

Piling More On Does Not Help When What Is Short Is a Ratio

— Adding **50** kg of the same leaves to **100** kg at a C/N of **60** leaves the ratio at **60** — adding **17.1062** kg of material at C/N **7** brings it to **30** and the rate from **0.513094** to **1.000000** — what must be added is the scarce side, not the plentiful one — [Paper 471]

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— *From thinking to syncing.* —

Abstract

A compost heap that will not work is thought to lack material. This paper shows that what is short is not quantity but a ratio—adding more of the plentiful side leaves it at **60**, while **17.1062** kg of the scarce side brings it to **30**. No new theorem or law is claimed. First, at a C/N of **30** the relative rate is exactly **1.0000000000000000** (Section 2). Second, both excess carbon (**100**) and excess nitrogen (**10**) slow it (Section 2). Third, this is the core of the paper. Adding **50** kg of the same leaves leaves the ratio unmoved, while **17.1062** kg at C/N **7** brings it to **30** (Section 3). Fourth, the rate is symmetric in the logarithm: C/N **90** and **10** give exactly the same value (Section 2). Fifth, a mixture always lies between its parts, so two on the same side cannot cross over (Section 3). Sixth, the separator is whether quantity is short or a ratio is off (Section 4). **Keywords:** composting, C/N ratio, organic matter decomposition, microorganisms, limiting factor.

Scope of this paper (scope note): No new theorem or law is claimed—the C/N ratio of compost, microbial decomposition and the arithmetic of mixing ratios are all standard. No procedure is prescribed—turning, moisture, aeration, temperature and duration are not the subject, nor are hygiene precautions. The rate function is a model—a log-normal form is assumed; it is not measured, and only expresses that departing from the ideal slows things. No material values are asserted—C/N of 60 for leaves and 7 for poultry manure are representative; real materials vary. Nitrogen loss is excluded—ammonia volatilisation and nitrate leaching are not the subject. Relation to earlier papers: Paper 470 showed that a highly accurate test can be wrong nine times in ten—there too, improving the wrong side achieved nothing. Paper 300 showed that common root and distinct root can be decided—“the quantity of material” and “the ratio of material” are distinct roots by that criterion. Paper 447 showed that added workers flow out of the exit—there too, the increasing direction had a limit. What is added is tabulating the rate at five C/N ratios, confirming the symmetry in the logarithm, solving for the required addition as 17.1062 kg and inverting, showing that adding the same material moves nothing, and placing the separator at quantity versus ratio.

1. Notation and the Question

Setting: The microbes that decompose organic matter use carbon and nitrogen at roughly 30 : 1. Write the carbon-to-nitrogen ratio of a material as C/N and take the ideal as 30. Express the slowing away from the ideal in log-normal form,

$$v(C/N) = \exp\left[-\frac{1}{2} \left(\frac{\ln(C/N/30)}{0.6}\right)^2\right]$$

A mass m at ratio c carries $mc/(1+c)$ of carbon and $m/(1+c)$ of nitrogen, and a mixture takes the ratio of the totals.

Observation 1.1

A heap that will not work is thought to lack material. Pile on more—it is treated as a question of quantity.

Observation 1.2

But what the microbes demand is a ratio. They use carbon and nitrogen as a pair—and an excess of either does not help.

Question: What must be added to move it.

2. Erring Either Way Slows It

Computation 2.1: Take the relative rate at five C/N ratios.

C/N ratio	Relative rate
10	0.187061
20	0.795857
30	1.000000
60	0.513094
100	0.133552

Observation 2.2

At C/N 30 it is exactly 1.0000000000000000. The peak of the assumed form—where supply matches what the microbes ask for.

Observation 2.3

With excess carbon (100) it falls to 0.133552. A seventh and a half—nitrogen is short and the microbes cannot multiply.

Observation 2.4

With excess nitrogen (10) it falls to 0.187061. Here the surplus leaves as ammonia—erring either way slows it.

Observation 2.5

The rate is symmetric in the logarithm. C/N 90 and C/N 10 give exactly the same value—tripling 30 or dividing it by three costs the same.

Observation 2.6

So what acts is a ratio, not a difference. +30 from 30 to 60 weighs the same as −20 from 30 to 10—the scale is logarithmic.

3. Adding the Same Thing Moves Nothing

Computation 3.1: Take the mixture ratio after adding two materials to 100 kg of leaves at C/N 60.

Added	Amount	Resulting C/N
Leaves (C/N 60)	50 kg	60.0000
Manure (C/N 7)	17.1062 kg	30.0000

Observation 3.2

Adding 50 kg of the same material leaves the ratio at 60. Though the heap is half as large again—the rate stays at 0.513094.

Observation 3.3

Adding 17.1062 kg at C/N 7 brings it to 30. Seventeen per cent of the leaves—and inverting returns 30.000000.

Observation 3.4

The rate goes from 0.513094 to 1.000000, a factor of 1.9490. For seventeen per cent more mass—where half as much again bought nothing.

Observation 3.5

A mixture always lies between its parts. Between 7 and 60—so two materials on the same side can never cross over, however much is added.

Observation 3.6

This is what “not a matter of quantity” means. A ratio is intensive, not extensive—it does not move by addition, only by mixing.

4. The Separator

The separator: is quantity short, or is a ratio off.

Observation 4.1

If quantity is short, add more of the same. Pile on what is to hand—no further judgement needed.

Observation 4.2

If a ratio is off, something different must be added. And specifically the scarce side—without knowing which is scarce, nothing can be moved.

Observation 4.3

These are distinct roots by the criterion of Paper 300. Both are called “short of material”—one a shortage of an extensive quantity, one an error in an intensive one.

Observation 4.4

The same shape as Paper 470. There, raising sensitivity barely moved the predictive value while specificity multiplied it by 5.47—here adding the same material moves nothing while adding a different one moves everything. In both, improving the wrong side achieves nothing.

Observation 4.5

It overlaps Paper 447 as well. There, too many workers cost effective performance—here an excess of either carbon or nitrogen slows the heap. In both, the increasing direction has a limit.

Observation 4.6

So when decomposition stalls, measure the ratio. Quantity says nothing—and once measured, which side to add is uniquely determined.

Observation 4.7

To be honest—the rate function is a model. A log-normal form was assumed, not measured—so 0.513094 depends on it; but that adding the same material leaves the ratio unmoved follows from the arithmetic of mixing alone.

5. Roll Call and Closing

1. 1.0000000000000000 at C/N 30 (Observation 2.2): **matching the demand.**
2. 0.133552 with excess carbon (Computation 2.1): **a seventh and a half.**
3. 0.187061 with excess nitrogen (Computation 2.1): **either way slows it.**
4. Symmetric in the logarithm (Observation 2.5): **90 and 10 exactly equal.**
5. 50 kg of the same leaves 60.0000 (Computation 3.1): **the core.**
6. 17.1062 kg at C/N 7 gives 30 (Computation 3.1): **confirmed by inversion.**
7. The rate rises by 1.9490 (Observation 3.4): **for 17 % more mass.**
8. A mixture lies between its parts (Observation 3.5): **one side cannot cross.**

9. The separator is quantity or ratio (Observation 4.3): **distinct roots by Paper 300.**

10. The conclusion is model-free (Observation 4.7): **from mixing arithmetic alone.**

Closing: A compost heap that will not work is thought to lack material—pile on more, treated as a question of quantity. But what the microbes demand is a ratio: they use carbon and nitrogen as a pair, and an excess of either does not help. Erring either way slows it—at C/N 30 the relative rate is exactly **1.0000000000000000**; with excess carbon at 100 it falls to **0.133552**, a seventh and a half, because nitrogen is short and the microbes cannot multiply. With excess nitrogen at 10 it falls to **0.187061**, the surplus leaving as ammonia. The rate is symmetric in the logarithm, C/N 90 and 10 giving exactly the same value: tripling 30 or dividing it by three costs the same, so what acts is a ratio and not a difference. And adding the same thing moves nothing—adding 50 kg of the same leaves to 100 kg at C/N 60 leaves the ratio at **60.0000**; the heap is half as large again and the rate stays at 0.513094. Adding **17.1062** kg at C/N 7 brings it to 30—seventeen per cent of the leaves, with inversion returning 30.000000. The rate goes from 0.513094 to **1.000000**, a factor of **1.9490**, for seventeen per cent more mass where half as much again bought nothing. A mixture always lies between its parts, so two materials on the same side can never cross over. A ratio is intensive, not extensive: it does not move by addition, only by mixing. One thing separates them—is quantity short, or is a ratio off. If quantity is short, pile on what is to hand and no further judgement is needed. If a ratio is off, something different must be added—specifically the scarce side—and without knowing which is scarce nothing can be moved. They are distinct roots by the criterion of Paper 300, one a shortage of an extensive quantity and one an error in an intensive one. It is the same shape as Paper 470, where raising sensitivity barely moved the predictive value while specificity multiplied it by 5.47: in both, improving the wrong side achieves nothing. It overlaps Paper 447 too, where too many workers cost effective performance: in both, the increasing direction has a limit. So when decomposition stalls, measure the ratio—quantity says nothing, and once measured which side to add is uniquely determined. To be honest—the rate function is a model, a log-normal form assumed rather than measured, so 0.513094 depends on it. But that adding the same material leaves the ratio unmoved follows from the arithmetic of mixing alone.

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