

**Supplementary Table S2** The correlation of environmental factors on the emission rate of N<sub>2</sub> by Spearman correlation analysis at both regional scale (all regions) and subregional scale (LP, IMP and XP).

| N <sub>2</sub>               | All      | LP       | IMP     | XP       |
|------------------------------|----------|----------|---------|----------|
| Altitude                     | -0.093   | -0.335*  | 0.013   | -0.045   |
| MAT                          | 0.152    | 0.404**  | 0.083   | 0.292*   |
| MAP                          | 0.540**  | 0.387**  | 0.342*  | 0.708**  |
| pH                           | -0.15    | -0.426** | 0.323*  | -0.438** |
| Moisture                     | -0.22    | -0.254   | 0.278   | 0.119    |
| EC                           | 0.272**  | 0.2      | 0.381** | 0.241    |
| Bulk density                 | -0.358** | -0.510** | -0.333* | -0.27    |
| TOC                          | 0.444**  | 0.570**  | 0.430** | 0.547**  |
| TC                           | 0.481**  | 0.484**  | 0.539** | 0.555**  |
| TN                           | 0.415**  | 0.441**  | 0.488** | 0.601**  |
| TP                           | 0.058    | -0.168   | 0.427** | -0.138   |
| TK                           | -0.252** | -0.202   | -0.185  | -0.461** |
| C/N                          | 0.099    | -0.079   | 0.428** | -0.129   |
| DOC                          | 0.520**  | 0.394**  | 0.385** | 0.689**  |
| DC                           | 0.504**  | 0.383**  | 0.540** | 0.678**  |
| DIC                          | 0.182*   | 0.123    | 0.466** | 0.009    |
| NO <sub>2</sub> <sup>-</sup> | -0.219** | -0.213   | 0.087   | -0.412** |
| NH <sub>4</sub> <sup>+</sup> | 0.465**  | 0.564**  | 0.21    | 0.621**  |
| NO <sub>3</sub> <sup>-</sup> | -0.155   | -0.19    | -0.065  | -0.082   |
| DN                           | -0.009   | -0.14    | 0.095   | 0.192    |
| N addition                   | 0.581**  | 0.861**  | 0.723** | 0.103    |