Table S1. Quadratic model coefficient of determination (r^2), correlation coefficients a, b, and c for crop N, grain N yield, grain protein concentration, and response to N supply of all genotypes in each site-year shown in Figures 1 and 2. Coefficient significance: *P<0.1, **P<0.05, ***P<0.01 of committing type I error.

| 2004 Crop N | Model fit | r^2 | Coefficient | P value | Coefficient | P value | Coefficient | P value |
|-------------|-----------|-----|--------------|---------|--------------|---------|--------------|---------|
| 1519-16S    |           | 0.86| 5.99         | NS      | 0.35         | *       | 0.0003       | NS      |
| 1553-25 G   |           | 0.83| 6.36         | NS      | 0.38         | **      | 0.0000       | NS      |
| 1584-12 G   |           | 0.82| 3.01         | NS      | 0.58         | **      | -0.0011      | *       |
| Scarlet     |           | 0.87| 4.49         | NS      | 0.47         | **      | -0.0004      | NS      |
| 3512-1 G    |           | 0.72| 3.14         | NS      | 0.61         | **      | -0.0012      | NS      |
| 3512-26 T   |           | 0.84| 0.00         | NS      | 0.47         | **      | -0.0004      | NS      |
| 3586-6 G    |           | 0.84| 6.10         | NS      | 0.34         | **      | 0.0002       | NS      |
| Tara        |           | 0.76| 9.41         | NS      | 0.45         | *       | 0.0003       | **      |
| 2005 Crop N |           |     |              |         |              |         |              |         |
| 1519-16S    |           | 0.83| 0.69         | NS      | 0.39         | *       | 0.0007       | NS      |
| 1553-25 G   |           | 0.79| 1.97         | NS      | 0.30         | NS      | 0.0011       | NS      |
| 1584-12 G   |           | 0.93| -0.56        | NS      | 0.58         | **      | -0.0007      | NS      |
| Scarlet     |           | 0.85| 2.67         | NS      | 0.47         | **      | 0.0000       | NS      |
| 3512-1 G    |           | 0.93| -1.45        | NS      | 0.63         | **      | -0.0007      | NS      |
| 3512-26 T   |           | 0.94| -0.06        | NS      | 0.51         | **      | -0.0001      | NS      |
| 3586-6 G    |           | 0.90| 6.25         | NS      | 0.49         | **      | -0.0001      | NS      |
| Tara        |           | 0.87| 0.15         | NS      | 0.56         | **      | -0.0005      | NS      |
| 2004 Grain N Yield | | | | | | | | |
| 1519-16S    |           | 0.81| 25.68        | *       | 0.04         | NS      | 0.0008       | NS      |
| 1553-25 G   |           | 0.70| 30.79        | *       | -0.02        | NS      | 0.0009       | NS      |
| 1584-12 G   |           | 0.63| 17.14        | NS      | 0.26         | NS      | -0.0002      | NS      |
| Scarlet     |           | 0.69| 21.86        | *       | 0.17         | NS      | 0.0001       | NS      |
| 3512-1 G    |           | 0.40| 17.79        | NS      | 0.31         | NS      | -0.0005      | NS      |
| 3512-26 T   |           | 0.68| 29.17        | *       | 0.07         | NS      | 0.0006       | NS      |
| 3586-6 G    |           | 0.78| 27.90        | *       | -0.02        | NS      | 0.0010       | NS      |
| Tara        |           | 0.58| 44.82        | **      | -0.13        | NS      | 0.0012       | NS      |
Table S1 continued

| Model          | 2005 Grain N Yield | 2004 Protein Concentration | 2005 Protein Concentration |
|----------------|--------------------|----------------------------|----------------------------|
|                | r²                 | a (y-intercept)            | b (linear)                 | c (quadratic)             |
|                |                    | Coefficient                | P value                    | Coefficient               | P value                   |
| 2005 Grain N Yield |                   |                            |                            |                            |
| 1519-16S       | 0.91               | -3.49                      | NS                         | 0.46                      | **                        | -0.0006                  | NS                        |
| 1553-25 G      | 0.94               | -2.16                      | NS                         | 0.43                      | **                        | -0.0006                  | †                         |
| 1584-12 G      | 0.78               | -3.19                      | NS                         | 0.53                      | **                        | -0.0011                  | †                         |
| Scarlet        | 0.77               | 9.92                       | NS                         | 0.26                      | NS                        | -0.0001                  | NS                        |
| 3512-1 G       | 0.96               | 1.34                       | NS                         | 0.40                      | **                        | -0.0004                  | NS                        |
| 3512-26 T      | 0.92               | -3.50                      | NS                         | 0.51                      | **                        | -0.0008                  | †                         |
| 3586-6 G       | 0.83               | 18.04                      | *                          | 0.20                      | NS                        | 0.0003                   | NS                        |
| Tara           | 0.91               | -4.35                      | NS                         | 0.57                      | **                        | -0.0012                  | **                        |
| 2004 Protein Concentration |   |                            |                            |                            |
| 1519-16S       | 0.71               | 13.84                      | **                         | -0.07                     | *                         | 0.0004                   | **                        |
| 1553-25 G      | 0.60               | 13.23                      | **                         | -0.05                     | NS                        | 0.0003                   | **                        |
| 1584-12 G      | 0.62               | 12.79                      | **                         | -0.04                     | NS                        | 0.0002                   | *                         |
| Scarlet        | 0.50               | 11.68                      | **                         | -0.02                     | NS                        | 0.0001                   | NS                        |
| 3512-1 G       | 0.70               | 13.74                      | **                         | -0.06                     | *                         | 0.0003                   | **                        |
| 3512-26 T      | 0.64               | 13.18                      | **                         | -0.05                     | NS                        | 0.0003                   | *                         |
| 3586-6 G       | 0.74               | 13.14                      | **                         | -0.06                     | *                         | 0.0003                   | **                        |
| Tara           | 0.54               | 13.99                      | **                         | -0.06                     | NS                        | 0.0003                   | *                         |
| 2005 Protein Concentration |   |                            |                            |                            |
| 1519-16S       | 0.81               | 11.36                      | **                         | -0.03                     | NS                        | 0.0003                   | *                         |
| 1553-25 G      | 0.82               | 10.22                      | **                         | -0.03                     | NS                        | 0.0003                   | *                         |
| 1584-12 G      | 0.82               | 11.78                      | **                         | -0.04                     | NS                        | 0.0003                   | **                        |
| Scarlet        | 0.75               | 11.49                      | NS                         | 0.49                      | **                        | -0.0001                  | NS                        |
| 3512-1 G       | 0.84               | 9.47                       | **                         | -0.01                     | NS                        | 0.0002                   | **                        |
| 3512-26 T      | 0.89               | 10.07                      | **                         | -0.03                     | NS                        | 0.0003                   | **                        |
| 3586-6 G       | 0.75               | 12.31                      | **                         | -0.05                     | NS                        | 0.0004                   | **                        |
| Tara           | 0.83               | 9.10                       | **                         | 0.00                      | NS                        | 0.0002                   | †                         |
Table S2. Analysis of variance of dependent variables of year, N rate, genotype and N rate x genotype interaction for crop parameters, N use and components: \( P < 0.1, \* P < 0.05, \** P < 0.01 \) of committing type I error.

| Variable     | grain yield | GPC   | crop N | grain N yield | NUE  | NUPE | NUTE | NHI |
|--------------|-------------|-------|--------|---------------|------|------|------|-----|
| year (Y)     | **          | **    | **     | **            | **   | **   | **   | **  |
| N rate (N)   | **          | **    | **     | **            | **   | **   | **   | **  |
| genotype (G) | **          | *     | †      | **            | **   | NS   | NS   | *   |
| NxG          | NS          | NS    | NS     | NS            | NS   | NS   | NS   | *   |