**Supporting Information**

**Table S6. A. 2-D optimum design (1) (Nitrogen and Phosphorus)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Treatment  No. of Blocks | Factor X3 (Nitrogen, N) | | Factor X4 (Phosphorus, P2O5) | |
| Level Code Applied N (kg/ha) | | Level Code Applied P2O5 (kg/ha) | |
| 1, (7,13) | -1 | 0 | -1 | 0 |
| 2, (8,14) | 1 | 153 | -1 | 0 |
| 3, (9,15) | -1 | 0 | 1 | 90 |
| 4, (10,16) | -0.1315 | 66 | -0.1315 | 39 |
| 5, (11,17) | 1 | 153 | 0.3945 | 63 |
| 6, (12,18) | 0.3945 | 106.5 | 1 | 90 |

Three repeat, 18 blocks total, each with a 28 m2 area.