**Supplementary Material**

Table S1. Cumulative percentage of principal component of soil quality indicators.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Soil depth (cm) | Factor | Eigen value | Percent of variance | Cumulative percentage | Communality | Weight |
| 0-5 | Bulk density | 1.873 | 37.46 | 37.46 | 0.767 | 0.241 |
| Field capacity | 1.307 | 26.131 | 63.59 | 0.516 | 0.162 |
| Saturation capacity | 0.781 | 15.611 | 79.201 | 0.529 | 0.166 |
| Total N | 0.654 | 13.077 | 92.278 | 0.64 | 0.201 |
| Microbial biomass | 0.386 | 7.722 | 100 | 0.727 | 0.229 |
| 5-10 | Bulk density | 1.639 | 32.783 | 32.783 | 0.712 | 0.18 |
| Field capacity | 1.311 | 26.227 | 59.01 | 0.726 | 0.183 |
| Soil organic matter | 1.016 | 20.316 | 79.325 | 0.876 | 0.221 |
| Microbial biomass | 0.748 | 14.954 | 94.279 | 0.839 | 0.212 |
| Catalase activities | 0.286 | 5.721 | 100 | 0.813 | 0.205 |
| 10-30 | Bulk density | 1.759 | 43.979 | 43.979 | 0.768 | 0.278 |
| Non-capillary porosity | 1.006 | 25.145 | 69.124 | 0.779 | 0.282 |
| Microbial biomass | 0.884 | 22.096 | 91.221 | 0.983 | 0.356 |
| Catalase activities | 0.351 | 8.779 | 100 | 0.235 | 0.085 |
| 0-30 | Bulk density | 2.214 | 44.276 | 44.276 | 0.802 | 0.234 |
| Aggregates | 1.218 | 24.359 | 68.635 | 0.778 | 0.227 |
| Soil organic matter | 0.947 | 18.93 | 87.565 | 0.724 | 0.211 |
| Microbial biomass | 0.483 | 9.663 | 97.228 | 0.832 | 0.242 |
| Catalase activities | 0.139 | 2.772 | 100 | 0.296 | 0.086 |
|  |

Table S2. Soil quality index.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Soil depth (cm) | T | NT | TS | NTS | TP | NTP | LSD0.05 |
| 0-5 | 0.369 | 0.462 | 0.558 | 0.647 | 0.44 | 0.516 | 0.053 |
| 5-10 | 0.377 | 0.414 | 0.484 | 0.493 | 0.374 | 0.471 | 0.085 |
| 10-30 | 0.215 | 0.278 | 0.252 | 0.301 | 0.194 | 0.265 | 0.097 |
| 0-30 | 0.307 | 0.396 | 0.432 | 0.527 | 0.303 | 0.419 | 0.043 |
| The abbreviations of treatment names are those described in Table 1. |

Table S3. Correlation between soil quality index and grain yield.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Factors | 0-5 cm | 5-10 cm | 10-30cm | 0-30 cm | Grain yield |
| 0-5cm | 1 |  |  |  |  |
| 5-10 cm | 0.308 | 1 |  |  |  |
| 10-30cm | 0.215 | 0.361\* | 1 |  |  |
| 0-30 cm | 0.764\*\* | 0.505\*\* | 0.595\*\* | 1 |  |
| Grain yield | 0.565\*\* | 0.14 | 0.296 | 0.445\* | 1 |