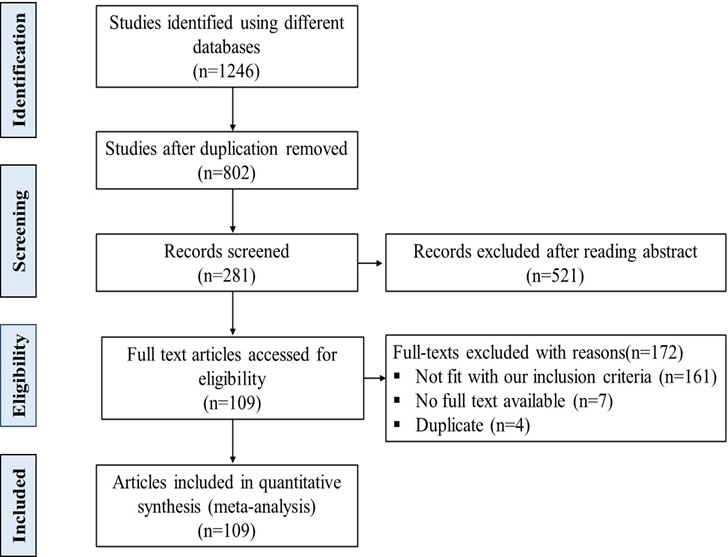
Supplementary Material

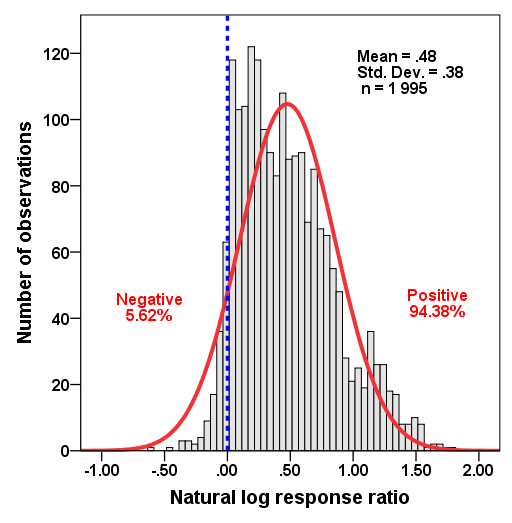
**This file includes:**

Figures S1, S2, S3, S4 and S5;

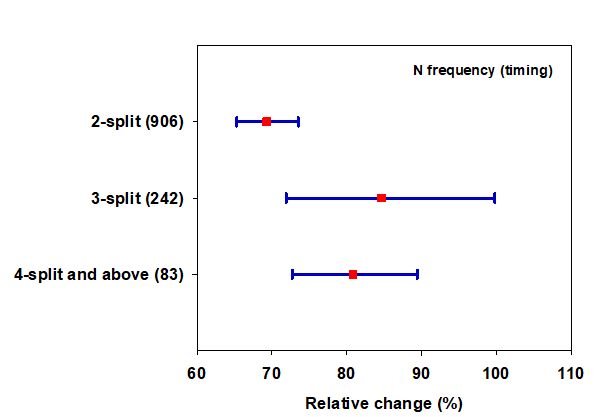
Table S1



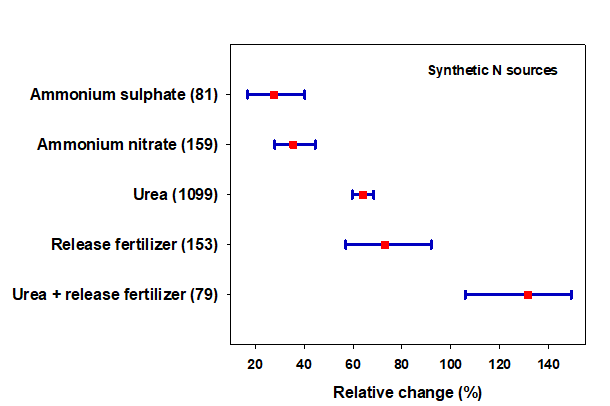
**Figure S1.** Flowchart diagram of the process applied for the meta-analysis

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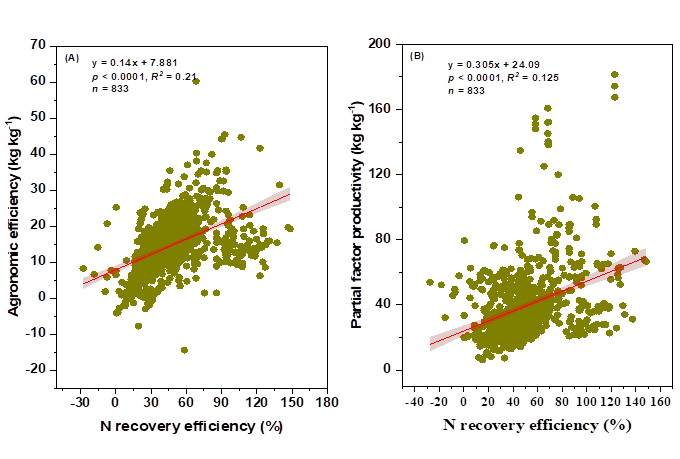
**Figure S2.** Histogram of natural log response ratio (ln*RR*) of wheat yield response to N fertilization at the global level (*n* = 1995). The blue dotted line represents a line of zero effect.

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**Figure S3.** Effect of N fertilization on wheat yield as affected by frequency of N split. Error bars represent a mean value at 95% CIs. Numbers in parentheses indicate the number of observations.

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**Figure S4.** Effect of N fertilization on wheat yield as affected by different chemical N sources. Error bars represent a mean value at 95% CIs. Numbers in parentheses indicate the number of observations.



**Figure S5.** Relationship between agronomic N use efficiency (kg kg-1) **(A)** and partial factor productivity (kg kg-1) **(B)** with N recovery efficiency (%) in wheat crop

**Table S1.** Bibliography for studies included in the meta-analysis.

|  |  |  |
| --- | --- | --- |
| Author-year | Title of the journal | Country |
| Abril et al. 2007 | Effect of wheat crop fertilization on nitrogen dynamics and balance in the Humid Pampas, Argentina | Argentina |
| Wallace et al. 2018 | Fertiliser timing and use of inhibitors to reduce N2O emissions of rainfed wheat in a semi-arid environment | Australia |
| Haque et al. 2017 | Response of yield, nitrogen use efficiency, and grain protein content of wheat (*Triticum aestivum l.*) Varieties to different nitrogen levels | Bangladesh |
| Timsina et al. 2001 | Cultivar, nitrogen, and water effects on productivity and nitrogen-use efficiency and balance for rice-wheat sequences of Bangladesh | Bangladesh |
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| Asgedom et al. 2016 | Nitrous oxide emissions from a clay soil receiving granular urea formulations and dairy manure | Canada |
| Grant, Moulin and Tremblay 2016 | Nitrogen management effects on spring wheat yield and protein concentration vary with seeding date and slope position | Canada |
| Duan J et al. 2019 | Optimizing nitrogen management to achieve high yield, high nitrogen efficiency and low nitrogen emission in winter wheat | China |
| Guo et al. 2019 | Root and nitrate-N distribution and optimization of n input in winter wheat | China |
| Ma et al. 2019 | Determining the optimal N input to improve grain yield and quality in winter wheat with reduced apparent N loss in the North China Plain | China |
| Wang et al. 2022 | Effects of nitrogen application rate under straw incorporation on photosynthesis, productivity and nitrogen use efﬁciency in winter wheat | China |
| He et al. 2013 | Effect of nitrogen management on productivity, nitrogen use efficiency and nitrogen balance for a wheat-maize system | China |
| Khan et al. 2020 | Soil water consumption, water use efficiency and winter wheat production in response to nitrogen fertilizer and tillage | China |
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| Liu et al. 2021 | Impacts of nitrogen practices on yield, grain quality, and nitrogen-use efﬁciency of crops and soil fertility in three paddy-upland cropping systems | China |
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