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# Calibrating Agro-Hydrological Model under Grazing Activities and its Challenges and Implications.

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## Supplementary Materials

Table S1. Planting schedule for watersheds 1 and 8 including plant populations (plants/m<sup>2</sup>), as reported in Nelson et al. [1,2]

Table S2. Fertilizer application schedule for watersheds 1 and 8, including species and applicate rates (kg/ha) as reported in Nelson et al. [1,2]

Table S3. Pesticides application schedule for watersheds 1 and 8, including species and applicate rates (kg/ha), as reported in Nelson et al. [1,2]

Table S4. Grazing schedule watersheds 1 and 8, as reported in Nelson et al. [1,2]

Table S5. APEX crop database for the crops in WRE [3,4]

Table S6. Fertilizers applied in WRE watersheds during the monitoring period and implied characteristics in the APEX database [3,4]

Table S7. Pesticides applied in WRE watersheds during the monitoring period and implied characteristics in the APEX database [3,4]

Table S8. Grazer characteristics for the WRE watersheds during the monitoring period and implied characteristics in the APEX database [3–5]

Table S9. Calibrated APEX parameters for native prairie (WRE1) and cropland (WRE8) for surface runoff, implied by maximum NSE and COD and absolute PBIAS. Refer to Table 2 for the definition of parameters.

Table S10. Annual average of selected response variables, including environmental indicators in grassland (WRE1), implied by the calibrated parameter set and respective changes in % with respect to grazing operations during calibration (1983–1995) and validation (1996–2000) periods, implied by four different best metrics. Values in gray-shaded cells refer to decreased response variables after grazing.

Table S11. Annual average of selected response variables, including environmental indicators in cropland (WRE8), implied by calibrated parameter set and respective changes in % with respect to grazing operations during calibration (1982–1994) and validation (1995–2000) periods, implied by four different best metrics. Values in gray-shaded cells refer to decreased response variables after grazing.

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**Table S1.** Planting schedule for watersheds 1 and 8 including plant populations (plants/m<sup>2</sup>) as reported in Nelson et al. [1,2]

Watershed	Planting Date	Crop	Plant population (plants/m <sup>2</sup> )
WRE1	1/1/1979	Pasture	3000
	Total		3000
WRE8	9/11/1978	Winter wheat	210.97
	10/3/1979	Winter wheat	316.91
	3/10/1980	Winter wheat	316.91
	4/12/1981	Winter wheat	316.91
	10/6/1982	Winter wheat	316.91
	3/2/1983	Oats	714.00
	11/17/1983	Winter wheat	316.91
	10/23/1984	Winter wheat	316.91
	12/23/1985	Winter wheat	422.55
	10/31/1986	Winter wheat	316.91
	10/9/1987	Winter wheat	316.91
	10/26/1988	Winter wheat	316.91
	9/29/1989	Winter wheat	316.91
	10/5/1990	Winter wheat	316.91
	10/2/1992	Winter wheat	316.91
	10/12/1993	Winter wheat	422.55
	10/11/1994	Winter wheat	422.55
	10/24/1995	Winter wheat	422.55
	12/16/1996	Winter wheat	422.55
	9/19/1997	Winter wheat	422.55
	9/4/1998	Winter wheat	422.55
	10/11/1999	Winter wheat	316.91
	Total		7288.68

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**Table S2.** Fertilizer application schedule for watersheds 1 and 8, including species and application rates (kg/ha) as reported in Nelson et al. [1,2]

Watershed	Fertilizer brand	Date of Application	Rate of Application (kg/ha)
WRE1	33.5-00-00	3/31/1980	145.71
	12-50-00	3/31/1980	56.04
	34-00-00	5/7/1982	168.13
	34-00-00	4/26/1983	168.13
	33-00-00	5/30/1985	168.13
	Total		706.14
WRE8	34-00-00	1/1/1978	244.79
	00-46-00	10/24/1978	81.60
	34-00-00	10/24/1978	244.79
	16-20-06	9/12/1979	336.26
	34-00-00	9/25/1980	224.17
	18-46-00	9/15/1981	112.09
	34-00-00	9/15/1981	112.09
	34-00-00	3/9/1982	224.17
	18-46-00	9/17/1982	112.09
	34-00-00	9/17/1982	112.09
	34-00-00	11/15/1982	224.17
	34-00-00	5/1/1983	112.09
	34-00-00	3/22/1984	112.09
	18-46-00	9/1/1984	112.09
	34-00-00	3/19/1985	224.17
	34-00-00	11/22/1985	112.09
	10-20-10	11/22/1985	112.09
	46-00-00	10/17/1986	112.09
	46-00-00	3/6/1987	84.06
	18-46-00	10/18/1988	112.09
	46-00-00	3/14/1989	168.13
	46-00-00	9/26/1989	140.11
	18-46-00	9/26/1989	112.09
	46-00-00	9/14/1990	140.11
	46-00-00	2/28/1991	112.09
	10-20-10	9/27/1991	112.09
	46-00-00	3/10/1992	112.09
	46-00-00	3/10/1993	112.09
	18-46-00	10/5/1993	112.09
	46-00-00	10/5/1993	112.09
	46-00-00	3/18/1994	112.09
	46-00-00	3/10/1995	112.09
	46-00-00	10/17/1995	112.09
	Nitrogen	3/19/1997	34.75
	Nitrogen	3/11/1999	34.75
	Urea	10/28/1999	51.56
	Total		4811.36

44  
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**Table S3.** Pesticides application schedule for watersheds 1 and 8, including species and application rates (kg/ha), as reported in Nelson et al. [1,2]

Watershed	Pesticide brand	Date of application	Rate of application (kg/ha)
WRE1	Grazon	5/29/1985	0.58
	Grazon	5/19/1999	1.17
	2-4D	5/19/1999	1.17
	Total		2.91
WRE8	Glean	3/22/1985	0.19
	MCP (2-4D MCPA)	4/16/1985	1.68
	Landmaster	6/18/1987	2.93
	Ammonium Sulphate	6/18/1987	19.05
	Activator	6/18/1987	2.34
	MCPA	4/11/1988	0.84
	Landmaster BW	7/18/1989	3.78
	Glean	2/24/1990	0.02
	Salvo (2-4D)	2/24/1990	0.28
	Glean	2/15/1990	0.02
	Salvo (2-4D)	2/15/1990	0.22
	Landmaster BW	7/27/1995	3.78
	Dimethaoter	3/19/1997	0.90
	Finnesse	3/19/1997	0.01
	2-4D	3/19/1997	0.01
	Roundup Ultra	5/13/1999	1.12
	Weeder 64 (2-4D)	5/13/1999	1.12
	Roundup	5/13/1999	0.28
	Roundup	6/29/1999	0.28
	Roundup Ultra	8/8/1999	1.68
	Total		40.56

**Table S4.** Grazing schedule watersheds 1 and 8, as reported in Nelson et al. [1,2]

51

Watershed	Animal species	Numbers of cattle	Grazing schedule		
			Start date	Stop date	Days
WRE1	Calves	16	2/26/1979	3/30/1979	33
	Calves	6	6/25/1981	7/21/1981	27
	Calves	6	8/18/1981	9/16/1981	30
	Cows	10	7/31/1984	9/17/1984	49
	Calves	6	6/15/1986	7/9/1986	25
	Mature cows	8	7/13/1987	9/21/1987	71
	Mature cows	8	6/13/1988	7/7/1988	25
	Mature cows	8	6/8/1989	8/4/1989	58
	Mature cows	8	8/24/1989	9/11/1989	19
	Mature cows	8	6/4/1990	7/9/1990	36
	Mature cows	8	9/24/1990	10/1/1990	8
	Mature cows	8	6/4/1991	7/9/1991	36
	Mature cows	8	6/15/1992	7/6/1992	22
	Mature cows	9	10/1/1992	11/20/1992	51
	Stockers	16	8/15/1997	9/2/1997	19
	Stockers	16	7/7/1998	7/13/1998	7
	Stockers	4	6/11/1999	9/22/1999	104
	Total	153			620
WRE8	Calves	4	12/15/1978	2/16/1979	64
	Bulls	4	4/1/1979	4/15/1979	15
	Yearlings	4	5/20/1979	6/3/1979	15
	Heifers	15	5/8/1983	6/6/1983	30
	Calves	12	9/8/1987	9/29/1987	22
	Stockers	49	5/12/1998	5/21/1998	10
	Stockers	2	12/1/1998	4/21/1999	142
	Stockers	4	12/3/1998	4/21/1999	140
	Stockers	6	3/11/1999	4/21/1999	42
	Total	100			480

52

Table S5. APEX crop database for the crops in WRE [3,4]

53

Crop characteristics	Crops		
Crop number used in APEX database	187	10	16
Unit planted in	WRE1	WRE8	WRE8
Acronym of crop	PAST	WWHT	OATS
Full name of crop	PASTURE	WINTER WHEAT	OATS
Biomass-Energy Ratio (CO <sub>2</sub> =330ppm)	35.000	35.000	35.000
Harvest Index	0.020	0.450	0.420
Optimal temperature for plant growth	25.000	15.000	15.000
Minimum temperature for plant growth	8.000	0.000	0.000
Maximum potential leaf area index	5.000	6.000	6.000
Fraction of growing season when leaf area declines	0.990	0.600	0.800
First point on optimal leaf area development curve	15.010	15.010	15.010
Second point on optimal leaf area development curve	50.950	50.950	50.950
Leaf area index decline rate parameter	1.000	1.000	1.000
Biomass-energy ratio decline rate parameter	1.000	1.000	1.000
Aluminum tolerance index	2.000	2.000	2.000
Maximum Stomatal Conductance	0.007	0.007	0.007
Critical aeration factor	0.850	0.850	0.850
Seeding rate	5.000	90.000	90.000
Maximum crop height	1.000	1.000	1.000
Maximum root depth	2.000	2.000	2.000
CO <sub>2</sub> Concentration /Resulting WA value (Split Variable)	660.400	660.470	660.470
Fraction of nitrogen in yield	0.015	0.025	0.032
Fraction of phosphorus in yield	0.002	0.003	0.006
Fraction of potassium in yield	0.016	0.004	0.005
Lower limit of harvest index	0.010	0.210	0.210
Pest (insects and disease) factor	0.600	0.600	0.600
Seed cost (\$ kg <sup>-1</sup> )	0.690	0.260	0.030
Price for yield (\$t <sup>-1</sup> )	20.000	153.620	124.030
Price for forage yield (\$ t <sup>-1</sup> )	5.000	20.000	20.000
Fraction water in yield	0.100	0.120	0.100
Nitrogen uptake parameter (N fraction in plant at emergence)	0.022	0.060	0.058
Nitrogen uptake parameter (N fraction in plant at 05 maturity)	0.013	0.023	0.022
Nitrogen uptake parameter (N fraction in plant at maturity)	0.010	0.013	0.013
Phosphorus uptake parameter (P fraction in plant at emergence)	0.004	0.008	0.005
Phosphorus uptake parameter (P fraction in plant at 05 maturity)	0.002	0.003	0.002
Phosphorus uptake parameter (P fraction in plant at maturity)	0.002	0.002	0.001
Potassium uptake parameter (K fraction in plant at emergence)	0.028	0.023	0.028
Potassium uptake parameter (K fraction in plant at05 maturity)	0.016	0.020	0.020
Potassium uptake parameter (K fraction in plant at maturity)	0.012	0.017	0.012
Wind erosion factor for standing live	3.390	3.390	3.390
Wind erosion factor for standing dead	3.390	3.390	3.390
Wind erosion factor for flat residue	3.390	1.610	1.610
Crop category number	6	5	5
First point on frost damage curve	5.050	5.010	5.010
Second point on frost damage curve	15.950	15.100	15.100

Crop characteristics		Crops	
Parameter relating vapor pressure deficit to WA	7.000	6.000	7.000
Threshold VPD (KPA)	0.500	0.500	0.500
VPD value (KPA)	4.750	4.750	4.750
Fraction of root weight at emergence	0.400	0.400	0.400
Fraction of root weight at maturity	0.200	0.200	0.200
Heat Units required for Germination	100.000	100.000	100.000
Plant Population for Crops & Grass-1st Point on curve	22.500	125.600	125.600
Plant Population for Crops & Grass - 2nd Point on curve	40.710	250.950	250.950
Salinity effects on yield	0.040	0.070	0.070
Salinity threshold	2.800	6.000	8.000
Lignin fraction in plant at 05 maturity	0.010	0.010	0.010
Lignin fraction in plant at full maturity	0.100	0.100	0.100
Water use conversion to biomass (t/mm)	0.000	0.000	0.000
Fraction turnout for cotton	0.000	0.000	0.000
Fraction lint for cotton	0.000	0.000	0.000
Indeterminate crop growth*	0.000	0.000	0.000
Root decay as a percentage of the total root (belowground) biomass	0.002	0.002	0.002
Light extinction coefficient	0.000	0.000	0.000

**Table S6.** Fertilizers applied in WRE watersheds during monitoring period and implied character-istics in the APEX database [3,4]

ID	FTNM	FN	FP	FK	FNO	FPO	FNH3	FOC	FSLT	FCST
3	00-45-00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	12-20-00	0.12	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	12-50-00	0.12	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	16-20-00	0.16	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.28
33	18-46-00	0.18	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.27
60	33.5-00-00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22
61	34-00-00	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29
66	46-00-00	0.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31
92	ELEM-N	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24
126	UREA	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
129	10-20-10	0.10	0.09	0.08	0.00	0.00	0.00	0.00	0.00	0.27

ID	Fertilizer ID number	57
FTNM	Fertilizer name	58
FN	Mineral N fraction	59
FP	Mineral P fraction	60
FK	Mineral K fraction	61
FNO	Organic N fraction	62
FPO	Organic P fraction	63
FNH3	Ammonia N fraction	64
FOC	Organic C fraction	65
FSLT	Salt fraction	66
FCST	Cost of Fertilizer (\$/kg)	67
		68



**Table S7.** Pesticides applied in WRE watersheds during the monitoring period and implied characteristics in the APEX database [3,4]

ID	PSTN	PSOL	PHLS	PHLF	PWOF	PKOC	PCST
1	2,4-D	1000.00	10.00	9.00	0.40	74.00	0.00
120	Glean	7000.00	160.00	30.00	0.80	40.00	0.00
204	Roundup	900000.00	47.00	2.50	0.60	24000.00	0.00
290	Landmaster	12000.00	249.00	0.00	0.00	0.00	0.00
291	Ammonia Sulfate	744000.00	0.00	0.00	0.00	0.00	0.00
292	MCPA	825.00	24.00	0.00	0.00	0.00	0.00
293	Landmaster BW	45000.00	249.00	0.00	0.00	0.00	0.00
294	Grazon P+D	900.00	513.00	40.00	0.00	0.00	0.00
295	Salvo	45000.00	6.20	0.00	0.00	0.00	0.00
296	Finesse	12500.00	320.00	0.00	0.00	0.00	0.00
297	Dimethoate	25.00	4.00	0.00	0.00	0.00	0.00
299	Roundup Ultra	1010000.00	249.00	133.00	0.00	0.00	0.00
300	Activator	2000.00	488.00	60.00	0.00	0.00	0.00

ID	Pesticide ID number	71
PSTN	Pesticide name. Common or brand name of the pesticide. (cols. 7-22)	72
PSOL	Pesticide solubility in ppm. The amount of the pesticide product which can dissolve in water. (ppm) (cols. 23-34)	73 74
PHLS	Pesticide half-life in soil in days. The time that it takes for the concentration of pesticide product in the soil to be reduced by half. (days) (cols. 35-42)	75 76
PHLF	Pesticide half-life on foliage in days. The time that it takes for the concentration of pesticide products on the foliage to be reduced by half. Degradation occurs through microbial activity and/or sunlight. (days) (cols. 43-50)	77 78 79
PWOF	Fraction of pesticides washed off. Percentage of the pesticide product that is applied to foliage that is washed off into the soil. (%) (cols. 51-58)	80 81
PKOC	Absorption coefficient for organic C in pesticides. Amount of pesticide products attached to the soil divided by the amount of the pesticide product in solution, normalized by organic carbon % in the soil. (cols. 59-68)	82 83 84
PCST	Pesticide cost in \$/KG. Used for economic analyses only. (cols. 69-76)	85 86

**Table S8.** Grazer characteristics for the WRE watersheds during monitoring period and implied characteristics in the APEX database [3–5]

Number	1	2	3	4	5	6	7
Animal species	Calves	Cow	Cow-calf	Stocker	Bulls	Yearlings	Heifers
PTHP	0.15	0.15	0.15	0.15	0.15	0.15	0.15
PTHD	0.4	0.4	0.4	0.4	0.4	0.4	0.4
PTHU	0.95	0.95	0.95	0.95	0.95	0.95	0.95
GZLMt/ha	1.11	0.46	0.63	2.40	1.24	1.07	5.31
GZIN	0.026	0.026	0.026	0.008	0.020	0.026	0.030
GZWkg/hd	130.0	454.0	454.0	227.0	500.0	130.0	272.0
GZWMkg/hd	454.0	454.0	454.0	408.0	1000.0	354.0	635.0
PMLKkg/hd	0.0	9.0	9.0	0.0	0.0	0.0	27.3
ANTQ	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IGZD	2	4	4	7	4	3	7
IMPL	0	0	0	0	0	1	0
ICVB	0	60	60	60	60	0	82
ICVF	0	90	90	90	90	0	365
ICWD	50	315	315	240	99	50	180

PTHP Preferred forage threshold

PTHD Desirable forage threshold

PTHU Undesirable forage threshold

GZLMt/ha Grazing limit(t/ha)

GZIN Grazer intake rate fraction of GZWT

GZWkg/hd Initial weight of grazer (kg/hd)

GZWMkg/hd Mature weight of grazer (kg/hd)

PMLKkg/hd Peak production of milk (kg/hd)

ANTQ Tolerance factor for anti-quality factors of forage

IGZD Grazing intake

IMPL Anabolic implant

ICVB Beginning day of year of calving

ICVF Final day of year of calving

ICWD Weaning day of year

**Table S9.** Calibrated APEX parameters for native prairie (WRE1) and cropland (WRE8) for surface runoff, implied by maximum NSE and COD and absolute PBIAS. Refer to Table 2 for the definition of parameters.

Parameters	WRE1: Native prairie						WRE8: Cropland					
	NSE		COD		PBIAS		NSE		COD		PBIAS	
	Without	With	Without	With	Without	With	Without	With	Without	With	Without	With
PARAM [2]	1.613	1.860	1.940	1.860	1.299	1.848	1.589	1.589	1.520	1.520	1.425	1.425
PARAM [4]	0.283	0.796	0.915	0.796	0.327	0.505	0.814	0.814	0.584	0.584	0.724	0.724
PARAM [7]	0.074	0.045	0.052	0.045	0.411	0.458	0.934	0.934	0.453	0.453	0.520	0.520
PARAM [8]	18.950	11.720	16.130	11.720	17.890	14.010	12.570	12.570	16.140	16.140	18.350	18.350
PARAM [14]	0.694	0.454	0.121	0.454	0.335	0.819	0.113	0.113	0.331	0.331	0.699	0.699
PARAM [15]	0.080	0.083	0.105	0.083	0.085	0.146	0.005	0.005	0.038	0.038	0.069	0.069
PARAM [17]	0.331	0.471	0.355	0.471	0.130	0.071	0.008	0.008	0.012	0.012	0.002	0.002
PARAM [18]	1.076	1.277	1.050	1.277	1.325	1.138	1.361	1.361	1.345	1.345	1.303	1.303
PARAM [19]	0.072	0.091	0.073	0.091	0.049	0.078	0.082	0.082	0.002	0.002	0.036	0.036
PARAM [20]	0.396	0.380	0.372	0.380	0.400	0.342	0.384	0.384	0.372	0.372	0.391	0.391
PARAM [23]	0.0030	0.0030	0.0026	0.0030	0.0028	0.0028	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029
PARAM [34]	0.594	0.562	0.583	0.562	0.536	0.520	0.590	0.590	0.597	0.597	0.597	0.597
PARAM [42]	2.086	2.113	1.081	2.113	2.447	0.975	0.419	0.419	1.620	1.620	0.828	0.828
PARAM [45]	8.176	0.652	1.099	0.652	0.833	4.367	2.828	2.828	1.916	1.916	4.509	4.509
PARAM [50]	0.473	0.478	0.392	0.478	0.403	0.382	0.308	0.308	0.371	0.371	0.326	0.326
PARAM [65]	0.004	0.049	0.064	0.049	0.022	0.062	0.093	0.093	0.010	0.010	0.086	0.086
PARAM [66]	3.709	5.914	8.245	5.914	9.532	2.647	6.526	6.526	4.150	4.150	2.152	2.152
PARAM [69]	0.269	0.850	0.992	0.850	0.298	0.761	0.559	0.559	0.488	0.488	0.887	0.887
PARAM [70]	1.251	0.814	0.857	0.814	1.001	0.766	0.727	0.727	0.613	0.613	0.871	0.871
PARAM [72]	0.190	0.098	0.111	0.098	0.400	0.073	0.352	0.352	0.070	0.070	0.329	0.329

103

104

105

106

**Table S10.** Annual average of selected response variables, including environmental indicators in grassland (WRE1), implied by the calibrated parameter set and respective changes in % with respect to grazing operations during calibration (1983-1995) and validation (1996-2000) periods, implied by four different best metrics. Values in gray-shaded cells refer to decreased response variables after grazing.

Response variables	OF				NSE				COD				PBIAS			
	Calibration		Validation		Calibration		Validation		Calibration		Validation		Calibration		Validation	
	Without	With	Without	With	Without	With	Without	With	Without	With	Without	With	Without	With	Without	With
Precipitation, mm	1009		890		1009		890		1009		890		1009		890	
Water yield, mm	146.67	146.72	98.43	75.41	149.12	159.09	92.61	101.84	155.49	159.09	103.97	101.84	146.67	146.68	98.43	98.39
Deep percolation, mm	36.63	30.59	22.94	14.28	31.78	30.86	21.12	20.06	26.32	30.86	18.67	20.06	36.63	18.09	22.94	3.38
Sediment, t/ha	2.29	0.45	2.03	1.39	1.86	0.57	1.88	3.34	3.36	0.57	3.02	3.34	2.29	0.76	2.03	4.54
Soil erosion, t/ha	2.29	0.46	2.03	1.40	1.86	0.57	1.87	3.34	3.36	0.57	3.03	3.34	2.29	0.76	2.03	4.54
Evapotranspiration, mm	820.63	827.98	775.81	818.92	824.03	814.49	795.37	788.29	823.97	814.49	785.01	788.29	820.63	840.68	775.81	805.71
Potential ET, mm	1514.60	1661.15	1457.21	1596.03	1765.19	1622.15	1694.49	1559.10	1714.63	1622.15	1646.65	1559.10	1514.60	1452.04	1457.21	1397.90
Total phosphorus, kg/ha	0.37	0.08	0.05	0.25	0.27	0.16	0.07	0.53	0.38	0.16	0.04	0.53	0.37	0.17	0.05	0.64
Total nitrogen, kg/ha	5.74	2.43	4.05	4.15	5.33	2.73	4.13	7.86	6.93	2.73	4.72	7.86	5.74	3.85	4.05	11.21
Plant biomass, t/ha	15.53	28.78	8.52	20.84	17.65	20.47	9.68	12.53	12.69	20.47	6.97	12.53	15.53	19.86	8.52	9.17
Forage yield, t/ha	11.25	2.54	5.51	4.54	13.09	1.58	6.19	2.27	9.34	1.58	4.06	2.27	11.25	1.48	5.51	1.59
Standing dead crop residue, t/ha	6.23	24.00	5.46	16.35	8.51	17.49	6.63	9.88	6.37	17.49	5.15	9.88	6.23	16.90	5.46	7.41
Standing live plant biomass, t/ha	0.25	1.46	0.34	1.10	0.37	1.02	0.43	0.67	0.23	1.02	0.32	0.67	0.25	0.97	0.34	0.51
Drought stress, d	4.22	36.39	9.97	43.27	21.94	24.62	22.84	30.66	15.86	24.62	17.45	30.66	4.22	22.43	9.97	25.66
Temperature stress, d	139.37	138.95	133.71	141.18	142.21	134.71	135.38	137.21	138.32	134.71	131.31	137.21	139.37	134.11	133.71	132.64
Nitrogen stress, d	76.22	0.00	78.27	4.29	23.59	32.90	24.76	0.00	0.31	32.90	0.00	0.00	76.22	34.77	78.27	0.00
Phosphorus stress, d	65.99	104.71	84.38	88.05	90.94	101.49	120.26	129.88	140.47	101.49	166.19	129.88	65.99	103.71	84.38	150.81

**Table S11.** Annual average of selected response variables, including environmental indicators in cropland (WRE8), implied by calibrated parameter set and respective changes in % with respect to grazing operations during calibration (1982-1994) and validation (1995-2000) periods, implied by four different best metrics. Values in gray-shaded cells refer to decreased response variables after grazing.

Response variables	OF				NSE				COD				PBIAS			
	Calibration		Validation		Calibration		Validation		Calibration		Validation		Calibration		Validation	
	Without	With	Without	With	Without	With	Without	With	Without	With	Without	With	Without	With	Without	With
Precipitation, mm	1289		896		1289		896		1289		896		1289		896	
Water yield, mm	160.99	160.91	110.34	109.07	163.30	163.24	113.25	113.22	163.46	163.45	111.88	112.20	160.99	160.91	110.34	109.07
Deep percolation, mm	44.73	44.69	32.62	33.13	52.24	52.22	41.51	42.69	45.30	45.31	34.29	33.90	44.73	44.69	32.62	33.13
Sediment, t/ha	8.06	7.47	2.26	1.60	17.87	17.92	9.67	9.44	13.01	13.12	6.09	6.86	8.06	7.47	2.26	1.60
Soil erosion, t/ha	8.06	7.47	2.26	1.60	17.87	17.92	9.67	9.44	13.01	13.12	6.09	6.86	8.06	7.47	2.26	1.60
Evapotranspiration, mm	1058.08	1058.18	763.76	764.20	1046.17	1046.24	749.76	748.67	1056.72	1056.69	759.36	759.69	1058.08	1058.18	763.76	764.20
Potential ET, mm	2225.94	2225.94	1721.51	1721.51	2184.97	2184.97	1690.36	1690.36	2225.94	2225.94	1721.51	1721.51	2225.94	2225.94	1721.51	1721.51
Total phosphorus, kg/ha	2.84	2.75	0.64	0.38	5.56	5.64	2.66	2.60	4.46	4.55	1.99	2.17	2.84	2.75	0.64	0.38
Total nitrogen, kg/ha	16.98	16.15	3.37	2.71	19.51	19.86	8.20	8.04	20.61	21.09	6.83	7.43	16.98	16.15	3.37	2.71
Crop biomass, t/ha	20.05	20.13	17.75	17.94	19.46	19.56	17.19	17.36	21.90	21.97	19.04	19.36	20.05	20.13	17.75	17.94
Crop yield, t/ha	4.88	4.89	3.30	3.61	4.23	4.24	3.06	3.25	5.18	5.19	3.58	4.00	4.88	4.89	3.30	3.61
Standing dead crop residue, t/ha	13.89	13.94	12.67	12.67	13.56	13.63	12.21	12.19	15.14	15.17	13.72	13.85	13.89	13.94	12.67	12.67
Standing live plant biomass, t/ha	1.30	1.30	1.21	1.21	1.27	1.27	1.16	1.16	1.41	1.42	1.30	1.32	1.30	1.30	1.21	1.21
Drought stress, d	4.88	4.89	3.30	3.61	4.23	4.24	3.06	3.25	5.18	5.19	3.58	4.00	4.88	4.89	3.30	3.61
Temperature stress, d	65.48	65.63	47.20	47.27	64.11	64.25	46.09	45.78	69.55	69.58	50.63	51.13	65.48	65.63	47.20	47.27
Nitrogen stress, d	13.62	13.17	26.14	26.89	17.96	17.40	30.57	31.46	1.70	1.51	0.04	0.03	13.62	13.17	26.14	26.89
Phosphorus stress, d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.27	14.54	0.00	0.00	0.00	0.00

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