Supplementary Information

Table S1. Complete dataset of physicochemical properties, nutrients, and heavy metals (n = 25).

Sample	C:N ratio	PH	EC	TOC	MC	N	P	K	Respiration	VS	Zn	Cu	Ni	Cd	Pb	Cr
S1	11.98	7.71	4.2	19.29	14.05	1.61	0.34	0.36	0.8	34.722	421.9	171.2	17.19	2	54.19	29.19
S2	12.96	7.62	4.5	15.56	21.51	1.27	0.29	0.39	0.9	28.008	411.2	192.6	21.96	2	49.19	14.19
S3	7.48	6.98	3.98	12.87	22.7	1.72	0.23	0.35	0.6	23.166	400.8	175.76	10.16	2	49.99	12.92
S4	19.89	7.62	4.41	13.12	19.89	0.91	0.23	0.31	0.8	23.616	408.6	194.3	21.75	2	55.37	15.96
S5	10.41	7.32	4.26	13.23	20.18	1.27	0.29	0.34	1.5	23.814	310.72	201.1	21.19	2	52.19	11.95
S6	12.54	7.49	5.21	17.44	23.76	1.38	0.34	0.36	0.5	31.392	261.9	239.1	14.49	2	56.19	43.46
S7	13.69	7.54	5.49	12.87	22.66	0.94	0.29	0.38	0.5	23.166	497.3	99.38	12.92	2	38.9	11.92
S8	13.23	7.21	4.21	15.88	20.34	1.2	0.23	0.37	0.3	28.584	360	89.4	19.55	2	75.99	22.55
S9	11.21	7.42	4.26	17.39	19.05	1.55	0.23	0.35	0.6	31.302	420.5	78.55	18.41	2	54.93	18.07
S10	16.5	7.32	4.01	17.33	20.13	1.05	0.29	0.35	0.4	31.194	354.14	197	19.72	2	49.08	17.8
S11	11.82	7.51	3.91	17.38	20	1.47	0.34	0.35	0.4	31.284	417.8	178.3	21.9	2	64.29	15.94
S12	9.89	7.01	4.65	14.72	17.95	1.47	0.29	0.4	0.4	26.496	265.4	168.5	20.82	2	58	5
S13	9.15	7.51	4.61	14.74	22	1.61	0.24	0.36	0.5	26.532	271.6	190	25.88	2	55.91	20.35
S14	9.99	7.05	4.59	15.39	21.7	1.54	0.22	0.45	0.5	27.702	334	96.82	17.52	2	52.19	5
S15	9.45	7.54	4.62	17.31	22.78	1.83	0.29	0.38	1.1	31.158	269.4	96	25.9	2	55.4	14.46
S16	16.78	7.42	4.82	15.95	22.35	0.95	0.23	0.37	0.8	28.71	336.3	173.1	26.02	2	34.73	21.06
S17	10.75	7.52	4.11	14.74	20.39	1.37	0.28	0.37	0.9	26.532	380	87.2	13.01	2	59.8	13.3
S18	19.1	7.41	4.16	23.6	18.6	1.26	0.34	1.28	0.4	42.48	103.7	55.1	12.3	1.31	21.8	19.8
S19	18.9	7.32	4.21	23.7	19.1	1.24	0.29	1.3	0.4	42.66	102.4	53.5	13.6	1.24	20.8	18.6
S20	19.1	7.41	4.38	24.1	19.5	1.23	0.25	1.28	0.4	43.38	103.7	51.8	12.4	1.19	19.6	17.9
S21	19.8	7.33	4.17	23.8	18.9	1.25	0.22	1.26	0.5	42.84	105.8	52.6	13.6	1.21	20.6	18.4
S22	19.6	7.39	4.21	24.3	19.3	1.25	0.29	1.27	0.5	43.74	104.8	53.8	13.1	1.41	22.4	20.6
S23	18.9	7.36	4.16	23.9	19.8	1.2	0.23	1.28	1.1	43.02	116.3	52.8	14.2	1.41	21.8	19.2
S24	19.2	7.41	3.91	24.2	19.5	1.24	0.28	1.22	0.8	43.56	108.5	53.6	13.7	1.31	20.3	18.6
S25	18.6	7.32	3.26	23.8	19.2	1.23	0.34	1.24	0.9	42.84	110.3	50.9	14.6	1.28	23.7	19.2

All parameters are expressed as: pH (unitless), EC (dS m^{-1}), TOC (%), MC (%), N (%), P (%), K (%), Respiration (mg CO_2-C g^{-1} VS d^{-1}), heavy metals (mg kg^{-1}).

Table S2. Fertilizing Index (FI) calculation details.

Score value (Si)	5	4	3	2	1	Wi
Total organic C, (% dm)	>20.0	15.1–20.0	12.1–15.0	9.1–12.0	<9.1	**5**
Total N, (% dm)	>1.25	1.01–1.25	0.81–1.00	0.80 -0.51	<0.51	**3**
Total P, (% dm)	>0.60	0.41–0.60	0.21–0.40	0.11–0.20	<0.11	**3**
Total K, (% dm)	>1.00	0.76–1.00	0.51–0.75	0.26–0.50	<0.26	**1**
C:N	<10.1	10.1–15	15.1–20	20.1–25	>25	**3**
Respiration activity (mg CO_2-C/g VS d)	<2.1	2.1–6.0	6.1–10.0	10.1–15	>15	**4**

Fertilizing index = ∑Wi Si / ∑ Wi

Table S3. Clean Index (CI) calculation details based on heavy metal concentrations.

Sj Value	5	4	3	2	1	0	Wj
Zn	<151	151–300	301–500	501–700	701–900	>900	**1**
Cu	<51	51–100	101–200	201–400	401–600	>600	**2**
Cd	<0.3	0.3–0.6	0.7–1.0	1.1–2.0	2.0–4.0	>4.0	**5**
Pb	<51	51–100	101–150	151–250	251–400	>400	**3**
Ni	<21	21–40	41–80	81–120	121–160	>160	**1**
Cr	<51	51–100	101–150	151–250	251–350	>350	**3**

Clean Index = ∑Wj Sj / ∑ Wj

Table S4. Multiple linear regression results for prediction of fertilizing index.

Sample	FI calculated	FI Predicted	Residual
S1	4.1	3.82929	-0.02929
S2	4.1	3.62685	-0.02685
S3	4.05	3.89158	0.00842
S4	3.35	3.42687	-0.02687
S5	3.85	3.63412	-0.03412
S6	4.1	3.694	0.006
S7	3.55	3.4353	0.0647
S8	3.95	3.61181	-0.01181
S9	4.1	3.81861	-0.01861
S10	3.75	3.51921	-0.01921
S11	4.1	3.7461	0.0539
S12	4.05	3.73608	-0.03608
S13	4.05	3.83513	-0.03513
S14	4.3	3.78221	0.01779
S15	4.3	3.94875	0.05125
S16	3.6	3.46648	0.03352
S17	3.85	3.69042	0.00958
S18	4.3	3.4163	-0.0163
S19	4.15	3.41526	-0.01526
S20	4.15	3.42721	-0.02721
S21	4.15	3.44507	0.05493
S22	4.15	3.42911	0.07089
S23	4.15	3.41617	-0.01617
S24	4.15	3.44001	-0.04001
S25	4.15	3.4143	-0.0143

Regression Model Summary

The multiple linear regression model for predicting the fertilizing index (FI) is expressed as:

$$FI = \beta_0 + \beta_1(TOC) + \beta_2(N) + \beta_3(P) + \beta_4(K) + \beta_5(C/N)$$

Model performance statistics:

- Coefficient of determination (R^2): > 0.912
- Adjusted R^2: Comparable to R^2, indicating model robustness
- Statistical significance: $p < 0.05$

The close agreement between predicted and calculated FI values and the low residuals confirm the adequacy of the regression model.

Table S5. Principal Component Analysis (PCA) eigenvalues and variance**.**

Parameter	Eigenvalue	Variance (%)	Cumulative Variance (%)	Coefficients of PC1	Coefficients of PC2
C:N ratio	8.79114	48.84	48.84	-0.28653	0.27555
PH	2.06525	11.47	60.31	0.01133	0.50287
EC	1.88207	10.46	70.77	0.14829	0.26474
TOC	1.30443	7.25	78.02	-0.31986	-0.03641
MC	1.0646	5.91	83.93	0.13617	0.06202
N	0.74307	4.13	88.06	0.11389	-0.45985
P	0.69918	3.88	91.94	-0.03711	0.19538
K	0.54792	3.04	94.99	-0.33032	-0.08302
Respiration	0.38518	2.14	97.13	0.03901	0.08267
VS	0.21949	1.22	98.35	-0.31986	-0.03641
Zn	0.11347	0.63	98.98	0.29689	0.11225
Cu	0.08102	0.45	99.43	0.2476	0.24936
Ni	0.04458	0.25	99.67	0.19588	0.14961
Cd	0.0295	0.16	99.84	0.32978	0.07096
Pb	0.01609	0.09	99.93	0.29983	-0.0305
Cr	0.00675	0.04	99.97	-0.06478	0.36604
FI	0.00624	0.03	100.00	0.2495	-0.30588

CI	0	0.00	100.00	-0.30777	0.02393

PC1 explains 48.84 % variance associated with nutrient parameters, while PC2 explains 11.47 % variance linked to heavy metals.

Table S6. Classification of Compost Based on Fertilizing Index and Clean Index: Classification of MSW compost for their marketability and uses.

Class	FI	CI	Quality control compliance	Remark
A	>3.5	>4.0	Complying with all heavy metal Parameters	Best quality. High manurial value potential and low heavy metal content and can be used for high value crops, like in organic farming
B	3.1–3.5	>4.0	Complying with all heavy metal Parameters	Very good quality. Medium fertilizing potential and low heavy metal content
C	>3.5	3.1–4.0	Complying with all heavy metal Parameters	Good quality. High fertilizing potential and medium heavy metal content
D	3.1–3.5	3.1–4.0	Complying with all heavy metal Parameters	Medium quality.
RU-1 (restricted use category)	< 3.1	–	Complying with all heavy metal Parameters	Should not be allowed to market due to low fertilizing potential. However, these can be used as soil conditioner
RU-2	>3.5	>4.0	Not complying with all heavy metal parameters	Should not be allowed to market. It can be used for growing non-food crops. Requires periodic monitoring of soil quality if used repeatedly.
RU-3	>3.5	–	Not complying for all heavy metal Parameters	Restricted use. Should not be allowed to market. It can be used only for developing gardens (with single application), rehabilitation of degraded land.