Instructions for AgMIP Wheat Phase 4
Global wheat yield potential assessment
Step 2 – Nitrogen response curve simulations

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Objectives

The objective of these simulations is to quantify changes in global nitrogen (N) demand associated wheat yield potential under baseline and future climate scenarios. We will execute simulations at our recently used 34 global sites with a range of N fertilizer applications. These N response curves will quantify crop N demand, N use efficiency and N agronomic efficiency.

Simulation setup and runs

Set up your model for the 34 global locations as instructed for Step 1 global simulations. For each of the original simulations, add 10 N treatments ranging from with 0 to 450 kg N ha^{-1} in steps of 50 kg N ha^{-1} (Table 1). Depending on the N treatment, the total N fertilizer is to be applied in one to four splits. If your model allows fertilizer application at specific growth stages, fertilizer is to be applied at the Zadoks growth stages indicated in Table 1, or the nearest stage simulated by your model. If your model does not allow this, applications can should be applied applications at the dates given in the Excel file in the folder "GS dates" (one file per climate scenario and GCM). These dates were derived from simulations with the *SiriusQuality* model.

Execute your model at the 34 locations for 30 years, with the baseline climate and the future scenarios (5 GCMs x 2 RCPs), for the "normal" and "high-yield" traits, and the 10 N treatments. The total number of simulation-years is 224,400.

Simulation results files

The annual summary results should be saved using the provided template (*"AgMIP_Wheat_Template_Summary_Phase4_34Sites_SpecialRuns.txt").* Keys for the simulated variables in the template are given in "*AgMIP_summary_template_keys.xlsx*". Do **not** report the daily simulation results.

Table 1. N applications rates and split for autumn / winter and spring sown wheat crops. Numbers in parenthesis are fractions of total N fertilizer.

			N application split (kg N ha^{-1})				
Sowing season	**Code**	**Total N fertilizer (kN ha^{-1})**	**Sowing (GS0)**	**Main stem and three tillers (GS23)**	**Pseudostem erect (GS30)**	**Second node detectable (GS32)**	**Flag leaf ligule just visible (GS39)**
Autumn / winter	000	0	0	0	0	0	0
	050	50	0	0	50 (0.10)	0	0
	100	100	0	34 (0.34)	66 (0.66)	0	0
	150	150	0	30 (0.20)	75 (0.50)	45 (0.30)	0
	200	200	0	40 (0.20)	100 (0.50)	60 (0.30)	0
	250	250	0	38 (0.15)	100 (0.40)	62 (0.25)	50 (0.20)
	300	300	0	45 (0.15)	120 (0.40)	75 (0.25)	60 (0.20)
	350	350	0	53 (0.15)	140 (0.40)	87 (0.25)	70 (0.20)
	400	400	0	60 (0.15)	160 (0.40)	100 (0.25)	80 (0.20)
	450	450	0	68 (0.15)	180 (0.40)	112 (0.25)	90 (0.20)
Spring	000	0	0	0	0	0	0
	050	50	0	0	50 (0.10)	0	0
	100	100	34 (0.34)	0	66 (0.66)	0	0
	150	150	30 (0.20)		75 (0.50)	45 (0.30)	0
	200	200	40 (0.20)	0	100 (0.50)	60 (0.30)	0
	250	250	38 (0.15)	0	100 (0.40)	62 (0.25)	50 (0.20)
	300	300	45 (0.15)	0	120 (0.40)	75 (0.25)	60 (0.20)
	350	350	53 (0.15)	0	140 (0.40)	87 (0.25)	70 (0.20)
	400	400	60 (0.15)	0	160 (0.40)	100 (0.25)	80 (0.20)
	450	450	68 (0.15)	0	180 (0.40)	112 (0.25)	90 (0.20)

Table 4. Name and 2-letters code for the 41 wheat models

Model name		**Model 2-letter code**
1.	APSIM-Next Generation	AE
2.	APSIM-Wheat	AW
3.	DSSAT CSM-CERES-Wheat	D1
4.	DSSAT-Nwheat	DN
5.	DSSAT-CROPSIM	DR
6.	HERMES	HE
7.	SIMPLACE<LINTUL-5+>	L5
8.	SIMPLACE<LINTUL-5>	L6
9.	LINTUL4	LI
10.	MONICA	MO
11.	SIRIUSQUALITY	SQ
12.	SSM-iCrop	SS