Article Supplementary Materials

Upcycling phosphorus recovered from anaerobically digested dairy manure to support production of vegetables and flowers

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Table S1. Nutrient contents of as-is and dried fine solids, other blend ingredients, derived plant foods, and the market alternative on a dry weight basis.

|                    | As-is Fine Solids | Dried Fine Solids | Potting Mix | Grain & Whey Permeate | Biochar | Plant Food A | Plant Food A1 | Plant Food A2 | Plant Food B | Market Alternative |
|--------------------|------------------|------------------|-------------|-----------------------|---------|--------------|--------------|--------------|--------------|-------------------|
| Total N (g kg⁻¹)   | 50.2             | 19.5             | 5.7         | 39.8b                 | 17.8b   | 41.6c        | 41.6c        | 40.4c        | 40.1c        | 44.9c             |
| Organic N (g kg⁻¹) | 38.8a            | 17.7c            | 5.7d        | 39.7d                 | 17.5d   | 40.1e        | 40.5e        | 39.7e        | 38.8e        | NA                |
| NH₄-N (g kg⁻¹)     | 11.3             | 1.8              | 0.0         | 0.1                   | 0.3     | 1.5          | 1.1          | 0.7          | 1.3          | NA                |
| NO₃-N (g kg⁻¹)     | 0.01             | 0.00             | 0.00        | 0.00                  | 0.00    | 0.00         | 0.00         | 0.00         | 0.00         | NA                |
| Total P (g kg⁻¹)   | 18.3             | 17.1             | 0.6         | 5.3                   | 8.3     | 16.0         | 17.1         | 17.4         | 16.1         | 19.3              |
| Neutral NH₄ Citrate P (g kg⁻¹) | 19.4             | 19.5             | 0.4         | 5.3                   | 6.8     | 17.3         | 16.5         | 16.0         | 16.9         | 15.7              |
| 2% Citric Acid P (g kg⁻¹) | 15.3             | 11.9             | NA          | NA                    | NA      | 11.8         | 10.8         | 9.7          | 11.8         | 9.9                |
| Olsen P (g kg⁻¹)   | 0.8              | 1.8              | NA          | NA                    | NA      | 1.9          | 1.9          | 2.1          | 1.6          | 0.7                |
| Water Extractable P (g kg⁻¹) | 1.9              | 3.0              | NA          | NA                    | NA      | 3.2          | 3.4          | 3.4          | 3.5          | 2.3                |
| Total K (g kg⁻¹)   | 14.7             | 12.9             | 1.2         | 7.6                   | 31.0    | 13.3         | 14.5         | 14.9         | 13.8         | 19.4              |
| Neutral NH₄ Citrate K (g kg⁻¹) | 18.6             | 16.9             | 1.5         | 8.4                   | 32.5    | 16.9         | 16.2         | 15.8         | 16.1         | 21.4              |
| Total C (g kg⁻¹)   | 405              | 383              | 329         | 470                   | 550     | 386          | 413          | 424          | 388          | NA                |
| Total B (g kg⁻¹)   | 0.02             | 0.02             | 0.03        | 0.00                  | 0.04    | 0.02         | 0.02         | 0.02         | 0.02         | 0.00              |
| Total Ca (g kg⁻¹)  | 32               | 32               | 25          | 2                     | 35      | 22           | 22           | 22           | 22           | 56                |
| Total Cu (g kg⁻¹)  | 0.64             | 0.66             | 0.04        | 0.00                  | 0.03    | 0.67         | 0.70         | 0.69         | 0.68         | 0.04              |
| Total Fe (g kg⁻¹)  | 0.83             | 0.83             | 1.85        | 0.22                  | 2.50    | 0.82         | 0.79         | 0.78         | 0.80         | 0.25              |
| Total Mg (g kg⁻¹)  | 12               | 12               | 5.1         | 1.6                   | 15      | 12           | 12           | 12           | 12           | 3.5               |
| Total Mn (g kg⁻¹)  | 0.22             | 0.22             | 0.11        | 0.01                  | 0.28    | 0.23         | 0.24         | 0.23         | 0.24         | 0.07              |
| Total Na (g kg⁻¹)  | 5.5              | 5.4              | 0.4         | 1.7                   | 7.1     | 5.1          | 5.6          | 5.2          | 5.2          | 1.7               |
| Total Z (g kg⁻¹)   | 0.35             | 0.35             | 0.08        | 0.06                  | 0.14    | 0.29         | 0.32         | 0.32         | 0.32         | 0.28              |

*a* Partially dried to ~45% total solids at 60°C

*b* Total N measured by combustion analysis

*c* Total N calculated as sum of total Kjeldahl N and NO₃-N

*d* Organic N estimated as total N – (NH₄-N + NO₃-N)

*e* Organic N is estimated as total Kjeldahl N – NH₄-N
Table S2. Bioassay germination rates, survival rates, root dry biomass, shoot dry biomass and total dry biomass by amendment and application rate (mean ± 1 SD). Groups share a letter if the difference in means was not statistically significant ($P > 0.05$). $n = 6$ trays of 16 seedlings for germination and survival and $n = 24$ seedlings for root biomass, shoot biomass and total biomass.

| Plant       | Amendment        | Application Rate | Germination (%) | Survival (%) | Root Biomass (mg dry) | Shoot Biomass (mg dry) | Total Biomass (mg dry) |
|-------------|------------------|------------------|-----------------|--------------|-----------------------|------------------------|------------------------|
| tomato      | control          | 0                | 93±5<sup>ab</sup> | 98±6<sup>a</sup> | 9±2<sup>d</sup>       | 17±3<sup>d</sup>       | 26±5<sup>d</sup>       |
| tomato      | Market Alternative | 2               | 84±7<sup>b</sup>  | 89±9<sup>a</sup> | 51±11<sup>a</sup>    | 139±38<sup>a</sup>     | 190±47<sup>a</sup>     |
| tomato      | Plant Food B     | 2                | 94±4<sup>b</sup>  | 99±3<sup>a</sup> | 23±6<sup>d</sup>      | 63±17<sup>d</sup>      | 86±21<sup>d</sup>      |
| tomato      | Plant Food B     | 4                | 94±0<sup>bc</sup> | 97±6<sup>a</sup> | 30±6<sup>bc</sup>     | 90±19<sup>bc</sup>     | 120±24<sup>bc</sup>    |
| tomato      | Plant Food B     | 6                | 91±5<sup>bc</sup> | 100±0<sup>a</sup> | 38±7<sup>bc</sup>     | 115±21<sup>bc</sup>    | 152±27<sup>bc</sup>    |
| tomato      | Plant Food B     | 8                | 97±5<sup>a</sup>  | 96±8<sup>a</sup> | 37±9<sup>bc</sup>     | 114±27<sup>bc</sup>    | 150±35<sup>bc</sup>    |
| tomato      | Plant Food B     | 10               | 96±5<sup>a</sup>  | 93±0<sup>a</sup> | 37±10<sup>bc</sup>    | 110±28<sup>bc</sup>    | 147±38<sup>bc</sup>    |
| tomato      | Plant Food B     | 12               | 91±3<sup>bc</sup> | 92±9<sup>a</sup> | 33±14<sup>b</sup>     | 107±44<sup>bc</sup>    | 141±57<sup>bc</sup>    |
| marigold    | control          | 0                | 98±3<sup>a</sup>  | 100±0<sup>a</sup> | 10±2<sup>c</sup>      | 17±3<sup>d</sup>       | 27±5<sup>d</sup>       |
| marigold    | Market Alternative | 2               | 96±5<sup>a</sup>  | 80±24<sup>bc</sup> | 51±16<sup>a</sup>    | 127±38<sup>a</sup>     | 178±52<sup>bc</sup>    |
| marigold    | Plant Food A     | 2                | 99±3<sup>a</sup>  | 100±0<sup>a</sup> | 33±8<sup>b</sup>      | 69±15<sup>d</sup>      | 102±22<sup>d</sup>     |
| marigold    | Plant Food A     | 4                | 98±3<sup>bc</sup> | 97±3<sup>bc</sup> | 44±10<sup>bc</sup>    | 99±19<sup>abc</sup>    | 143±26<sup>abc</sup>   |
| marigold    | Plant Food A     | 6                | 99±3<sup>a</sup>  | 92±5<sup>bc</sup> | 38±15<sup>bc</sup>    | 88±31<sup>bc</sup>     | 125±45<sup>bc</sup>    |
| marigold    | Plant Food A     | 8                | 97±5<sup>a</sup>  | 82±12<sup>bc</sup> | 46±13<sup>bc</sup>    | 114±29<sup>bc</sup>    | 160±40<sup>bc</sup>    |
| marigold    | Plant Food A<sub>1</sub> | 6           | 99±3<sup>a</sup>  | 90±7<sup>bc</sup> | 48±17<sup>a</sup>     | 113±33<sup>a</sup>     | 161±48<sup>bc</sup>    |
| marigold    | Plant Food A<sub>2</sub> | 6             | 100±0<sup>a</sup> | 83±14<sup>ab</sup> | 52±12<sup>a</sup>     | 121±21<sup>ab</sup>    | 174±31<sup>a</sup>     |
Figure S1. Disease suppression potential of as-is fine solids and the market alternative ($n = 5$ per amendment). Negative values represented suppressive potential.