**Supplementary Table 1.** Effect of nano-fertilizers on economics of maize-wheat and pearl millet-mustard systems (mean of 2 years)

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Treatment | Maize | | | Wheat | | | Pearl millet | | | Mustard | | |
| Cost of cultivation (US$ ha-1) | Net return (US$ ha-1) | B:C | Cost of cultivation (US$ ha-1) | Net return (US$ ha-1) | B:C | Cost of cultivation (US$ ha-1) | Net return (US$  ha-1) | B:C | Cost of cultivation (US$ ha-1) | Net return (US$ ha-1) | B:C |
| RRN0PK | 485 | 314 | 1.65 | 429 | 272 | 1.63 | 318 | 374 | 2.18 | 332 | 509 | 2.54 |
| RRN 100PK | 525 | 918 | 2.75 | 462 | 816 | 2.76 | 335 | 863 | 3.58 | 352 | 1156 | 4.28 |
| RRN 0PK + Nano-Zn | 507 | 355 | 1.70 | 451 | 307 | 1.68 | 340 | 425 | 2.25 | 354 | 607 | 2.72 |
| RRN 50PK+ Nano-Zn | 532 | 662 | 2.24 | 472 | 581 | 2.23 | 351 | 631 | 2.80 | 366 | 891 | 3.43 |
| RRN 75PK+ Nano-Zn | 540 | 741 | 2.37 | 478 | 712 | 2.49 | 354 | 676 | 2.91 | 370 | 1007 | 3.72 |
| RRN 100PK+ Nano-Zn | 547 | 971 | 2.77 | 484 | 843 | 2.74 | 357 | 841 | 3.36 | 375 | 1157 | 4.09 |
| RRN 0PK + Nano-N+ Nano-Zn | 522 | 415 | 1.79 | 466 | 378 | 1.81 | 355 | 458 | 2.29 | 369 | 659 | 2.79 |
| RRN 50PK+ Nano-N+ Nano-Zn | 547 | 715 | 2.31 | 487 | 676 | 2.39 | 366 | 675 | 2.85 | 382 | 971 | 3.54 |
| RRN 75PK+ Nano-N+ Nano-Zn | 555 | 874 | 2.58 | 494 | 804 | 2.63 | 369 | 816 | 3.21 | 386 | 1120 | 3.90 |
| RRN 100PK+ Nano-N+ Nano-Zn | 562 | 996 | 2.77 | 500 | 866 | 2.73 | 372 | 898 | 3.41 | 390 | 1209 | 4.10 |
| RRN 0PK + Nano-N+ Nano-Zn +Nano-Cu | 530 | 378 | 1.71 | 473 | 366 | 1.77 | 362 | 427 | 2.18 | 376 | 620 | 2.65 |
| RRN 50PK+ Nano-N+ Nano-Zn +Nano-Cu | 555 | 699 | 2.26 | 495 | 651 | 2.32 | 373 | 661 | 2.77 | 389 | 973 | 3.50 |
| RRN 75PK+ Nano-N+ Nano-Zn +Nano-Cu | 562 | 828 | 2.47 | 501 | 773 | 2.54 | 376 | 788 | 3.09 | 393 | 1074 | 3.73 |
| RRN 100PK+ Nano-N+ Nano-Zn +Nano-Cu | 570 | 951 | 2.67 | 507 | 841 | 2.66 | 379 | 877 | 3.31 | 397 | 1183 | 3.98 |
| Sem± | - | 44.8 | 0.08 | - | 37.8 | 0.08 | - | 35.8 | 0.10 | - | 56.70 | 0.15 |
| CD (P≤0.05) | - | 131.0 | 0.24 | - | 110.5 | 0.23 | - | 104.7 | 0.29 | - | 165.8 | 0.44 |

*\*1 US $=82.78; B: C- ratio of gross return and cost of cultivation*

**Supplementary Table 2.** Effect of nano-Cu over nano-N and Zn in maize-wheat and pearl millet-mustard systems using contrast analysis

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast** | 2019-20 | | | | | 2020-21 | | | | |
| **DF** | **Contrast SS** | **Mean Square** | **F Value** | **Pr > F** | **DF** | **Contrast SS** | **Mean Square** | **F Value** | **Pr > F** |
| ***Maize*** | | | | | | | | | | |
| RRN0PK + Nano-N+ Nano-Zn ***Vs.*** RRN0PK + Nano-N+ Nano-Zn +Nano-Cu | 1 | 0.03375000 | 0.03375000 | 0.27 | 0.6105 | 1 | 0.03840000 | 0.03840000 | 0.31 | 0.5838 |
| RRN75PK+ Nano-N+ Nano-Zn ***Vs.*** RRN75PK+ Nano-N+ Nano-Zn +Nano-Cu | 1 | 0.04506667 | 0.04506667 | 0.35 | 0.5565 | 1 | 0.08166667 | 0.08166667 | 0.65 | 0.4258 |
| RRN100PK+ Nano-N+ Nano-Zn ***Vs.*** RRN10PK+ Nano-N+ Nano-Zn +Nano-Cu | 1 | 0.16006667 | 0.16006667 | 1.26 | 0.2718 | 1 | 0.00135000 | 0.00135000 | 0.01 | 0.9179 |
| ***Wheat*** | | | | | | | | | | |
| RRN0PK + Nano-N+ Nano-Zn ***Vs.*** RRN0PK + Nano-N+ Nano-Zn +Nano-Cu | 1 | 0.00375000 | 0.00375000 | 0.03 | 0.8701 | 1 | 0.01041667 | 0.01041667 | 0.11 | 0.7473 |
| RRN75PK+ Nano-N+ Nano-Zn ***Vs.*** RRN75PK+ Nano-N+ Nano-Zn +Nano-Cu | 1 | 0.01215000 | 0.01215000 | 0.09 | 0.7687 | 1 | 0.01401667 | 0.01401667 | 0.14 | 0.7087 |
| RRN100PK+ Nano-N+ Nano-Zn ***Vs.*** RRN10PK+ Nano-N+ Nano-Zn +Nano-Cu | 1 | 0.00806667 | 0.00806667 | 0.06 | 0.8106 | 1 | 0.00735000 | 0.00735000 | 0.07 | 0.7866 |
| ***Pearl millets*** | | | | | | | | | | |
| RRN0PK + Nano-N+ Nano-Zn ***Vs.*** RRN0PK + Nano-N+ Nano-Zn +Nano-Cu | 1 | 0.00735000 | 0.00735000 | 0.11 | 0.7444 | 1 | 0.00240000 | 0.00240000 | 0.05 | 0.8294 |
| RRN75PK+ Nano-N+ Nano-Zn ***Vs.*** RRN75PK+ Nano-N+ Nano-Zn +Nano-Cu | 1 | 0.00960000 | 0.00960000 | 0.14 | 0.7095 | 1 | 0.00960000 | 0.00960000 | 0.19 | 0.6669 |
| RRN100PK+ Nano-N+ Nano-Zn ***Vs.*** RRN10PK+ Nano-N+ Nano-Zn +Nano-Cu | 1 | 0.00060000 | 0.00060000 | 0.01 | 0.9257 | 1 | 0.00375000 | 0.00375000 | 0.07 | 0.7877 |
| ***Mustard*** | | | | | | | | | | |
| RRN0PK + Nano-N+ Nano-Zn ***Vs.*** RRN0PK + Nano-N+ Nano-Zn +Nano-Cu | 1 | 0.00135000 | 0.00135000 | 0.03 | 0.8695 | 1 | 0.00375000 | 0.00375000 | 0.07 | 0.7956 |
| RRN75PK+ Nano-N+ Nano-Zn ***Vs.*** RRN75PK+ Nano-N+ Nano-Zn +Nano-Cu | 1 | 0.00375000 | 0.00375000 | 0.08 | 0.7844 | 1 | 0.00666667 | 0.00666667 | 0.12 | 0.7300 |
| RRN100PK+ Nano-N+ Nano-Zn ***Vs.*** RRN10PK+ Nano-N+ Nano-Zn +Nano-Cu | 1 | 0.00001667 | 0.00001667 | 0.00 | 0.9854 | 1 | 0.00135000 | 0.00135000 | 0.02 | 0.8765 |