	32.9%	10.7%	71%	-	80%
Legumes	1.56%	60.9%	61.9%	32.9%	10.7%	71%	-	80%
Maize	8.60%	60.0%	60.0%	32.9%	10.7%	71%	-	70%
Oats	0.66%	60.9%	61.9%	32.9%	10.7%	71%	-	80%
other arable crops	0.25%	60.9%	61.9%	32.9%	10.7%	71%	100%	70%
Other cereals	0.36%	60.9%	61.9%	32.9%	10.7%	71%	-	80%
Other roots and tubers	0.01%	60.9%	61.9%	32.9%	10.7%	71%	-	80%
Permanent grassland	14.44%	100.0%	100.0%	32.9%	10.7%	71%	-	80%
Potatoes	0.39%	60.9%	61.9%	32.9%	10.7%	71%	100%	80%
Rapeseed	14.42%	63.4%	63.4%	32.9%	10.7%	71%	-	70%
Rye	6.31%	66.7%	66.7%	32.9%	10.7%	71%	-	80%
Set-aside	8.47%	100.0%	100.0%	0.0%	0.0%	0%	-	80%
Sugar beets	1.70%	50.0%	50.0%	32.9%	10.7%	71%	100%	80%
Triticale	6.88%	60.9%	61.9%	32.9%	10.7%	71%	-	80%
Wheat	19.37%	51.3%	51.3%	32.9%	10.7%	71%	-	80%

Table S3: Overview of the input data for manure and fertilizer (for sources please refer to descriptions in text).

Type of fertilizer	Name in CCB model	Amount in dtFM ha <sup>-1</sup>				Area
<i>Organic fertilizer</i>		2016	2017	2018	2019	all years
slurry (cattle)	cattle slurry 10%dm	122.48	120.26	121.13	118.58	32.9%
slurry (pig)	slurry(pig)	75.06	74.32	80.82	74.34	32.9%
liquid manure (cattle, pigs)	liquid manure	32.11	31.73	32.67	31.39	32.9%
manure (cattle)	fresh cattle manure	363.35	356.20	358.89	351.50	10.7%
manure (pigs, sheeps, goats, equids)	manure compost	248.01	245.21	266.05	245.21	10.7%
manure (chicken)	chicken manure (dry)	17.00	16.52	16.05	15.58	10.7%
manure (turkey)	turkey manure	4.76	4.56	4.37	4.17	10.7%
<i>Mineral fertilizer</i>		2018, in kgN ha <sup>-1</sup>				
anorganic N-input on field	Calcium Ammonium Nitrate		19.216			70.6%

Table S4: Overview of the development of the parameters in the four scenarios (for sources please refer to descriptions in text).

AMP	Parameter	BaU	trend	Sc3 (final value)		Notes
cultivated crops	Crop type area	Grass and clover	2.2%	↑	6.0%	Grass and clover and Legumes replace maize
		Legumes	2.2%		5.8%	
		Maize	9.5%	↓	0%	
		Barley	14.9%	↓	12.6%	Each field has marginal strips
		Oats	0.5%		0.4%	
		other arable crops	0.1%		0.1%	
		other cereals	0.1%		0.1%	
		other roots and tubers	0.0%		0.0%	
		permanent grassland	14.3%		10.3%	
		potatoes	0.2%		0.2%	
		rapeseed	15.2%		12.9%	
		rye	6.0%		5.1%	
		set-aside	7.4%		8.1%	
		sugar beets	1.0%		0.8%	
		triticale	7.1%		6.0%	
		wheat	19.4%		16.5%	
		Marginal strips	0%	↑	15.28%	Marginal strips are introduced in Sc1; Cultivated with respective shares of barley, oats, other cereals, rye, triticale, wheat
	Crop yield on marginal strips	barley	67.34	↓	40.40	Values from BaU scenario belong to normal fields, marginal strips introduced in Sc1 with same yield amount as in Sc3
		oats	37.60		22.56	
		other cereals	72.50		43.50	
		rye	52.63		31.58	
		triticale	46.90		28.14	
		wheat	72.90		43.74	
Reduced tillage	Area with reduced tillage	Wheat	51.32%	↑	100%	Gradual change throughout scenarios
		Barley	52.00%			
		Rapeseed	63.40%			
		Maize	60.00%			
		Sugar Beet	66.70%			
		Rye	66.70%			
		Set-aside	100%			
		permanent grassland	100%			
		marginal strips	-			
		all other	61.39%			
crop residues and by-products	Area with crop residues left on the field	rapeseed, other arable crops	70%	↑	100%	Gradual change throughout scenarios
		marginal strips	-	↑		change from Sc1 on
		all other	80%	↑		Gradual change throughout scenarios
fertilizer management	Area with fertilizer (only for legumes, grass and clover)	org. liquid	32.86%	↓	0%	Gradual change throughout scenarios
		org. solid	10.68%			
		mineral	70.60%			
	amount	Fertilizer type	In dt/ha	↓	Normal fields	Marginal strips

cattle_slurry 10%dm	120.61	105.5	30.2
liquid Manure	31.98	28.0	6.4
fresh cattle manure	357.48	312.8	89.4
slurry(pig)	76.14	66.6	19.0
manure compost	251.12	219.7	62.8
chicken manure (dry)	16.29	14.3	4.1
turkey manure	4.46	3.9	1.1
mineral (in kgN ha <sup>-1</sup> )	19.216	16.8	4.8