

# Composting for Low Income Households:

## How to make better fertilizers

A recent scientific paper has highlighted simple methods for recycling organic wastes in low-income countries<sup>1</sup>. If the household does not need to use organic waste for energy, composting is a good option. It is low-cost, improves the supply of nutrients and stabilizes the organic matter. However, if the organic waste available is low in nutrients or dry, action is needed to improve the nutrient content and increase the rate of composting. This should also avoid increased financial costs, water use or labour.



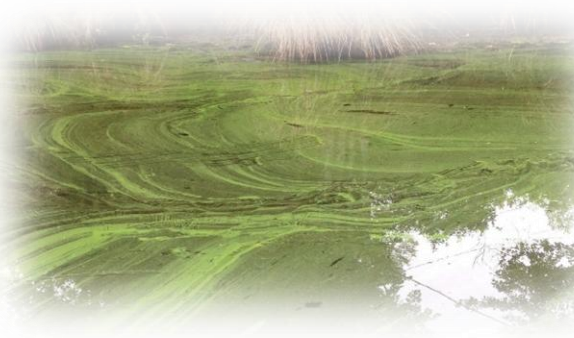
## Nitrogen

The optimal carbon (C) to nitrogen (N) ratio in the compost heap is 25–35. Below 25, ammonia is released; above 35, compost fails to heat or supply N. Low C:N ratio can be corrected with rice straw, biochar, soil or ammonia-oxidising inoculants; high C:N with poultry manure or N-fixing inoculants.

C:N	Description	Solutions	Effectiveness	Factors that limit use			
				Finances	Feedstock	Labour	Water
<25	Excess N	Co-compost with high C:N feedstock e.g. rice straw	High		Limits use		
	Overheating of compost	Absorb nutrients using biochar, soil or coir dust	Medium		Limits use		
	Smells of ammonia	Add ammonia-oxidising bacteria ( <i>Bacillaceae</i> )	Low	Limits use			
<b>25-35</b> Ideal range							
>35	Too little N Compost does not heat up	Co-compost with low C:N feedstock e.g. poultry manure	High		Limits use		
		Collect urine and apply to compost	High		Limits use		
		Co-compost with N-fixing under-utilised wild plants	Medium				
		Add commercial inoculum of N-fixing bacteria	Medium	Limits use			
		Add commercial <i>Trichoderma</i> inoculum	Medium	Limits use			
		Inoculate with liquid from the bottom of the compost pit	Low				

## Phosphorus

The optimal C to phosphorus (P) ratio is around 50. Below this, nutrient runoff can trigger algal blooms, and plants may show yellowing leaves and weak roots. Above 50, compost fails to heat properly, and plants exhibit poor flowering and purple leaves. Low C:P ratio can be corrected by co-composting with rice straw or



<sup>1</sup> Smith et al., 2026. *Environ. Res. Commun.* 8, 042002 <https://doi.org/10.1088/2515-7620/ae59f6>

adding biochar, soil or coir dust; high C:P by co-composting with poultry manure, adding rock phosphate or using P-mobilising inoculants.

C:P	Description	Solutions	Effectiveness	Factors that limit use			
				Finances	Feedstock	Labour	Water
<50	Excess P Algal bloom in runoff Yellowing leaves & small roots	Co-compost with high C:P feedstocks e.g. rice straw	High		Limits use		
		Absorb nutrients using biochar, soil or coir dust	Medium		Limits use		
<b>-50</b> Ideal range							
>50	Too little P Compost does not heat up Reduced flowering & purple leaves	Co-compost with low C:P feedstock e.g. poultry manure	High		Limits use		
		Mix with rock phosphate	High	Limits use			
		Inoculate with commercial P-mobilising bacteria (Aspergillus, Bacillus, Arthrobacter)	High	Limits use			

## Acidity

Composting works best at pH levels between 5.5 and 8.5. Outside this range, the heap will not heat-up properly. When compost is too acidic (pH less than 5.5), it smells sour and fungi may grow on it. Acidity can be reduced by adding lime, wood ash or alkaline materials, such as cattle manure or the washings from cattle sheds; covering the heap can also help. When compost is too alkaline (pH more than 8.5), balance can be restored by adding acidic or low C:N materials, such as poultry manure, food waste, pine needles or citrus peel.



pH	Description	Solutions	Effectiveness	Factors that limit use			
				Finances	Feedstock	Labour	Water
<5.5	Too acidic Compost does not heat up Sour smell Abundance of fungi	Co-compost with high pH feedstock (e.g. cattle manure) while also adjusting C:N to ideal ratio ~30	Low		Limits use		
		Add lime	High	Limits use			
		Add wood ash	Medium	Limits use			
		Cover compost	Low	Limits use			
<b>5.5-8.5</b> Ideal range							
>8.5	Too alkaline Compost does not heat up	Co-compost with low C:N feedstock (e.g. poultry manure) to increase acidifying processes	High		Limits use		
		Turn-in acidic feedstocks (e.g. food-waste, pine needles, citrus peel)	High	Limits use			

## Moisture and aeration

The moisture content of the compost heap should be 50% - 60%. If it is too wet or too dry, the heap will not heat up; very wet compost may smell of rotten eggs. Excess moisture can be corrected by adding dry materials, turning the heap more often, or improving aeration using pipes or the action of worms or insect larvae. Dry compost can be improved



by adding wet materials, urine or water, by covering the heap with plastic, soil or leaves, or using a shallow pit.

Moisture	Description	Solutions	Effectiveness	Factors that limit use			
				Finances	Feedstock	Labour	Water
<50%	Too dry Organic wastes do not decompose Compost does not heat up	Co-compost with wetter feedstocks	High		Limits use		
		Sprinkle with water	High				Limits use
		Cover	High	Limits use			
		Produce compost in a shallow pit	High				
		Divert urine into compost (avoid excess N or alkalinity)	High				
<b>50%-60% Ideal range</b>							
>60%	Too wet Organic wastes do not decompose Waterlogged Smells of bad eggs	Co-compost with drier feedstocks to achieve the moisture content of 55% (6) (e.g. most animal manures)	High		Limits use		
		Increase turning	High			Limits use	
		Embed bamboo poles, perforated pipes or construct on a lattice of branches or platform	Medium				
		Rotary drum composter to increase aeration	High	Limits use		Limits use	
		Vermi-compost or black-soldier fly larvae	High	Limits use		Limits use	

## Temperature

The ideal composting temperature is between 15°C and 35 °C. Below 15 °C, heat can be conserved by increasing heap size, insulating the pile, or composting in a pit. Above 35 °C, there is a risk of overheating, so the heap should be turned, spread out, or lightly watered to release excess heat.



Temperature	Description	Solutions	Effectiveness	Factors that limit use			
				Finances	Feedstock	Labour	Water
<15°C	Too cold Compost does not heat up	Increase volume to surface area	Medium				
		Insulate heap (e.g. use a thick-walled vessel or cover with thick fabric)	Medium	Limits use			
		Produce compost in a 1m deep pit with a sloping floor to insulate against low air temperatures	High				
<b>15°C-35°C Ideal range</b>							
>35°C	Too hot Compost overheats	Decrease volume to surface area by spreading heap out to allow heat loss (sheet composting)	High				
		Turn heap to release heat from the centre	High			Limits use	
		Sprinkle with water to cool the heap	Medium				Limits use
		Produce compost in a 1m deep pit with a sloping floor to insulate against high temperatures	High				Limits use

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