Supplementary materials

1. Experiment site

Field experiment was conducted during wheat growth season in 2006 at Jiangning Experimental Station, Nanjing, Jiangsu province. The experiment was in a rice-wheat rotation system. Soil type was a yellow brown soil. Soil chemical properties were 14.30 g kg^{-1} organic matter, 1.10 g kg^{-1} total nitrogen (N), 62.50 mg kg^{-1} available N, 10.36 mg kg^{-1} available phosphorus, 85.2 mg kg^{-1} available potassium.

2. Experiment design

Different N rates (75, 150, 225 kg N ha^{-1}) were applied to generate contrasting conditions of N availability in three winter wheat cultivars (Aikang 58, AK-58; Yangmai 12, YM-12; Huaimai 17, HM-17). A randomized design with three replicates was used in the experiment. The 4m × 4.5m plot was used in the experiment, with the basic seedlings of 1.8×10^6 ha^{-1}. The distribution of total N was 50% before sowing, and 50% at jointing stage. Phosphorus and potassium were added to the soil before sowing as monocalcium phosphate $Ca(H_2PO_4)^2$ and potassium chroride KCl at rates of 120 kg ha^{-1} P_2O_5 and 135 kg ha^{-1} K_2O, respectively.

3. Sampling and measurements

At booting stage, the LAI-2000 was used for non-destructively estimation of LAI. The measurements were conducted at dusk and dawn and consisted of a sequence of readings (one above and four below the rice canopy) taken three times at each plot with a 90° view cap. Tiller number (TN, 10,000 plants ha^{-1}) and plant height (H, m) were estimated by measuring the on 5 plants within the plot before each sampling, followed by sampling of those five plants. Fresh plants were separated into green leaf blade (leaf) and culm plus sheath (stem). The area of all the separated green leaves was measured by LI-3000 leaf area meter (LI-COR, Lincoln, NE, USA). And, the LAI determined with the LI-3000 served as the actual LAI of the corresponding plot.

4. Data analysis

The data obtained in this experiment was used to calibrate the equation (6) and (10) in the manuscript.

$$LAI = 1.7787 \times LAI_{2000} - 0.8116 \quad (6)$$

where LAI_{2000} is the records of LAI-2000.

$$LAI = -0.3375 \times PC_{HT}^{2} + 3.665 \times PC_{HT} - 1.8249 \quad (10)$$

where PC_{HT} is the combination of plant characters, calculated using plant height (H, m) and tiller number (TN, 10,000 plants ha^{-1}).

5. Results

Equation 6 (LAI-2000 calibration curve, *Fig. S1A*) and Equation 10 (LAI estimation based on plant height and tiller number, *Fig. S1B*) were used to assess the LAI in three wheat varieties at the booting stage. The results showed that both equations can estimate the LAI in different N rates. Since the data we used here is not systematic. We think the results can only serve as a reference, and we will design new N rates and densities experiments in other crops to explore the models we developed in this paper.

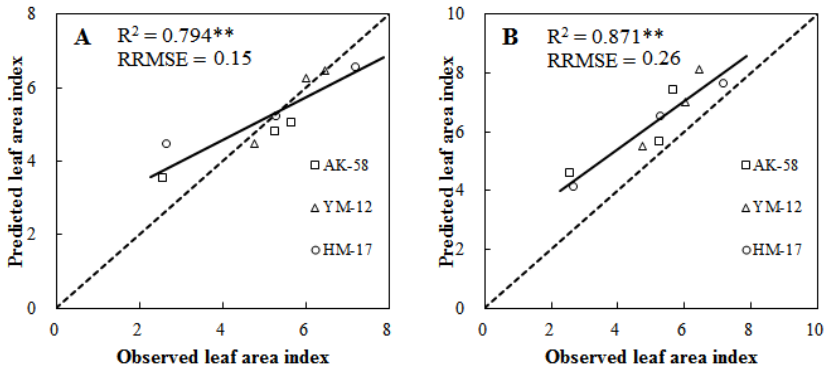

Figure S1 Relationship between observed and predicted leaf area index (LAI) based on LAI-2000 (A), and based on plant height and tiller number (B) for AK-58, YM-12 and HM-17 at booting stage.