

Supplemental Table 1. Summary of simulation results in 5 and 10 years, with the setting of 200 n and 100 QTLs

The columns "No" indicate the numbers in which the marker genotypes of breeding population were completely fixed in 100 simulation replications. The values in brackets indicate the standard deviation. The underlined values in columns "Genetic gain" and "Genetic variance" indicate the maximum values, while those in column "Inbreeding coefficient" indicate the minimum values in each column.

Scheme	Maker	$h^2 = 0.3$								$h^2 = 0.6$							
		5 year				10 year				5 year				10 year			
		No	Genetic gain	Genetic variance	Inbreeding coefficient	No	Genetic gain	Genetic variance	Inbreeding coefficient	No	Genetic gain	Genetic variance	Inbreeding coefficient	No	Genetic gain	Genetic variance	Inbreeding coefficient
GPS	-	0	2.9 (0.5)	0.5 (0.2)	<u>0.4</u> (0.1)	0	4.0 (0.7)	0.4 (0.2)	0.5 (0.1)	0	3.6 (0.5)	0.4 (0.2)	0.4 (0.1)	0	4.9 (0.7)	0.3 (0.1)	0.6 (0.1)
SPS	-	0	3.1 (0.7)	0.5 (0.3)	0.9 (0.0)	0	3.9 (0.7)	0.2 (0.1)	1.0 (0.0)	0	3.8 (0.6)	0.3 (0.1)	0.9 (0.0)	0	4.7 (0.8)	0.1 (0.1)	1.0 (0.0)
GGS	500	0	3.6 (0.5)	0.3 (0.2)	0.6 (0.1)	0	4.8 (0.7)	0.2 (0.1)	0.8 (0.1)	0	4.0 (0.5)	0.2 (0.1)	0.5 (0.1)	0	5.3 (0.7)	0.1 (0.1)	0.8 (0.1)
GGS	200	0	3.7 (0.4)	0.3 (0.2)	0.6 (0.1)	0	4.8 (0.7)	0.1 (0.1)	0.8 (0.1)	0	4.0 (0.5)	0.3 (0.1)	0.6 (0.1)	0	5.3 (0.7)	0.1 (0.1)	0.8 (0.1)
GGS	100	0	3.5 (0.5)	0.3 (0.1)	0.6 (0.1)	1	4.5 (0.7)	0.2 (0.1)	0.8 (0.1)	0	3.8 (0.5)	0.3 (0.1)	0.6 (0.1)	1	5.0 (0.7)	0.1 (0.1)	0.8 (0.1)
IGS	500	0	3.0 (0.4)	0.5 (0.2)	0.4 (0.0)	0	4.1 (0.6)	0.4 (0.2)	0.5 (0.0)	0	3.4 (0.4)	0.4 (0.1)	0.4 (0.0)	0	4.7 (0.6)	0.3 (0.1)	0.5 (0.1)
IGS	200	0	3.0 (0.4)	0.6 (0.2)	0.4 (0.0)	0	4.1 (0.6)	0.4 (0.2)	0.5 (0.0)	0	3.4 (0.4)	0.5 (0.2)	<u>0.4</u> (0.0)	0	4.7 (0.6)	0.3 (0.1)	<u>0.5</u> (0.1)
IGS	100	0	2.9 (0.4)	<u>0.6</u> (0.2)	0.4 (0.0)	0	3.9 (0.6)	<u>0.4</u> (0.2)	<u>0.5</u> (0.1)	0	3.3 (0.5)	<u>0.5</u> (0.1)	0.4 (0.0)	0	4.5 (0.6)	<u>0.3</u> (0.1)	0.5 (0.1)
GGS_S	500	0	<u>4.0</u> (0.6)	0.3 (0.1)	0.7 (0.1)	0	4.7 (0.9)	0.1 (0.1)	0.9 (0.0)	0	<u>4.7</u> (0.6)	0.2 (0.1)	0.7 (0.1)	0	5.6 (0.9)	0.1 (0.1)	0.9 (0.0)
GGS_S	200	0	3.8 (0.6)	0.3 (0.2)	0.7 (0.1)	1	4.5 (0.9)	0.1 (0.1)	0.9 (0.0)	0	4.5 (0.6)	0.2 (0.1)	0.7 (0.1)	0	5.3 (0.9)	0.1 (0.1)	0.9 (0.0)
GGS_S	100	0	3.6 (0.7)	0.3 (0.2)	0.7 (0.1)	9	4.2 (0.8)	0.1 (0.1)	0.9 (0.0)	0	4.1 (0.6)	0.3 (0.2)	0.7 (0.1)	0	4.7 (0.9)	0.1 (0.1)	0.9 (0.0)
IGS_S	500	0	3.7 (0.5)	0.4 (0.2)	0.6 (0.0)	0	4.6 (0.8)	0.2 (0.1)	0.8 (0.0)	0	4.3 (0.6)	0.3 (0.2)	0.6 (0.0)	0	5.4 (0.9)	0.2 (0.1)	0.8 (0.0)
IGS_S	200	0	3.6 (0.5)	0.4 (0.2)	0.6 (0.0)	0	4.4 (0.8)	0.2 (0.1)	0.8 (0.0)	0	4.2 (0.6)	0.3 (0.2)	0.6 (0.0)	0	5.1 (0.8)	0.2 (0.1)	0.8 (0.0)
IGS_S	100	0	3.4 (0.6)	0.4 (0.2)	0.6 (0.0)	0	4.0 (0.8)	0.3 (0.1)	0.8 (0.0)	0	3.8 (0.5)	0.4 (0.2)	0.6 (0.0)	0	4.6 (0.8)	0.3 (0.2)	0.8 (0.0)
GGS_SU	500	0	4.0 (0.6)	0.2 (0.1)	0.7 (0.1)	0	<u>5.1</u> (0.9)	0.1 (0.1)	0.9 (0.1)	0	4.4 (0.6)	0.2 (0.1)	0.6 (0.1)	0	<u>5.8</u> (0.9)	0.1 (0.0)	0.9 (0.1)
GGS_SU	200	0	3.8 (0.6)	0.3 (0.2)	0.7 (0.1)	3	4.9 (0.8)	0.1 (0.1)	0.9 (0.1)	0	4.3 (0.6)	0.2 (0.1)	0.7 (0.1)	0	5.7 (0.9)	0.1 (0.0)	0.9 (0.1)
GGS_SU	100	0	3.6 (0.6)	0.3 (0.2)	0.7 (0.1)	7	4.8 (0.8)	0.1 (0.1)	0.9 (0.1)	0	4.1 (0.5)	0.3 (0.1)	0.6 (0.1)	4	5.3 (0.8)	0.1 (0.1)	0.9 (0.1)
IGS_SU	500	0	3.3 (0.5)	0.5 (0.2)	0.5 (0.0)	0	4.6 (0.7)	0.3 (0.1)	0.6 (0.1)	0	3.9 (0.5)	0.4 (0.2)	0.5 (0.0)	0	5.4 (0.8)	0.2 (0.1)	0.6 (0.1)
IGS_SU	200	0	3.4 (0.5)	0.5 (0.2)	0.5 (0.1)	0	4.6 (0.8)	0.3 (0.1)	0.6 (0.1)	0	3.8 (0.5)	0.4 (0.2)	0.5 (0.0)	0	5.2 (0.8)	0.2 (0.1)	0.6 (0.1)
IGS_SU	100	0	3.2 (0.5)	0.5 (0.2)	0.5 (0.1)	0	4.3 (0.8)	0.3 (0.1)	0.6 (0.1)	0	3.7 (0.5)	0.4 (0.2)	0.5 (0.1)	0	5.0 (0.7)	0.2 (0.1)	0.6 (0.1)

Supplemental Table 2. Summary of simulation results in 5 and 10 years, with the setting of 200 n and 30 QTLs

The columns "No" indicate the numbers in which the marker genotypes of breeding population were completely fixed in 100 simulation replications. The values in brackets indicate the standard deviation. The underlined values in columns "Genetic gain" and "Genetic variance" indicate the maximum values, while those in column "Inbreeding coefficient" indicate the minimum values in each column.

Scheme	Maker	$h^2 = 0.3$									$h^2 = 0.6$								
		5 year			10 year			5 year			10 year								
		No	Genetic gain	Genetic variance	Inbreeding coefficient	No	Genetic gain	Genetic variance	Inbreeding coefficient	No	Genetic gain	Genetic variance	Inbreeding coefficient	No	Genetic gain	Genetic variance	Inbreeding coefficient		
GPS	-	0	2.7 (0.4)	0.5 (0.2)	<u>0.4</u> (0.1)	0	3.7 (0.5)	0.3 (0.1)	<u>0.5</u> (0.1)	0	3.4 (0.4)	0.3 (0.1)	0.4 (0.1)	0	4.4 (0.5)	0.1 (0.1)	0.6 (0.1)		
SPS	-	0	3.0 (0.5)	0.4 (0.2)	0.9 (0.0)	0	3.6 (0.5)	0.1 (0.1)	1.0 (0.0)	0	3.5 (0.5)	0.2 (0.2)	0.9 (0.0)	0	4.2 (0.6)	0.1 (0.1)	1.0 (0.0)		
GGS	500	0	3.5 (0.4)	0.2 (0.1)	0.6 (0.1)	0	4.2 (0.6)	0.1 (0.1)	0.8 (0.1)	0	3.8 (0.4)	0.2 (0.1)	0.6 (0.1)	0	4.6 (0.6)	0.1 (0.1)	0.8 (0.1)		
GGS	200	0	3.4 (0.6)	0.2 (0.2)	0.6 (0.1)	0	4.2 (0.7)	0.1 (0.1)	0.8 (0.1)	0	3.7 (0.4)	0.2 (0.1)	0.6 (0.1)	0	4.6 (0.5)	0.1 (0.0)	0.8 (0.1)		
GGS	100	0	3.3 (0.5)	0.2 (0.1)	0.6 (0.1)	1	4.2 (0.7)	0.1 (0.1)	0.8 (0.1)	0	3.6 (0.4)	0.2 (0.1)	0.6 (0.1)	0	4.5 (0.6)	0.1 (0.1)	0.8 (0.1)		
IGS	500	0	2.9 (0.4)	0.5 (0.2)	0.4 (0.0)	0	3.7 (0.5)	0.3 (0.1)	0.5 (0.1)	0	3.3 (0.3)	0.3 (0.1)	0.4 (0.0)	0	4.2 (0.4)	0.2 (0.1)	0.5 (0.1)		
IGS	200	0	2.8 (0.4)	<u>0.5</u> (0.2)	0.4 (0.0)	0	3.7 (0.6)	0.3 (0.1)	0.5 (0.1)	0	3.3 (0.3)	0.4 (0.1)	0.4 (0.0)	0	4.2 (0.5)	0.2 (0.1)	0.5 (0.0)		
IGS	100	0	2.8 (0.4)	0.5 (0.2)	0.4 (0.0)	0	3.6 (0.5)	<u>0.3</u> (0.2)	0.5 (0.1)	0	3.1 (0.3)	<u>0.4</u> (0.1)	<u>0.4</u> (0.0)	0	4.1 (0.5)	<u>0.2</u> (0.1)	<u>0.5</u> (0.1)		
GGS_S	500	0	<u>3.6</u> (0.6)	0.2 (0.1)	0.7 (0.1)	0	4.1 (0.7)	0.1 (0.1)	0.9 (0.0)	0	<u>4.2</u> (0.5)	0.2 (0.1)	0.7 (0.1)	0	4.7 (0.7)	0.1 (0.1)	0.9 (0.0)		
GGS_S	200	0	3.5 (0.6)	0.2 (0.2)	0.7 (0.1)	0	3.8 (0.7)	0.1 (0.1)	0.9 (0.0)	0	4.1 (0.6)	0.2 (0.1)	0.7 (0.1)	0	4.5 (0.7)	0.1 (0.1)	0.9 (0.0)		
GGS_S	100	0	3.3 (0.6)	0.2 (0.1)	0.7 (0.1)	2	3.6 (0.7)	0.1 (0.1)	0.9 (0.0)	0	3.8 (0.6)	0.2 (0.1)	0.7 (0.1)	0	4.1 (0.8)	0.1 (0.1)	0.9 (0.0)		
IGS_S	500	0	3.4 (0.5)	0.3 (0.1)	0.6 (0.1)	0	4.0 (0.6)	0.1 (0.1)	0.8 (0.0)	0	3.9 (0.5)	0.2 (0.1)	0.5 (0.1)	0	4.7 (0.7)	0.1 (0.1)	0.8 (0.0)		
IGS_S	200	0	3.3 (0.5)	0.3 (0.1)	0.6 (0.0)	0	3.7 (0.7)	0.1 (0.2)	0.8 (0.0)	0	3.8 (0.5)	0.2 (0.1)	0.5 (0.0)	0	4.4 (0.7)	0.1 (0.1)	0.8 (0.0)		
IGS_S	100	0	3.1 (0.5)	0.4 (0.2)	0.6 (0.0)	0	3.5 (0.7)	0.2 (0.2)	0.8 (0.0)	0	3.6 (0.5)	0.3 (0.2)	0.5 (0.1)	0	4.0 (0.7)	0.2 (0.1)	0.8 (0.0)		
GGS_SU	500	0	3.6 (0.5)	0.2 (0.1)	0.7 (0.1)	4	4.3 (0.7)	0.0 (0.1)	0.9 (0.1)	0	4.1 (0.5)	0.2 (0.1)	0.6 (0.1)	1	<u>4.9</u> (0.7)	0.0 (0.0)	0.9 (0.1)		
GGS_SU	200	0	3.6 (0.6)	0.2 (0.1)	0.7 (0.1)	1	<u>4.3</u> (0.7)	0.0 (0.0)	0.9 (0.1)	0	4.0 (0.5)	0.2 (0.1)	0.6 (0.1)	1	4.8 (0.7)	0.0 (0.0)	0.8 (0.1)		
GGS_SU	100	0	3.5 (0.6)	0.2 (0.1)	0.7 (0.1)	5	4.2 (0.7)	0.0 (0.1)	0.9 (0.1)	0	3.8 (0.5)	0.2 (0.1)	0.6 (0.1)	0	4.7 (0.7)	0.0 (0.0)	0.9 (0.1)		
IGS_SU	500	0	3.2 (0.5)	0.4 (0.2)	0.5 (0.0)	0	4.1 (0.6)	0.2 (0.2)	0.6 (0.1)	0	3.7 (0.4)	0.3 (0.1)	0.5 (0.1)	0	4.7 (0.6)	0.1 (0.1)	0.6 (0.1)		
IGS_SU	200	0	3.1 (0.5)	0.4 (0.2)	0.5 (0.0)	0	4.0 (0.6)	0.2 (0.1)	0.6 (0.0)	0	3.6 (0.4)	0.3 (0.1)	0.5 (0.0)	0	4.6 (0.6)	0.1 (0.1)	0.6 (0.0)		
IGS_SU	100	0	3.1 (0.4)	0.4 (0.2)	0.5 (0.0)	0	3.9 (0.6)	0.2 (0.1)	0.6 (0.1)	0	3.5 (0.4)	0.3 (0.1)	0.5 (0.0)	0	4.4 (0.6)	0.1 (0.1)	0.6 (0.1)		

Supplemental Table 3. Summary of simulation results in 5 and 10 years, with the setting of 500 n and 100 QTLs

The columns "No" indicate the numbers in which the marker genotypes of breeding population were completely fixed in 100 simulation replications. The values in brackets indicate the standard deviation. The underlined values in columns "Genetic gain" and "Genetic variance" indicate the maximum values, while those in column "Inbreeding coefficient" indicate the minimum values in each column.

Scheme	Maker	$h^2 = 0.3$								$h^2 = 0.6$							
		5 year				10 year				5 year				10 year			
		No	Genetic gain	Genetic variance	Inbreeding coefficient	No	Genetic gain	Genetic variance	Inbreeding coefficient	No	Genetic gain	Genetic variance	Inbreeding coefficient	No	Genetic gain	Genetic variance	Inbreeding coefficient
GPS	-	0	3.1 (0.5)	<u>0.5</u> (0.2)	<u>0.4</u> (0.1)	0	4.4 (0.7)	<u>0.3</u> (0.1)	<u>0.5</u> (0.1)	0	4.1 (0.5)	0.3 (0.1)	0.5 (0.1)	0	5.4 (0.7)	0.2 (0.1)	0.6 (0.1)
SPS	-	0	3.4 (0.6)	0.4 (0.2)	0.9 (0.0)	0	4.2 (0.7)	0.2 (0.1)	1.0 (0.0)	0	4.2 (0.5)	0.3 (0.1)	0.9 (0.0)	0	5.1 (0.6)	0.1 (0.1)	1.0 (0.0)
GGS	500	0	4.3 (0.5)	0.2 (0.1)	0.7 (0.1)	3	5.5 (0.7)	0.1 (0.1)	0.9 (0.1)	0	4.7 (0.4)	0.2 (0.1)	0.6 (0.1)	0	6.1 (0.8)	0.1 (0.1)	0.8 (0.1)
GGS	200	0	4.2 (0.5)	0.2 (0.1)	0.7 (0.1)	1	5.3 (0.7)	0.1 (0.1)	0.9 (0.1)	0	4.6 (0.4)	0.2 (0.1)	0.6 (0.1)	0	6.0 (0.7)	0.1 (0.1)	0.8 (0.1)
GGS	100	0	4.1 (0.5)	0.2 (0.1)	0.6 (0.1)	3	5.3 (0.7)	0.1 (0.1)	0.8 (0.1)	0	4.5 (0.4)	0.2 (0.1)	0.6 (0.1)	0	5.8 (0.7)	0.1 (0.1)	0.8 (0.1)
IGS	500	0	3.8 (0.4)	0.4 (0.1)	0.4 (0.0)	0	5.0 (0.6)	0.2 (0.1)	0.6 (0.1)	0	4.2 (0.4)	0.3 (0.1)	0.4 (0.0)	0	5.7 (0.6)	0.2 (0.1)	0.6 (0.1)
IGS	200	0	3.7 (0.4)	0.4 (0.2)	0.4 (0.0)	0	4.9 (0.6)	0.3 (0.1)	0.6 (0.1)	0	4.1 (0.4)	0.3 (0.1)	<u>0.4</u> (0.0)	0	5.5 (0.6)	0.2 (0.1)	<u>0.6</u> (0.1)
IGS	100	0	3.6 (0.4)	0.4 (0.1)	0.4 (0.0)	0	4.8 (0.5)	0.3 (0.1)	0.6 (0.1)	0	4.0 (0.4)	<u>0.4</u> (0.2)	0.4 (0.0)	0	5.3 (0.6)	<u>0.2</u> (0.1)	0.6 (0.0)
GGS_S	500	0	<u>4.9</u> (0.6)	0.2 (0.1)	0.8 (0.1)	1	5.7 (0.9)	0.1 (0.0)	0.9 (0.0)	0	<u>5.6</u> (0.6)	0.2 (0.1)	0.7 (0.1)	2	6.5 (1.0)	0.0 (0.0)	0.9 (0.0)
GGS_S	200	0	4.6 (0.6)	0.2 (0.1)	0.8 (0.1)	3	5.3 (0.8)	0.1 (0.1)	0.9 (0.0)	0	5.3 (0.7)	0.2 (0.1)	0.7 (0.1)	3	6.1 (1.1)	0.1 (0.1)	0.9 (0.0)
GGS_S	100	0	4.3 (0.7)	0.2 (0.1)	0.7 (0.1)	18	4.7 (0.9)	0.1 (0.1)	0.9 (0.0)	0	4.8 (0.6)	0.2 (0.1)	0.7 (0.1)	19	5.3 (0.9)	0.1 (0.1)	0.9 (0.0)
IGS_S	500	0	4.6 (0.6)	0.2 (0.1)	0.6 (0.0)	0	5.6 (0.8)	0.1 (0.1)	0.9 (0.0)	0	5.4 (0.6)	0.2 (0.1)	0.6 (0.0)	0	<u>6.6</u> (1.0)	0.1 (0.1)	0.8 (0.0)
IGS_S	200	0	4.5 (0.5)	0.3 (0.1)	0.6 (0.0)	0	5.3 (0.7)	0.1 (0.1)	0.8 (0.0)	0	5.1 (0.6)	0.2 (0.1)	0.6 (0.1)	0	6.1 (0.9)	0.1 (0.1)	0.8 (0.0)
IGS_S	100	0	4.1 (0.6)	0.3 (0.2)	0.6 (0.1)	0	4.8 (0.8)	0.2 (0.1)	0.8 (0.0)	0	4.6 (0.5)	0.3 (0.2)	0.6 (0.1)	0	5.3 (0.9)	0.2 (0.1)	0.8 (0.0)
GGS_SU	500	0	4.7 (0.6)	0.2 (0.1)	0.7 (0.1)	0	<u>5.9</u> (0.8)	0.0 (0.0)	0.9 (0.1)	0	5.3 (0.6)	0.2 (0.1)	0.7 (0.1)	0	6.7 (0.9)	0.0 (0.0)	0.9 (0.1)
GGS_SU	200	0	4.5 (0.6)	0.2 (0.1)	0.7 (0.1)	0	5.7 (0.8)	0.1 (0.1)	0.9 (0.1)	0	5.1 (0.6)	0.2 (0.1)	0.7 (0.1)	0	6.5 (0.9)	0.0 (0.0)	0.9 (0.1)
GGS_SU	100	0	4.4 (0.5)	0.2 (0.1)	0.7 (0.1)	1	5.5 (0.7)	0.1 (0.1)	0.9 (0.1)	0	4.8 (0.6)	0.2 (0.1)	0.7 (0.1)	1	6.2 (0.9)	0.1 (0.0)	0.9 (0.1)
IGS_SU	500	0	4.3 (0.5)	0.3 (0.1)	0.6 (0.1)	0	5.7 (0.8)	0.2 (0.1)	0.7 (0.1)	0	4.9 (0.5)	0.3 (0.1)	0.5 (0.1)	0	6.5 (0.8)	0.1 (0.1)	0.7 (0.1)
IGS_SU	200	0	4.2 (0.5)	0.3 (0.1)	0.6 (0.1)	0	5.5 (0.6)	0.2 (0.1)	0.7 (0.1)	0	4.8 (0.5)	0.3 (0.1)	0.5 (0.1)	0	6.3 (0.8)	0.1 (0.1)	0.7 (0.1)
IGS_SU	100	0	4.0 (0.5)	0.4 (0.1)	0.5 (0.1)	0	5.2 (0.7)	0.2 (0.1)	0.7 (0.1)	0	4.4 (0.5)	0.3 (0.2)	0.5 (0.0)	0	5.8 (0.7)	0.2 (0.1)	0.7 (0.1)

Supplemental Table 4. Summary of simulation results in 5 and 10 years, with the setting of 500 n and 30 QTLs

The columns "No" indicate the numbers in which the marker genotypes of breeding population were completely fixed in 100 simulation replications. The values in brackets indicate the standard deviation. The underlined values in columns "Genetic gain" and "Genetic variance" indicate the maximum values, while those in column "Inbreeding coefficient" indicate the minimum values in each column.

Scheme	Maker	$h^2 = 0.3$								$h^2 = 0.6$							
		5 year				10 year				5 year				10 year			
		No	Genetic gain	Genetic variance	Inbreeding coefficient	No	Genetic gain	Genetic variance	Inbreeding coefficient	No	Genetic gain	Genetic variance	Inbreeding coefficient	No	Genetic gain	Genetic variance	Inbreeding coefficient
GPS	-	0	3.0 (0.5)	<u>0.4</u> (0.2)	<u>0.4</u> (0.1)	0	4.1 (0.6)	<u>0.2</u> (0.1)	<u>0.5</u> (0.1)	0	3.8 (0.5)	0.3 (0.1)	0.4 (0.1)	0	4.7 (0.8)	0.1 (0.1)	0.6 (0.1)
SPS	-	0	3.3 (0.5)	0.4 (0.3)	0.9 (0.0)	0	4.1 (0.6)	0.1 (0.1)	1.0 (0.0)	0	3.9 (0.6)	0.2 (0.1)	0.9 (0.0)	0	4.5 (0.7)	0.0 (0.0)	1.0 (0.0)
GGS	500	0	4.1 (0.5)	0.1 (0.1)	0.7 (0.1)	1	4.8 (0.7)	0.0 (0.0)	0.9 (0.1)	0	4.3 (0.5)	0.1 (0.1)	0.6 (0.1)	0	5.1 (0.7)	0.0 (0.0)	0.8 (0.1)
GGS	200	0	4.0 (0.5)	0.2 (0.1)	0.7 (0.1)	1	4.7 (0.7)	0.0 (0.0)	0.9 (0.1)	0	4.3 (0.5)	0.1 (0.1)	0.6 (0.1)	1	5.1 (0.8)	0.0 (0.0)	0.8 (0.1)
GGS	100	0	3.9 (0.5)	0.1 (0.1)	0.7 (0.1)	5	4.6 (0.7)	0.0 (0.1)	0.9 (0.1)	0	4.2 (0.5)	0.1 (0.1)	0.6 (0.1)	1	4.9 (0.7)	0.0 (0.0)	0.8 (0.1)
IGS	500	0	3.6 (0.4)	0.3 (0.1)	0.4 (0.0)	0	4.6 (0.6)	0.1 (0.1)	0.6 (0.1)	0	3.9 (0.5)	0.2 (0.1)	0.4 (0.0)	0	4.9 (0.7)	0.1 (0.0)	0.6 (0.1)
IGS	200	0	3.5 (0.4)	0.3 (0.1)	0.4 (0.0)	0	4.5 (0.6)	0.2 (0.1)	0.6 (0.1)	0	3.9 (0.4)	0.2 (0.1)	<u>0.4</u> (0.0)	0	4.8 (0.7)	0.1 (0.1)	<u>0.6</u> (0.1)
IGS	100	0	3.4 (0.5)	0.4 (0.1)	0.4 (0.0)	0	4.3 (0.7)	0.2 (0.1)	0.6 (0.1)	0	3.7 (0.4)	<u>0.3</u> (0.1)	0.4 (0.0)	0	4.6 (0.7)	<u>0.1</u> (0.1)	0.6 (0.1)
GGS_S	500	0	<u>4.4</u> (0.6)	0.1 (0.1)	0.7 (0.1)	3	4.8 (0.9)	0.0 (0.0)	0.9 (0.0)	0	<u>4.7</u> (0.7)	0.1 (0.1)	0.7 (0.1)	1	5.0 (0.8)	0.0 (0.1)	0.9 (0.0)
GGS_S	200	0	4.2 (0.7)	0.1 (0.1)	0.7 (0.1)	4	4.5 (0.8)	0.1 (0.1)	0.9 (0.0)	0	4.6 (0.7)	0.1 (0.1)	0.7 (0.1)	1	5.0 (0.8)	0.0 (0.0)	0.9 (0.0)
GGS_S	100	0	3.9 (0.7)	0.2 (0.1)	0.7 (0.1)	19	4.1 (0.8)	0.1 (0.1)	0.9 (0.0)	0	4.2 (0.6)	0.1 (0.1)	0.7 (0.1)	19	4.3 (0.6)	0.1 (0.1)	0.9 (0.0)
IGS_S	500	0	4.3 (0.6)	0.2 (0.1)	0.6 (0.1)	0	4.9 (0.8)	0.1 (0.1)	0.8 (0.0)	0	4.6 (0.7)	0.1 (0.1)	0.6 (0.0)	0	5.1 (0.8)	0.0 (0.0)	0.8 (0.0)
IGS_S	200	0	4.1 (0.6)	0.2 (0.1)	0.6 (0.1)	0	4.6 (0.8)	0.1 (0.1)	0.8 (0.0)	0	4.4 (0.6)	0.2 (0.1)	0.6 (0.1)	0	4.9 (0.8)	0.1 (0.1)	0.8 (0.0)
IGS_S	100	0	3.8 (0.5)	0.3 (0.1)	0.6 (0.0)	0	4.1 (0.7)	0.2 (0.1)	0.8 (0.0)	0	4.1 (0.6)	0.2 (0.1)	0.6 (0.0)	0	4.3 (0.7)	0.1 (0.1)	0.8 (0.0)
GGS_SU	500	0	4.3 (0.6)	0.1 (0.1)	0.7 (0.1)	0	<u>5.0</u> (0.9)	0.0 (0.0)	0.9 (0.1)	0	4.6 (0.6)	0.1 (0.1)	0.7 (0.1)	0	<u>5.3</u> (0.9)	0.0 (0.0)	0.9 (0.1)
GGS_SU	200	0	4.2 (0.6)	0.1 (0.1)	0.7 (0.1)	0	4.9 (0.8)	0.0 (0.1)	0.9 (0.1)	0	4.6 (0.6)	0.1 (0.1)	0.7 (0.1)	0	5.2 (0.8)	0.0 (0.0)	0.9 (0.1)
GGS_SU	100	0	4.0 (0.6)	0.2 (0.1)	0.7 (0.1)	1	4.8 (0.8)	0.0 (0.0)	0.9 (0.1)	0	4.3 (0.5)	0.1 (0.1)	0.7 (0.1)	0	5.0 (0.7)	0.0 (0.0)	0.9 (0.1)
IGS_SU	500	0	4.0 (0.5)	0.2 (0.1)	0.5 (0.1)	0	4.9 (0.7)	0.1 (0.1)	0.7 (0.0)	0	4.3 (0.5)	0.2 (0.1)	0.5 (0.1)	0	5.2 (0.8)	0.0 (0.0)	0.7 (0.1)
IGS_SU	200	0	3.9 (0.5)	0.2 (0.1)	0.5 (0.0)	0	4.8 (0.7)	0.1 (0.1)	0.7 (0.1)	0	4.3 (0.5)	0.2 (0.1)	0.5 (0.1)	0	5.2 (0.8)	0.1 (0.0)	0.7 (0.1)
IGS_SU	100	0	3.8 (0.5)	0.3 (0.1)	0.5 (0.1)	0	4.7 (0.8)	0.1 (0.1)	0.7 (0.0)	0	4.0 (0.5)	0.2 (0.1)	0.5 (0.0)	0	4.9 (0.7)	0.1 (0.1)	0.7 (0.1)

Supplemental Table 5. Comparison of genetic gain across different selection schemes in 5 and 10 years, with the setting of 200 n and 100 QTLs

Asterisks (*) indicate a significant difference between selection schemes. The heritability of the target trait was set as $h^2 = 0.3$ (a) and $h^2 = 0.6$ (b). In GS-based schemes, the results when the number of markers was set as 500 were used for statistical tests. The P value was calculated by matched paired t test and adjusted using Bonferroni method. The values in brackets indicate genetic gain in 5 and 10 years. *p < 0.05; **p < 0.01; no, no significant difference.

(a) $h^2 = 0.3$

	5 year						
	GPS (2.9)	SPS (3.1)	GGs (3.6)	IGs (3.0)	GGs_S (4.0)	IGs_S (3.7)	GGs_SU (4.0)
SPS (3.1)	**	-	-	-	-	-	-
GGs (3.6)	**	**	-	-	-	-	-
IGs (3.0)	no	no	**	-	-	-	-
GGs_S (4.0)	**	**	**	**	-	-	-
IGs_S (3.7)	**	**	no	**	**	-	-
GGs_SU (4.0)	**	**	**	**	no	**	-
IGs_SU (3.3)	**	*	**	**	**	**	**

	10 year						
	GPS (4.0)	SPS (3.9)	GGs (4.8)	IGs (4.1)	GGs_S (4.7)	IGs_S (4.6)	GGs_SU (5.1)
SPS (3.9)	no	-	-	-	-	-	-
GGs (4.8)	**	**	-	-	-	-	-
IGs (4.1)	no	no	**	-	-	-	-
GGs_S (4.7)	**	**	no	**	-	-	-
IGs_S (4.6)	**	**	no	**	no	-	-
GGs_SU (5.1)	**	**	*	**	**	**	-
IGs_SU (4.6)	**	**	no	**	no	no	**

(b) $h^2 = 0.6$

	5 year						
	GPS (3.6)	SPS (3.8)	GGs (4.0)	IGs (3.4)	GGs_S (4.7)	IGs_S (4.3)	GGs_SU (4.4)
SPS (3.8)	**	-	-	-	-	-	-
GGs (4.0)	**	**	-	-	-	-	-
IGs (3.4)	**	**	**	-	-	-	-
GGs_S (4.7)	**	**	**	**	-	-	-
IGs_S (4.3)	**	**	**	**	**	-	-
GGs_SU (4.4)	**	**	**	**	**	*	-
IGs_SU (3.9)	**	no	no	**	**	**	**

	10 year						
	GPS (4.9)	SPS (4.7)	GGs (5.3)	IGs (4.7)	GGs_S (5.6)	IGs_S (5.4)	GGs_SU (5.8)
SPS (4.7)	no	-	-	-	-	-	-
GGs (5.3)	**	**	-	-	-	-	-
IGs (4.7)	*	no	**	-	-	-	-
GGs_S (5.6)	**	**	**	**	-	-	-
IGs_S (5.4)	**	**	no	**	no	-	-
GGs_SU (5.8)	**	**	**	**	*	**	-
IGs_SU (5.4)	**	**	no	**	no	no	**

Supplemental Table 6. Comparison of genetic gain across different selection schemes in 5 and 10 years, with the setting of 200 n and 30 QTLs

Asterisks (*) indicate a significant difference between selection schemes. The heritability of the target trait was set as $h^2 = 0.3$ (a) and $h^2 = 0.6$ (b). In GS-based schemes, the results when the number of markers was set as 500 were used for statistical tests. The P value was calculated by matched paired t test and adjusted using Bonferroni method. The values in brackets indicate genetic gain in 5 and 10 years. *p < 0.05; **p < 0.01; no, no significant difference.

(a) $h^2 = 0.3$

	5 year						
	GPS (2.7)	SPS (3.0)	GGs (3.5)	IGs (2.9)	GGs_S (3.6)	IGs_S (3.4)	GGs_SU (3.6)
SPS (3.0)	**	-	-	-	-	-	-
GGs (3.5)	**	**	-	-	-	-	-
IGs (2.9)	no	no	**	-	-	-	-
GGs_S (3.6)	**	**	no	**	-	-	-
IGs_S (3.4)	**	**	no	**	**	-	-
GGs_SU (3.6)	**	**	no	**	no	no	-
IGs_SU (3.2)	**	**	**	**	**	**	**

	10 year						
	GPS (3.7)	SPS (3.6)	GGs (4.2)	IGs (3.7)	GGs_S (4.1)	IGs_S (4.0)	GGs_SU (4.3)
SPS (3.6)	no	-	-	-	-	-	-
GGs (4.2)	**	**	-	-	-	-	-
IGs (3.7)	no	no	**	-	-	-	-
GGs_S (4.1)	**	**	no	**	-	-	-
IGs_S (4.0)	**	**	*	**	no	-	-
GGs_SU (4.3)	**	**	no	**	no	**	-
IGs_SU (4.1)	**	**	no	**	no	no	no

(b) $h^2 = 0.6$

	5 year						
	GPS (3.4)	SPS (3.5)	GGs (3.8)	IGs (3.3)	GGs_S (4.2)	IGs_S (3.9)	GGs_SU (4.1)
SPS (3.5)	no	-	-	-	-	-	-
GGs (3.8)	**	**	-	-	-	-	-
IGs (3.3)	**	**	**	-	-	-	-
GGs_S (4.2)	**	**	**	**	-	-	-
IGs_S (3.9)	**	**	**	**	**	-	-
GGs_SU (4.1)	**	**	**	**	*	*	-
IGs_SU (3.7)	**	no	no	**	**	**	**

	10 year						
	GPS (4.4)	SPS (4.2)	GGs (4.6)	IGs (4.2)	GGs_S (4.7)	IGs_S (4.7)	GGs_SU (4.9)
SPS (4.2)	*	-	-	-	-	-	-
GGs (4.6)	**	**	-	-	-	-	-
IGs (4.2)	**	no	**	-	-	-	-
GGs_S (4.7)	**	**	no	**	-	-	-
IGs_S (4.7)	**	**	no	**	no	-	-
GGs_SU (4.9)	**	**	**	**	*	**	-
IGs_SU (4.7)	**	**	no	**	no	no	**

Supplemental Table 7. Comparison of genetic gain across different selection schemes in 5 and 10 years, with the setting of 500 n and 100 QTLs

Asterisks (*) indicate a significant difference between selection schemes. The heritability of the target trait was set as $h^2 = 0.3$ (a) and $h^2 = 0.6$ (b). In GS-based schemes, the results when the number of markers was set as 500 were used for statistical tests. The P value was calculated by matched paired t test and adjusted using Bonferroni method. The values in brackets indicate genetic gain in 5 and 10 years. *p < 0.05; **p < 0.01; no, no significant difference.

(a) $h^2 = 0.3$

	5 year						
	GPS (3.1)	SPS (3.4)	GGG (4.3)	IGS (3.8)	GGG_S (4.9)	IGG_S (4.6)	GGG_SU (4.7)
SPS (3.4)	**	-	-	-	-	-	-
GGG (4.3)	**	**	-	-	-	-	-
IGS (3.8)	**	**	**	-	-	-	-
GGG_S (4.9)	**	**	**	**	-	-	-
IGG_S (4.6)	**	**	**	**	**	-	-
GGG_SU (4.7)	**	**	**	**	**	no	-
IGG_SU (4.3)	**	**	no	**	**	**	**

	10 year						
	GPS (4.4)	SPS (4.2)	GGG (5.5)	IGS (5.0)	GGG_S (5.7)	IGG_S (5.6)	GGG_SU (5.9)
SPS (4.2)	no	-	-	-	-	-	-
GGG (5.5)	**	**	-	-	-	-	-
IGS (5.0)	**	**	**	-	-	-	-
GGG_S (5.7)	**	**	no	**	-	-	-
IGG_S (5.6)	**	**	no	**	no	-	-
GGG_SU (5.9)	**	**	**	**	*	**	-
IGG_SU (5.7)	**	**	no	**	no	no	**

(b) $h^2 = 0.6$

	5 year						
	GPS (4.1)	SPS (4.2)	GGG (4.7)	IGS (4.2)	GGG_S (5.6)	IGG_S (5.4)	GGG_SU (5.3)
SPS (4.2)	*	-	-	-	-	-	-
GGG (4.7)	**	**	-	-	-	-	-
IGS (4.2)	no	no	**	-	-	-	-
GGG_S (5.6)	**	**	**	**	-	-	-
IGG_S (5.4)	**	**	**	**	**	-	-
GGG_SU (5.3)	**	**	**	**	**	no	-
IGG_SU (4.9)	**	**	**	**	**	**	**

	10 year						
	GPS (5.4)	SPS (5.1)	GGG (6.1)	IGS (5.7)	GGG_S (6.5)	IGG_S (6.6)	GGG_SU (6.7)
SPS (5.1)	**	-	-	-	-	-	-
GGG (6.1)	**	**	-	-	-	-	-
IGS (5.7)	**	**	**	-	-	-	-
GGG_S (6.5)	**	**	**	**	-	-	-
IGG_S (6.6)	**	**	**	**	no	-	-
GGG_SU (6.7)	**	**	**	**	no	no	-
IGG_SU (6.5)	**	**	**	**	no	no	no

Supplemental Table 8. Comparison of genetic gain across different selection schemes in 5 and 10 years, with the setting of 500 n and 30 QTLs

Asterisks (*) indicate a significant difference between selection schemes. The heritability of the target trait was set as $h^2 = 0.3$ (a) and $h^2 = 0.6$ (b). In GS-based schemes, the results when the number of markers was set as 500 were used for statistical tests. The P value was calculated by matched paired t test and adjusted using Bonferroni method. The values in brackets indicate genetic gain in 5 and 10 years. *p < 0.05; **p < 0.01; no, no significant difference.

(a) $h^2 = 0.3$

	5 year						
	GPS (3.0)	SPS (3.3)	GGs (4.1)	IGs (3.6)	GGs_S (4.4)	IGs_S (4.3)	GGs_SU (4.3)
SPS (3.3)	**	-	-	-	-	-	-
GGs (4.1)	**	**	-	-	-	-	-
IGs (3.6)	**	**	**	-	-	-	-
GGs_S (4.4)	**	**	**	**	-	-	-
IGs_S (4.3)	**	**	**	**	no	-	-
GGs_SU (4.3)	**	**	**	**	no	no	-
IGs_SU (4.0)	**	**	no	**	**	**	**

	10 year						
	GPS (4.1)	SPS (4.1)	GGs (4.8)	IGs (4.6)	GGs_S (4.8)	IGs_S (4.9)	GGs_SU (5.0)
SPS (4.1)	no	-	-	-	-	-	-
GGs (4.8)	**	**	-	-	-	-	-
IGs (4.6)	**	**	**	-	-	-	-
GGs_S (4.8)	**	**	no	**	-	-	-
IGs_S (4.9)	**	**	no	**	no	-	-
GGs_SU (5.0)	**	**	**	**	*	*	-
IGs_SU (4.9)	**	**	no	**	no	no	no

(b) $h^2 = 0.6$

	5 year						
	GPS (3.8)	SPS (3.9)	GGs (4.3)	IGs (3.9)	GGs_S (4.7)	IGs_S (4.6)	GGs_SU (4.6)
SPS (3.9)	**	-	-	-	-	-	-
GGs (4.3)	**	**	-	-	-	-	-
IGs (3.9)	**	no	**	-	-	-	-
GGs_S (4.7)	**	**	**	**	-	-	-
IGs_S (4.6)	**	**	**	**	**	-	-
GGs_SU (4.6)	**	**	**	**	no	no	-
IGs_SU (4.3)	**	**	no	**	**	**	**

	10 year						
	GPS (4.7)	SPS (4.5)	GGs (5.1)	IGs (4.9)	GGs_S (5.0)	IGs_S (5.1)	GGs_SU (5.3)
SPS (4.5)	**	-	-	-	-	-	-
GGs (5.1)	**	**	-	-	-	-	-
IGs (4.9)	*	**	**	-	-	-	-
GGs_S (5.0)	**	**	no	**	-	-	-
IGs_S (5.1)	**	**	no	**	no	-	-
GGs_SU (5.3)	**	**	**	**	**	**	-
IGs_SU (5.2)	**	**	no	**	no	no	**