

# **Regulation (EU) No 1774/2002; practical experiences with process validation of Biowaste composting and anaerobic digestion in The Netherlands**

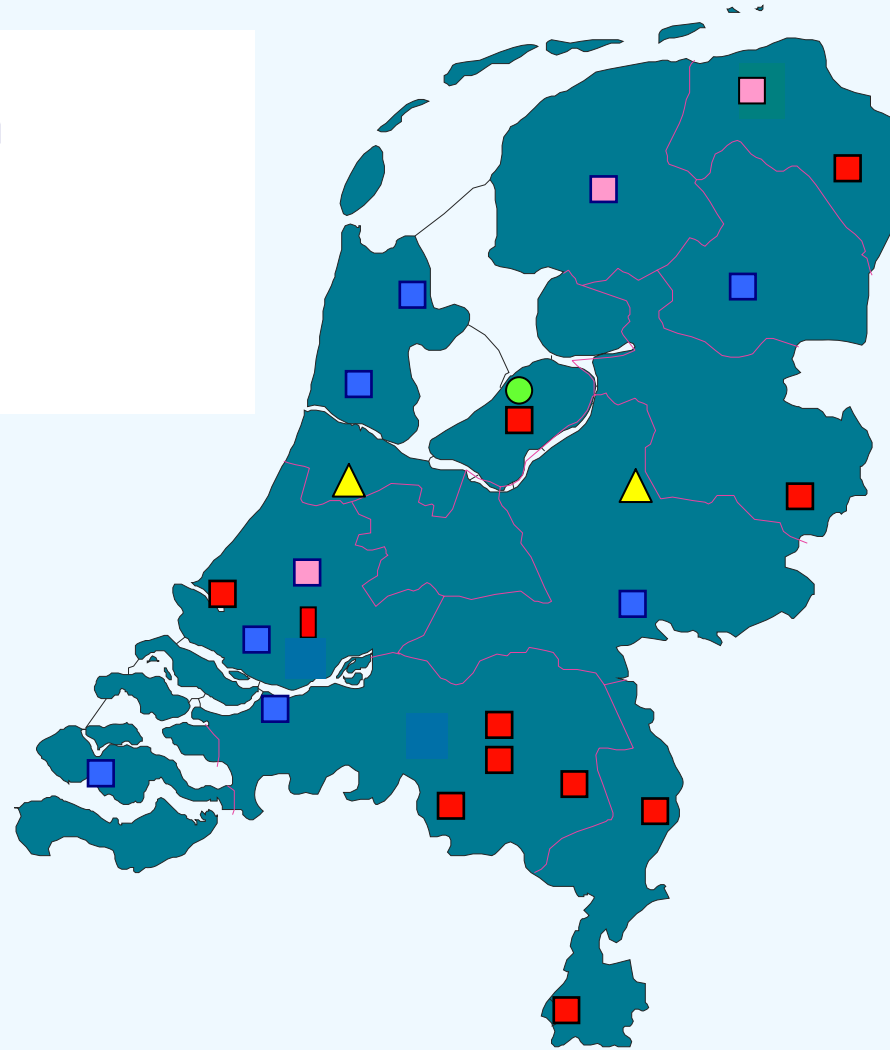
- 1. Existing plants and technologies in The Netherlands**
- 2. Practical experiences with process validation in The Netherlands (2006-2008)**
- 3. Summary**

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# 1. Existing plants and technologies in The Netherlands

- Bühler-GECO-system
- tunnelcomposting
- ▲ VAR-system
- PACOM-system
- digestion Biocel



## Time and temperature exposure in 5 Dutch Technologies

	Days	Temp (°C)	days	Temp (°C)
Bühler- or GECO-system	7	55-65	14	45-55
tunnelcomposting	1	60	7	45-55
VAR-system	14	55	28	<b>40</b>
			With minimal <b>10</b>	<b>55</b>
PACOM-system	7	55-65	17	45-55
Digestion BIOCEL	15	35-40	7	40-45

## 1. Existing plants, technologies and companies

<b>Composting- and digestion systems in The Netherlands</b> type	<b>number</b>	<b>licensed capacity (kton/year)</b>	<b>Share in total capacity (%)</b>
<b>Bühler- or GECO-system</b>	<b>7</b>	<b>704</b>	<b>41</b>
<b>tunnelcomposting</b>	<b>11</b>	<b>590</b>	<b>35</b>
<b>Open air (VAR-system)</b>	<b>2</b>	<b>229</b>	<b>13</b>
<b>Closed hall PACOM-system</b>	<b>3</b>	<b>100</b>	<b>6</b>
<b>anaërobic digestion (Biocel)</b>	<b>1</b>	<b>85</b>	<b>5</b>
<b>total</b>	<b>24</b>	<b>1.658</b>	<b>100</b>

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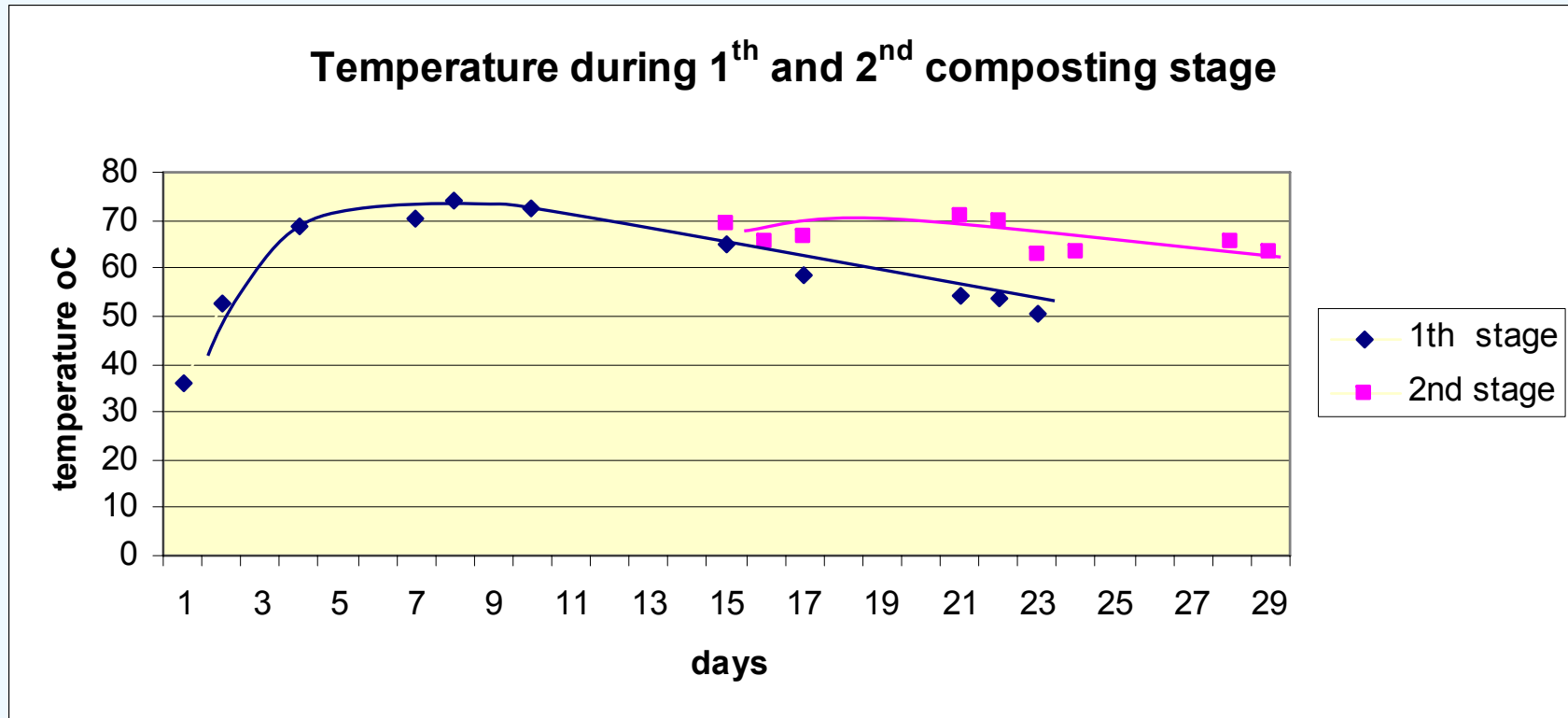


# 1. Existing plants

<b>Composting- and digestion systems in The Netherlands</b>	
<b>type</b>	
<b>Bühler- or GECO-system</b>	
<b>tunnelcomposting</b>	
<b>Open air (VAR-system)</b>	
<b>Closed hall PACOM-system</b>	
<b>anaerobic digestion (Bioc)</b>	
<b>total</b>	<b>24</b>



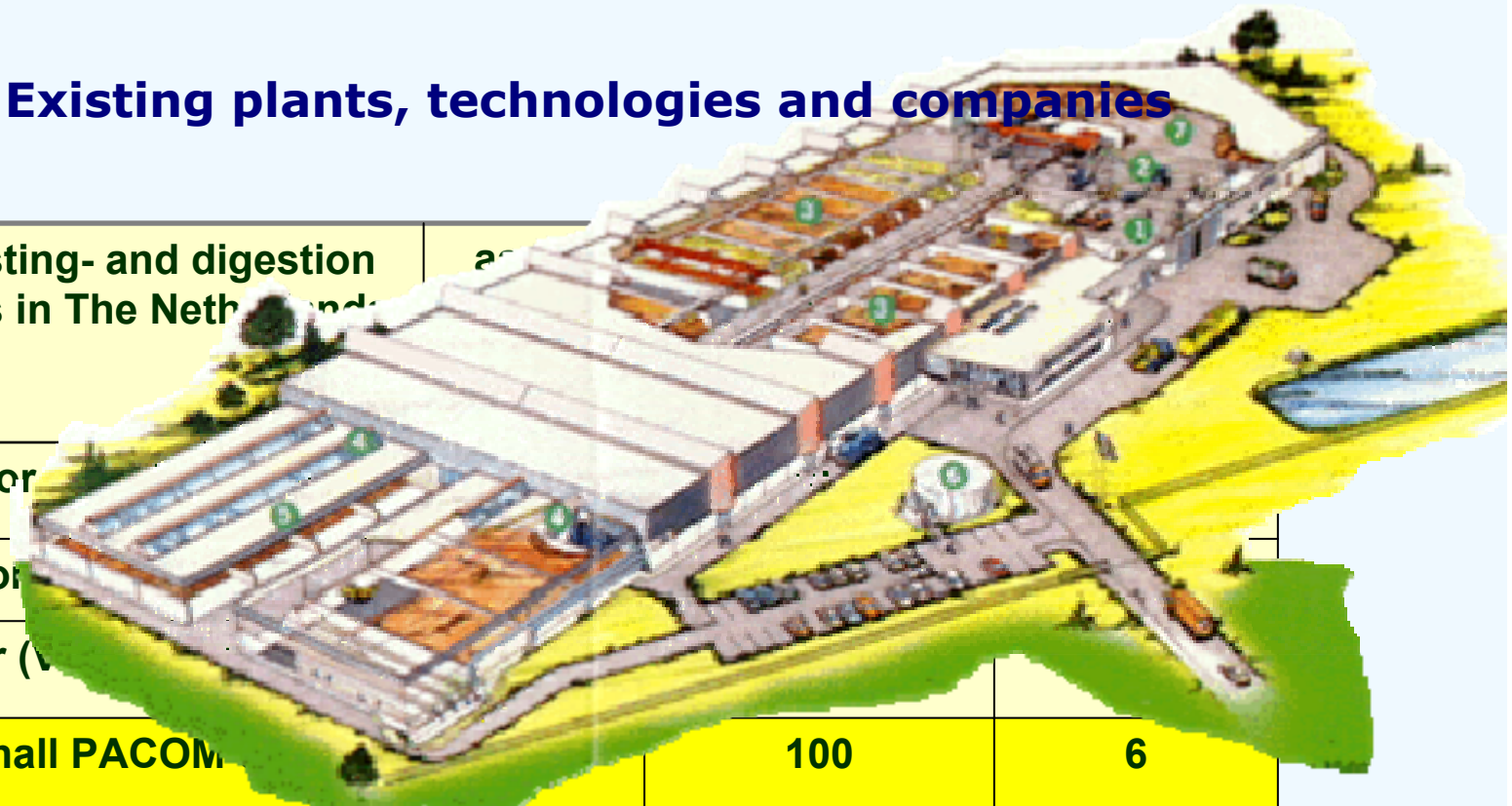
## Plant number 12 VAR system





# 1. Existing plants, technologies and companies

Composting- and digestion systems in The Netherlands	2007	
type		
Bühler- or tunnelcomposting		
Open air (Vermorel)		
Closed hall PACOM		100
anaerobic digestion (Biocel)	1	
total	24	6



# 1. Existing



<b>Composting- and d systems in The Net</b>			
<b>type</b>			
<b>Bühler- or GECO-sy</b>			
<b>tunnelcomposting</b>			
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<b>Closed hall PACOM</b>			
<b>anaërobic digestion (Biocel)</b>	<b>1</b>	<b>85</b>	<b>5</b>
<b>total</b>	<b>24</b>	<b>1.658</b>	<b>100</b>

## 2. Practical experiences with process validation in The Netherlands (2006-2008)

EC No 1774/2002 requires: 60 minutes, 70°C, < 12mm

or

1. 5log10 reduction for Enterococcus in the process

and

2. Enterococcus/E.Coli < 1000cfu/g after sanitation/in fresh compost (n = 5, c = 1, m = 1000, M = 5000 in 1 g)

3. Salmonella not detected in 25 g

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## Kitchen waste



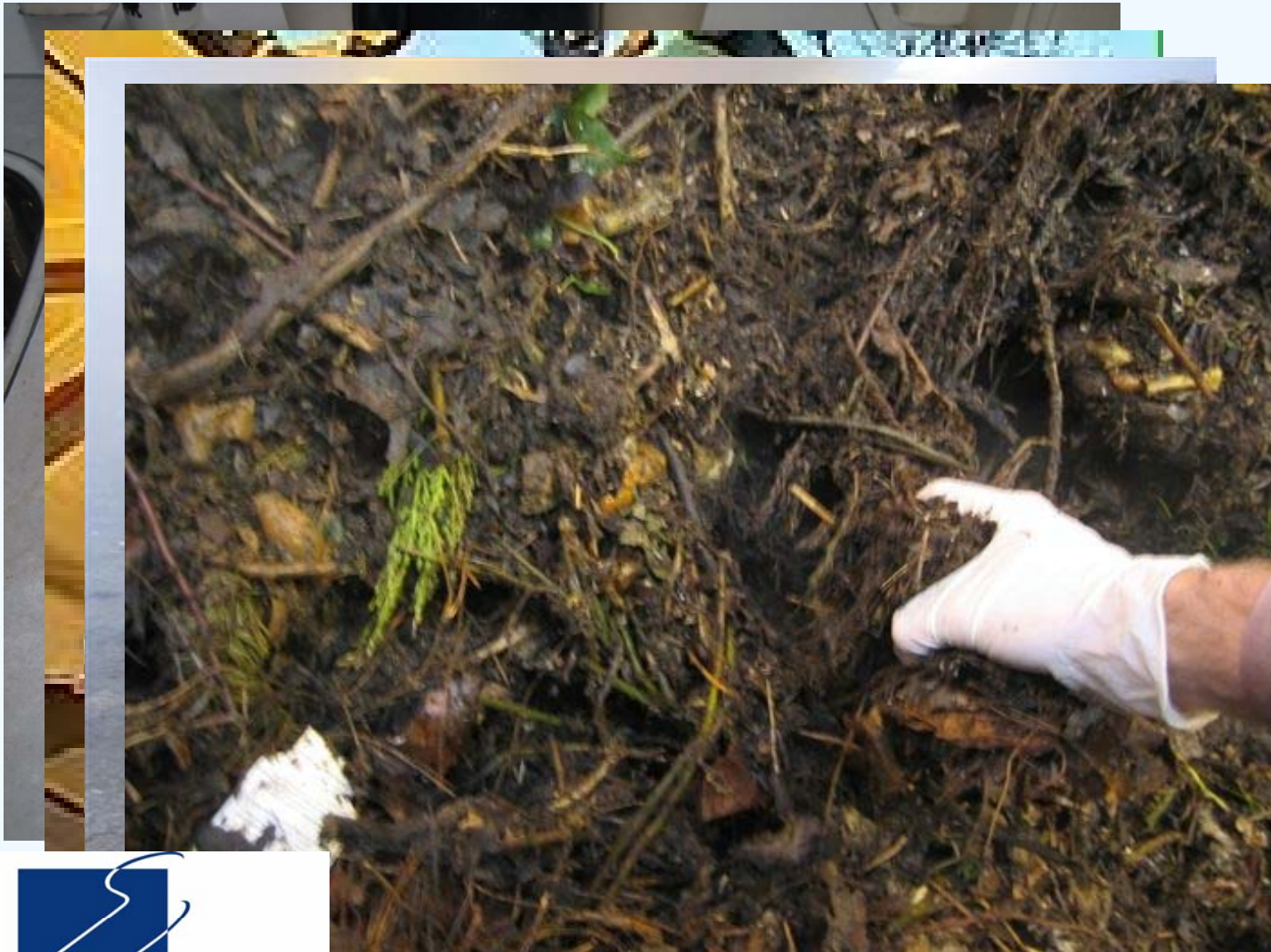
## Collection of kitchen and garden waste in The Netherlands



## Untreated kitchen and garden waste as received in the plant

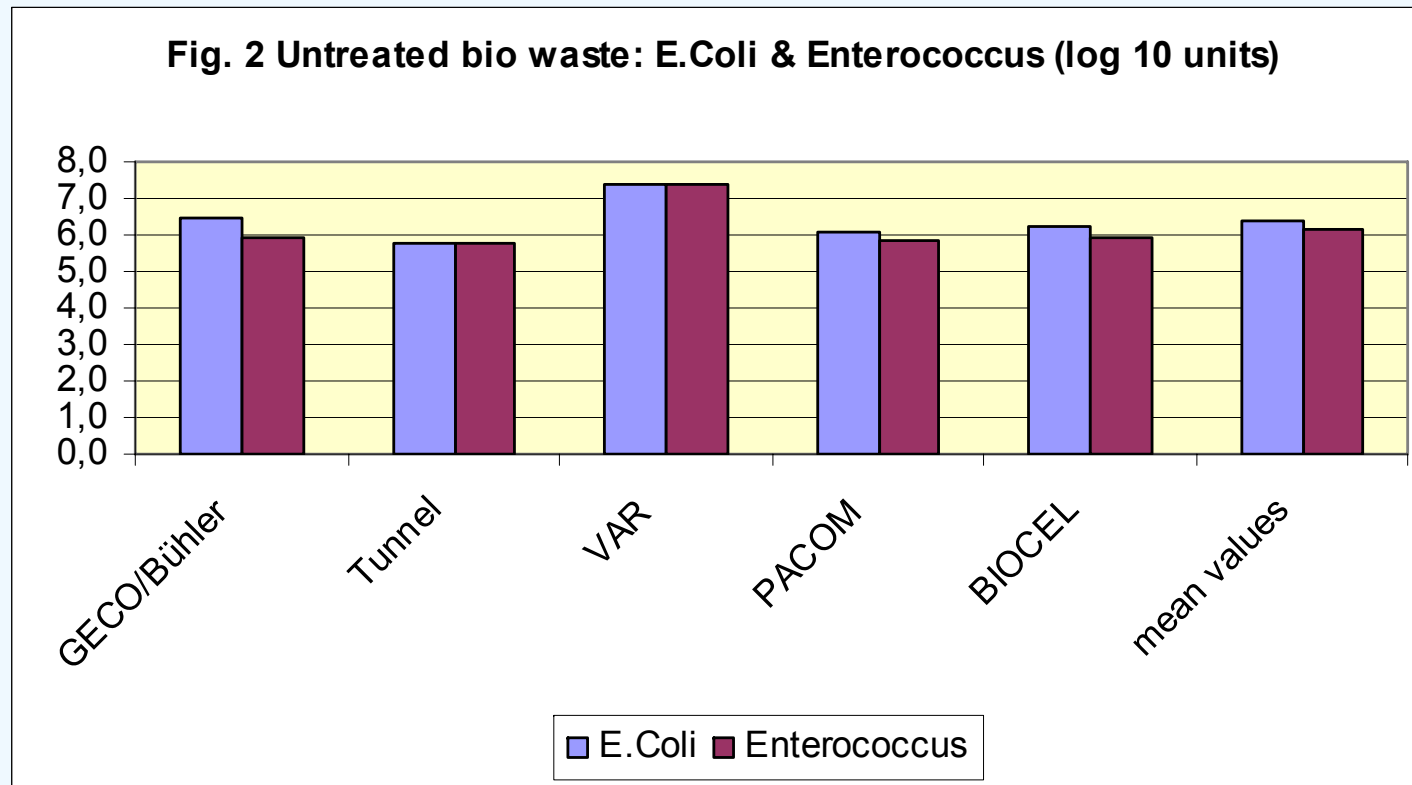


## Sampling of the untreated kitchen and garden waste: results





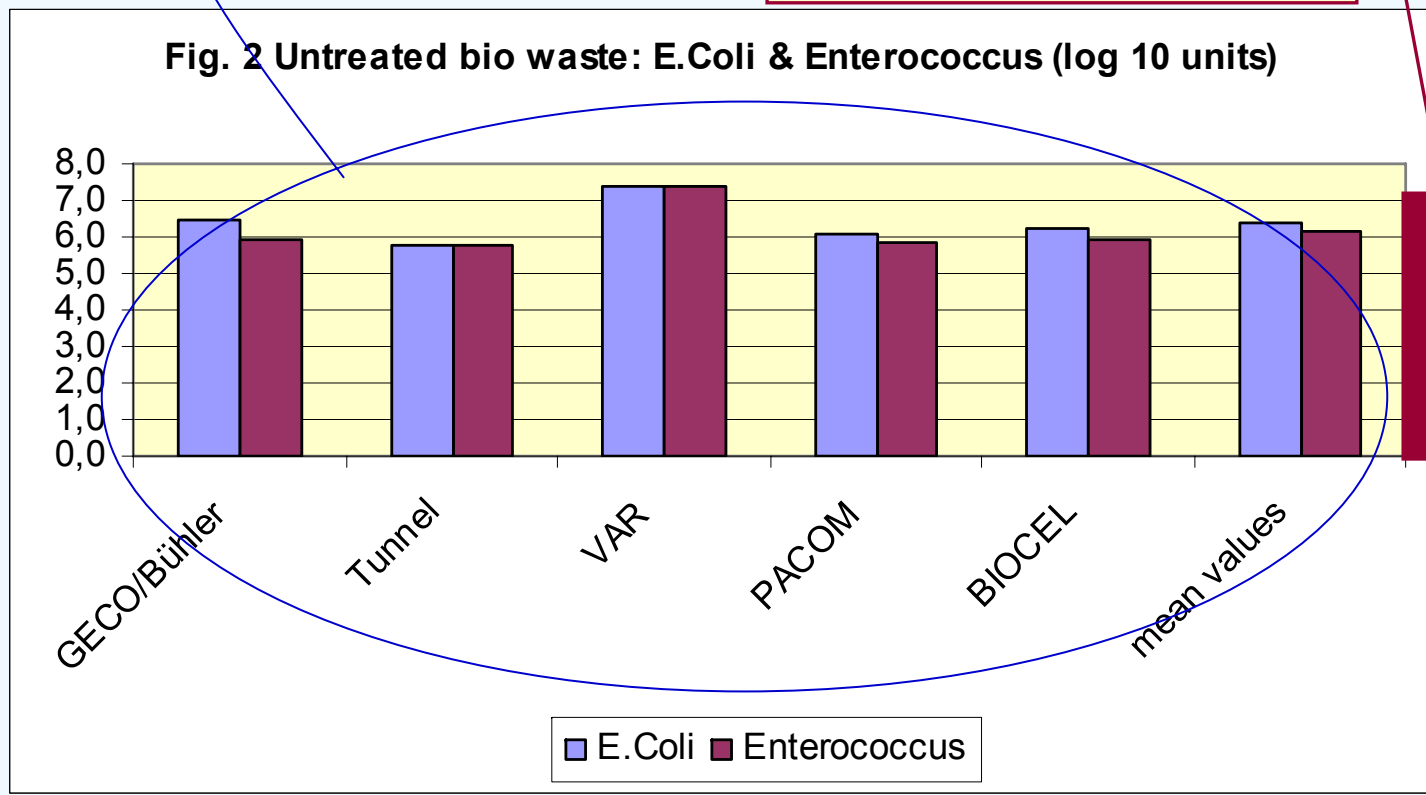
## Untreated waste pilot (5 plants in winter)



**sh untreated biowaste = Salmonella positive**

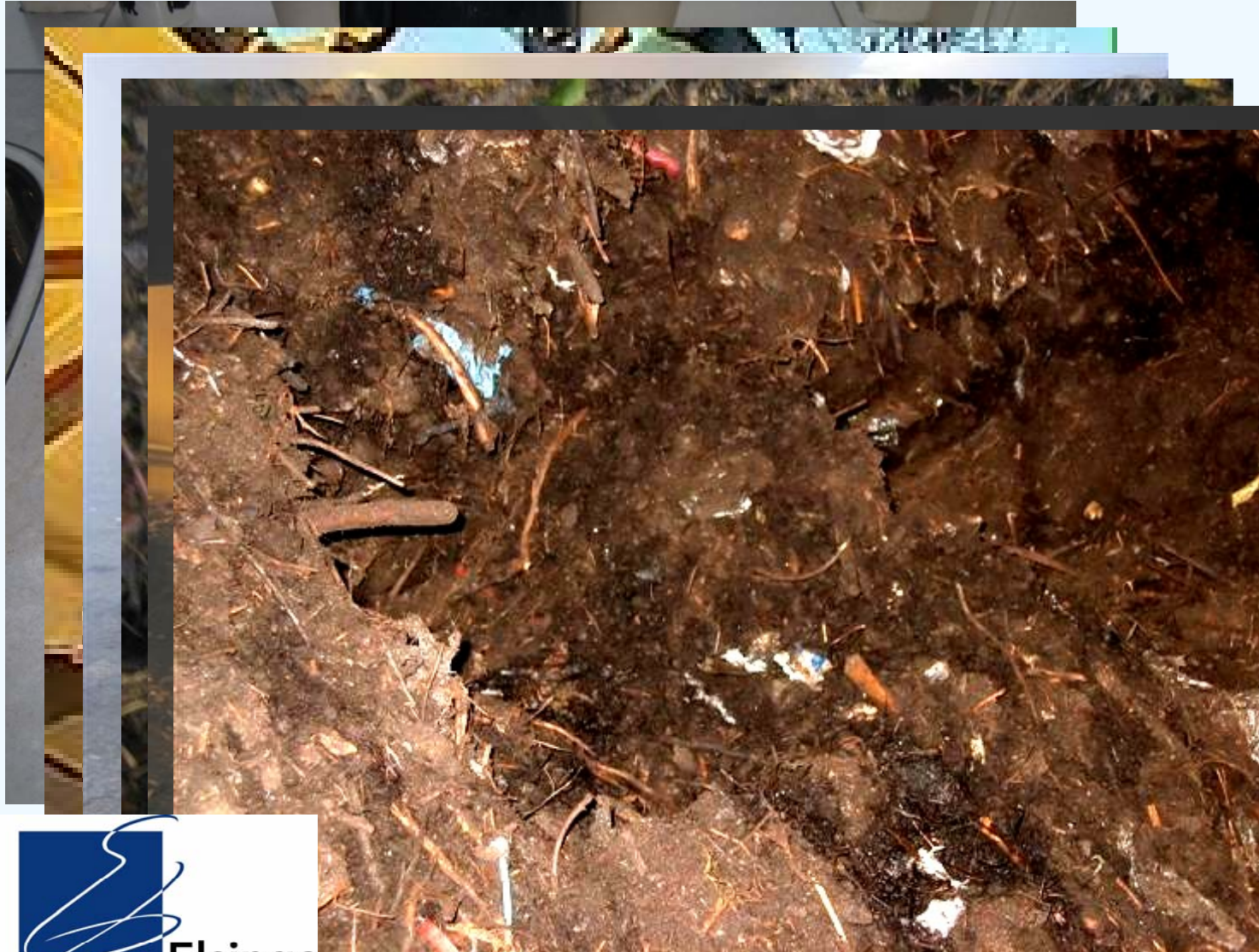
# Untreated waste pilot (5 plants in winter) and all 21 facilities (in summer)

Enterococcus 21 plants  
 $6,6 \leq 7,1 \leq 7,7$



sh untreated biowaste = Salmonella positive

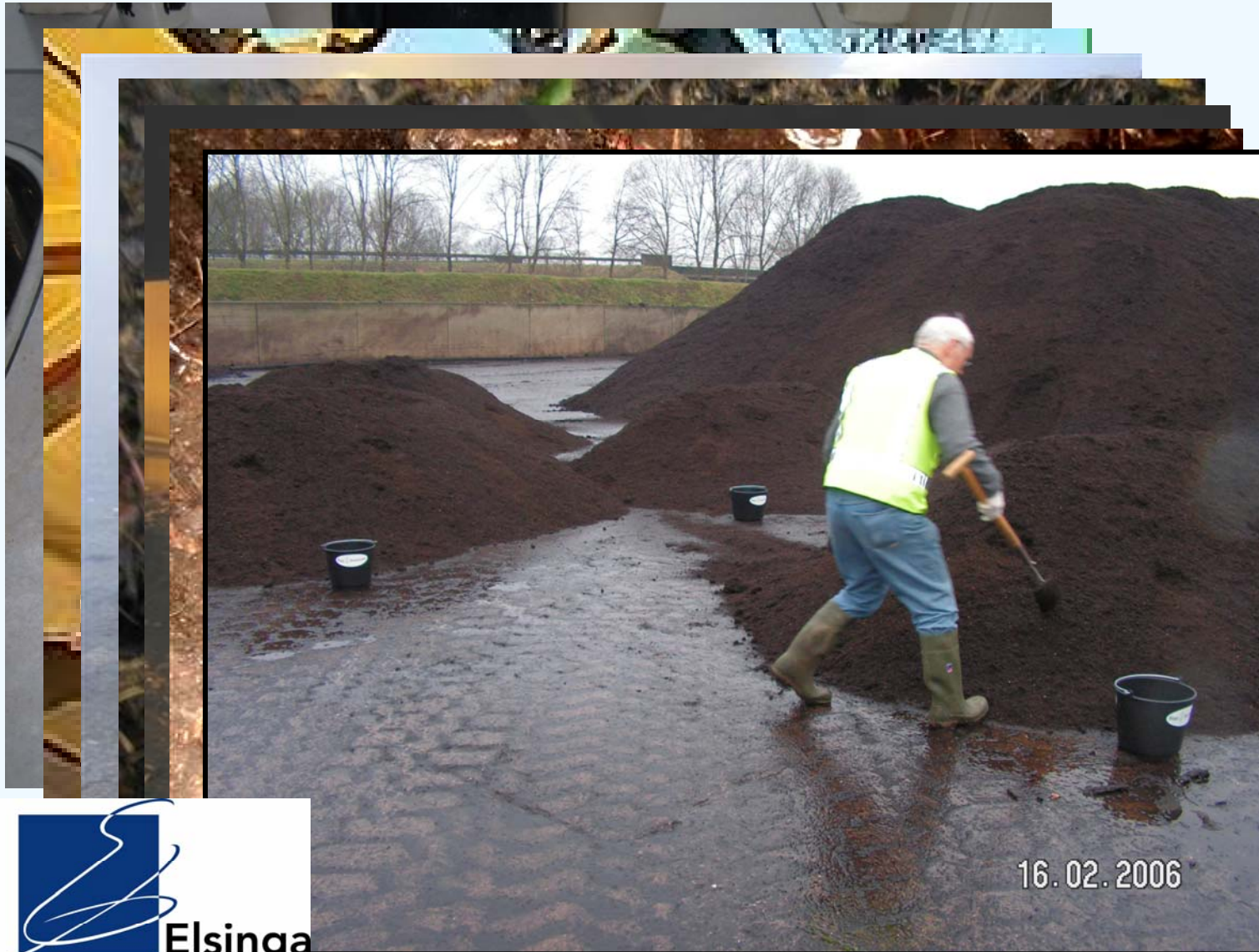
## Sampling of the sanitized product (before screening)



## Composted product after sanitation (before screening)



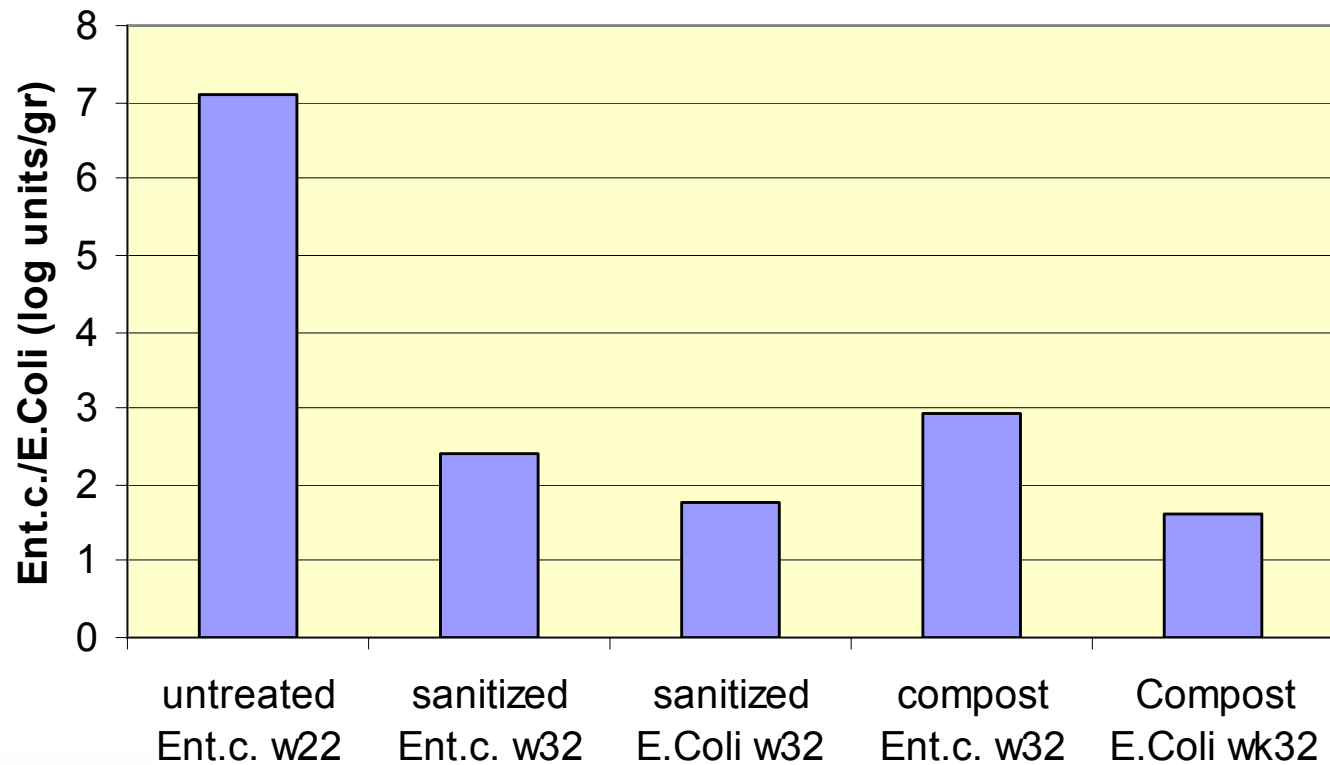
## Sampling of the fresh compost



16.02.2006

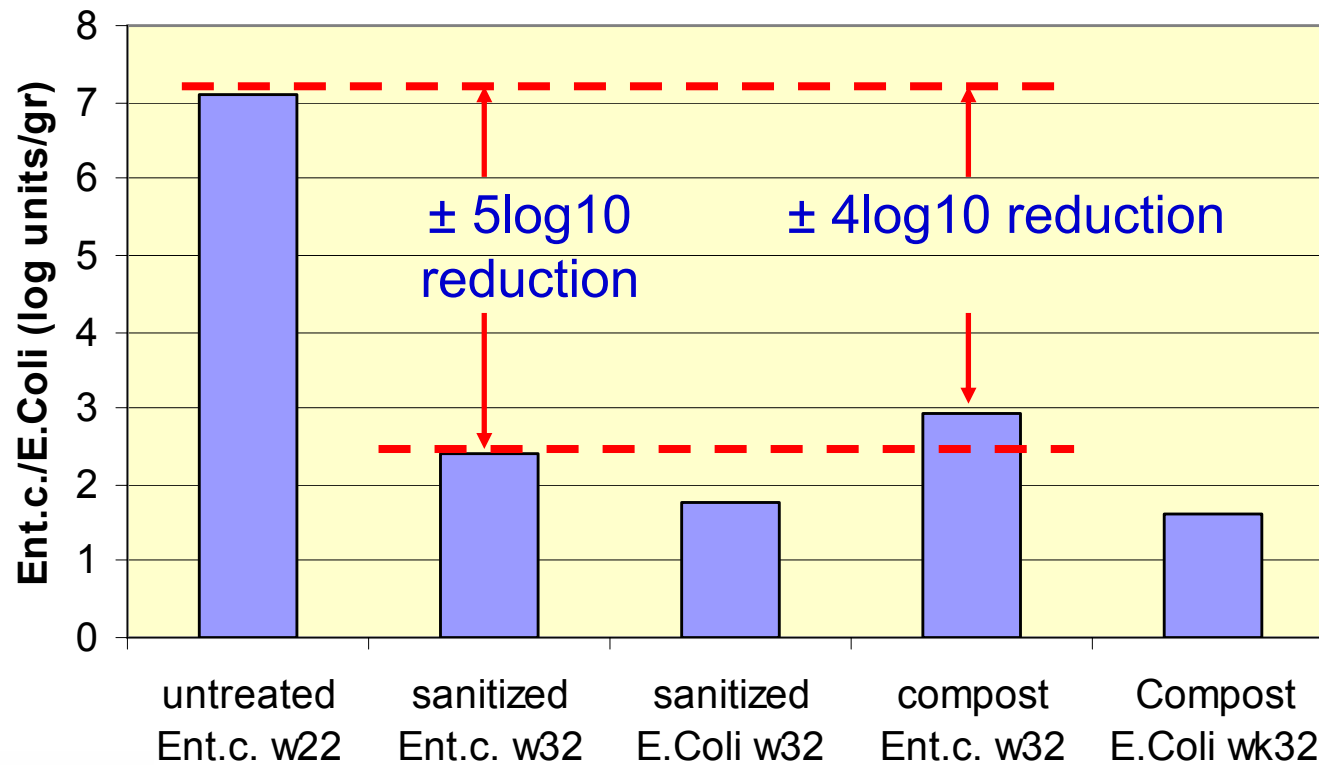
## Ent.c. and E.Coli after sanitation and in fresh compost (results 21 plants)

Fig 3 Ent.c. and E.Coli in 21 Dutch facilities (2006)



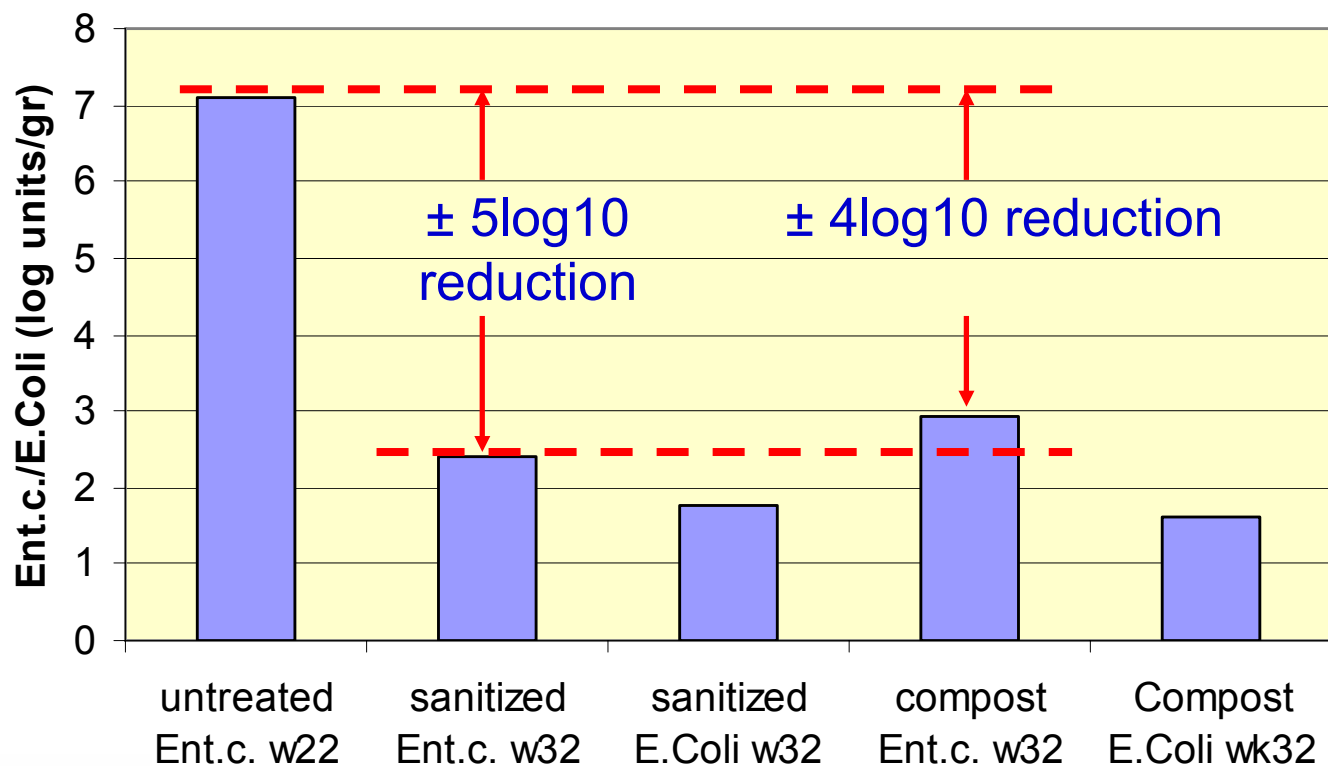
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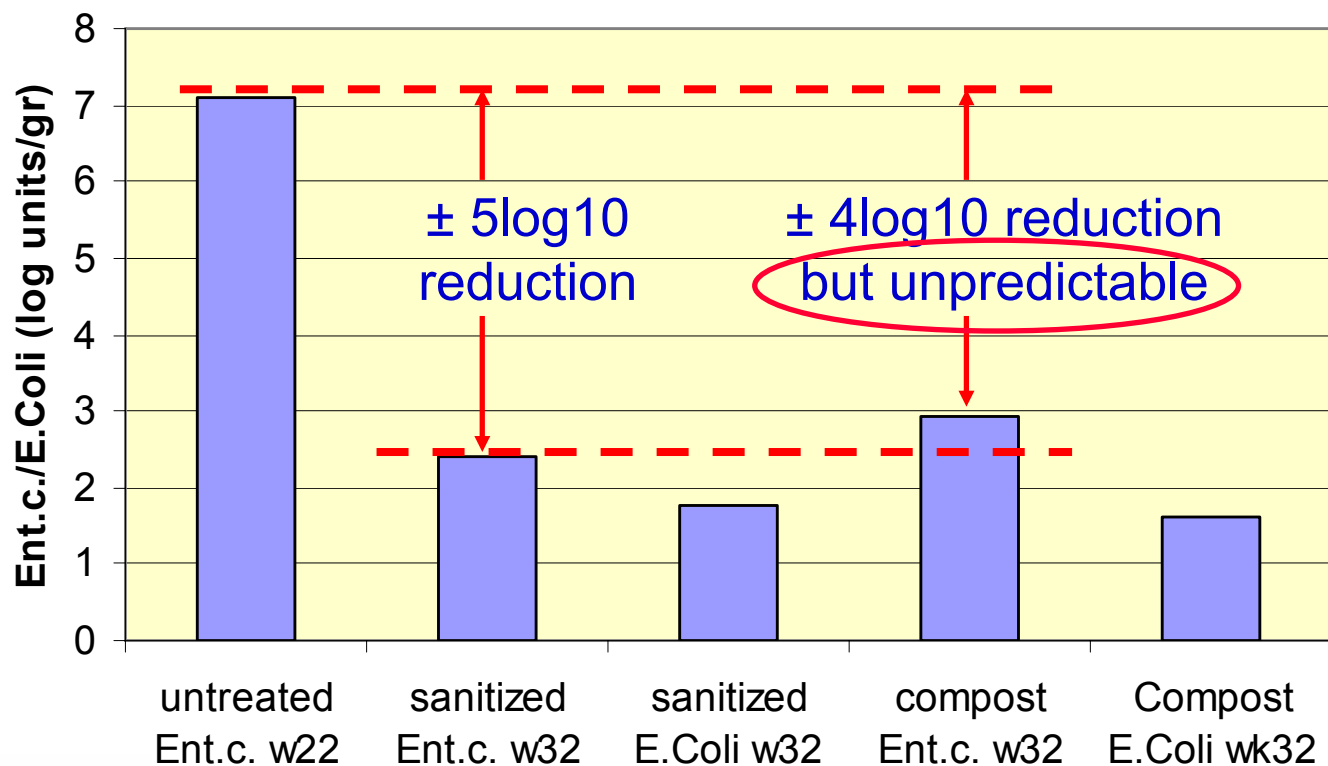


**Sanitized or compost: Salmonella negative >90%**



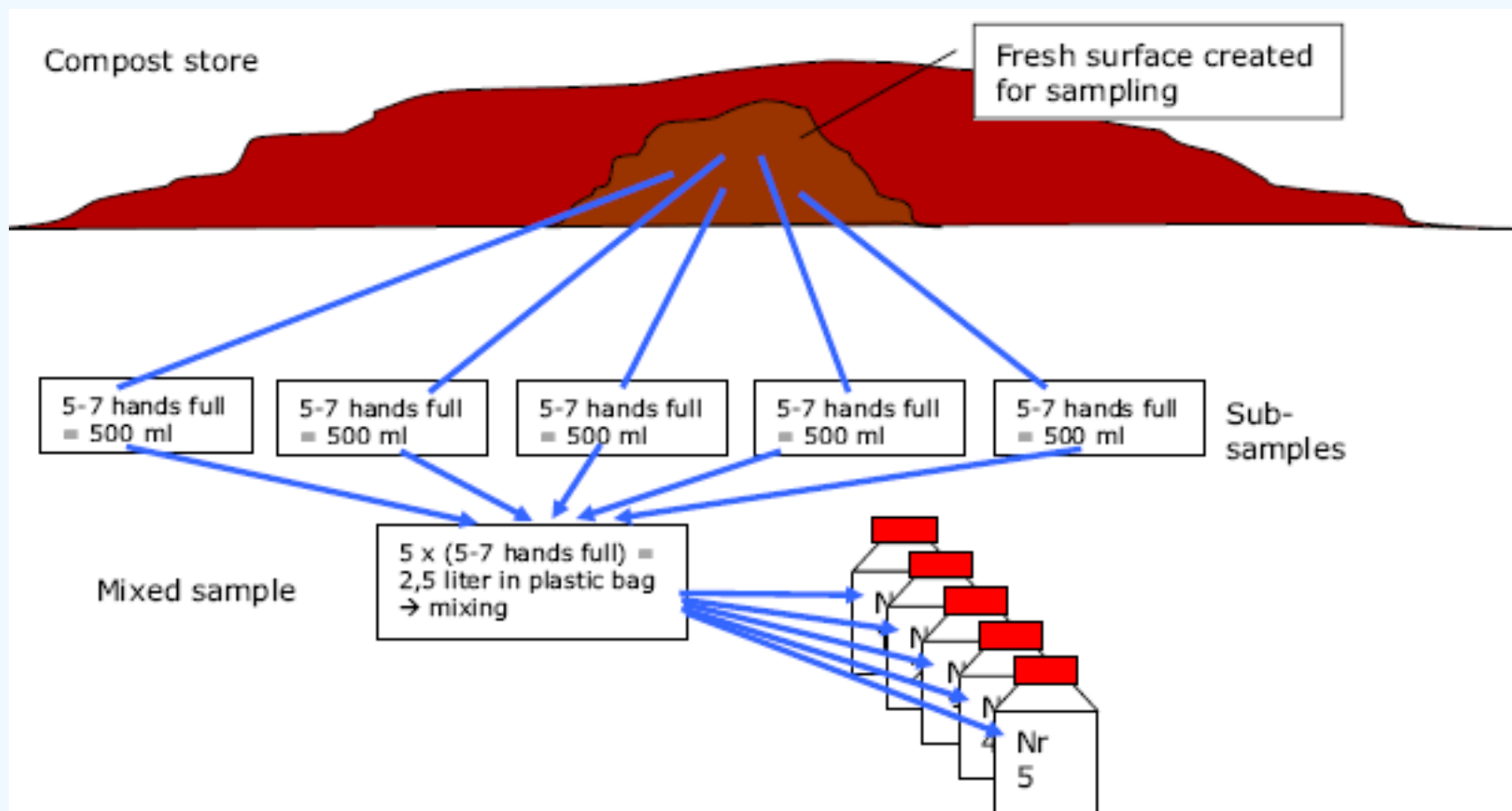
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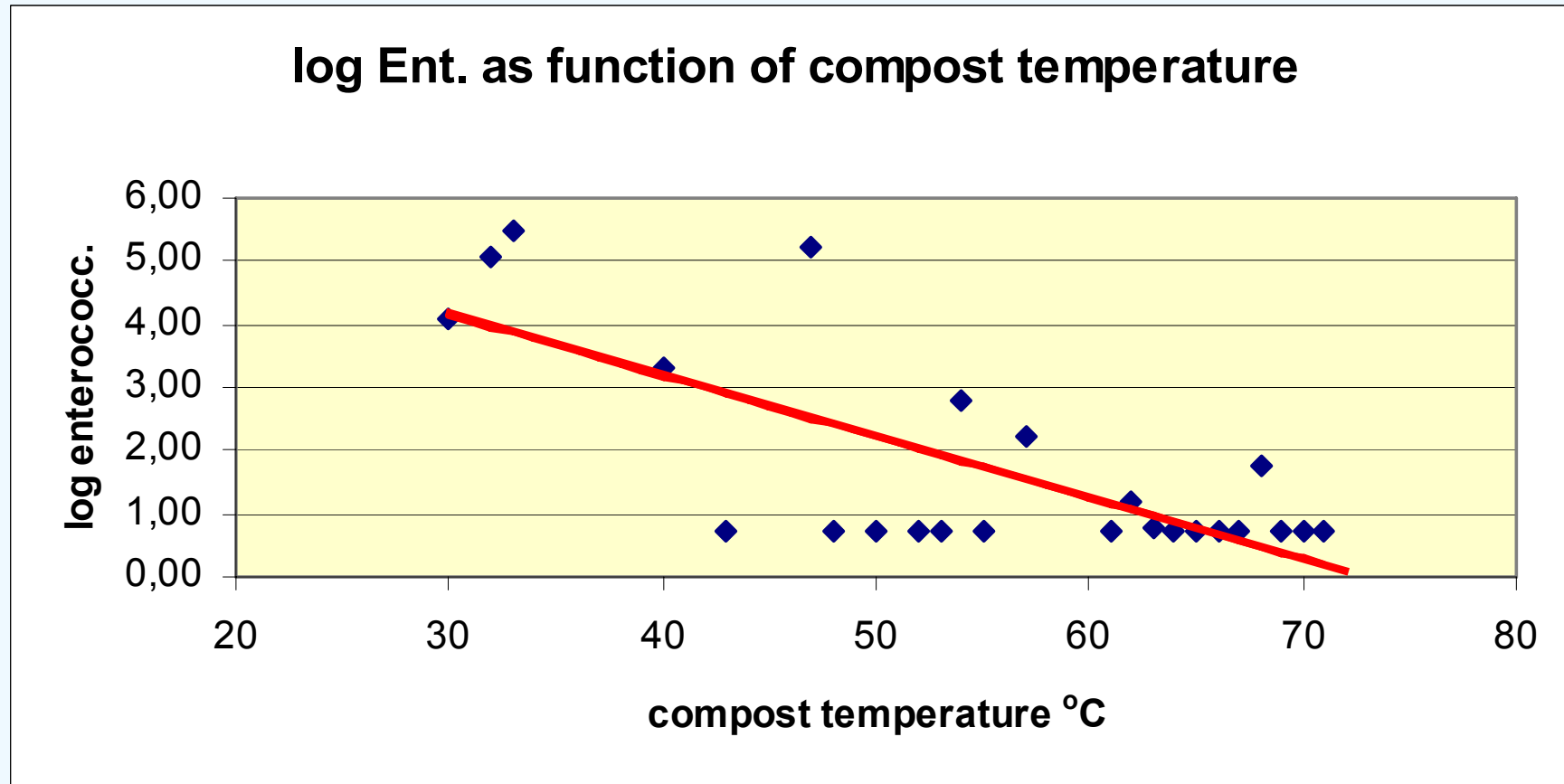
## Improved sampling



# Improved sampling

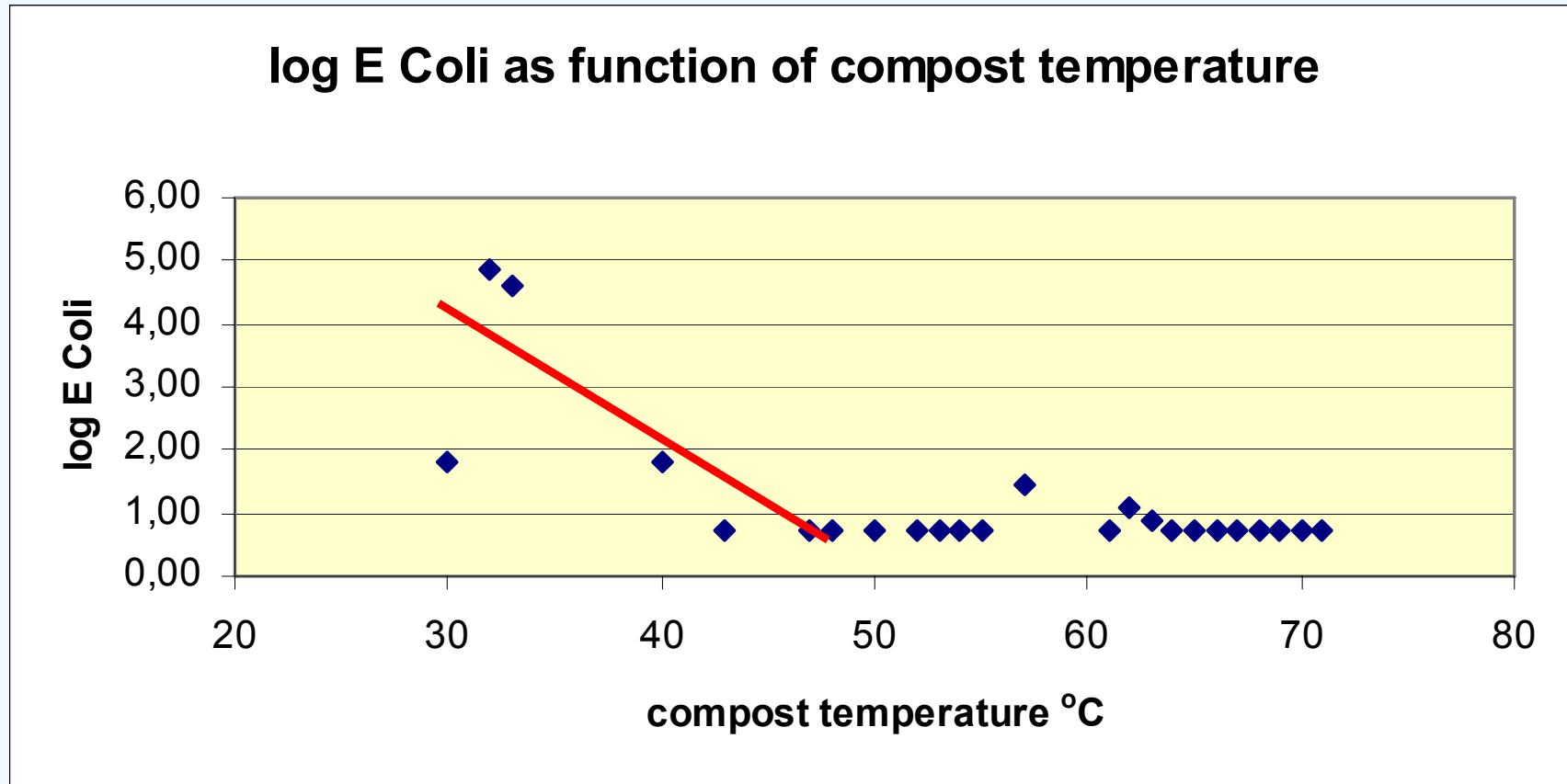


## Improved sampling



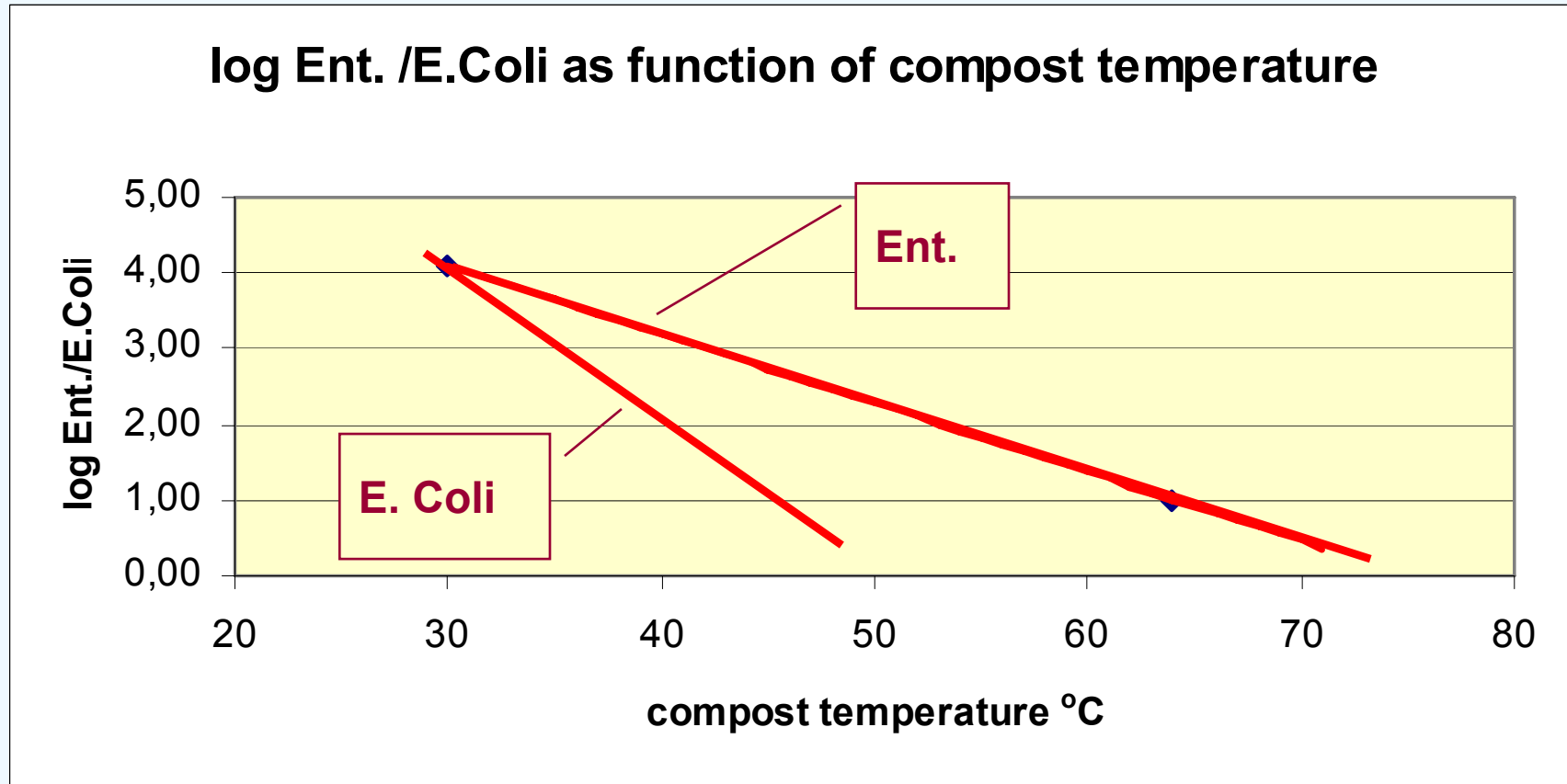
Compost  $\geq 2$  days at stock and:  
 $\geq 60^{\circ}\text{C}$   $\rightarrow$  (almost) always Enterococcus  $< 10$  cfu/gram

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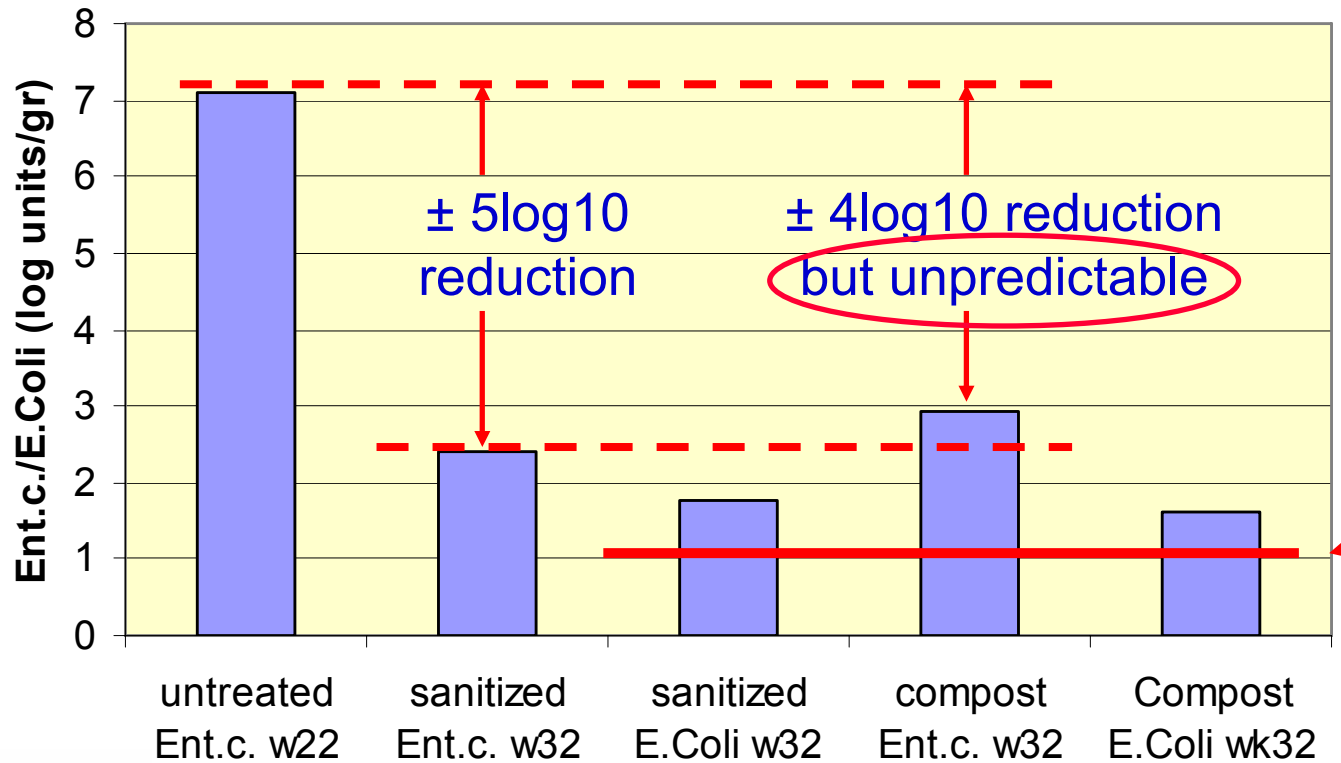
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**Improved sampling, compost 2 days  $\geq 60^{\circ}\text{C}$   
Predictable results!**

**Fig 3 Ent.c. and E.Coli in 21 Dutch facilities (2006)**



**Sanitized or compost: Salmonella negative >90%**

### 3. Summary

1. Existing plants and technologies in The Netherlands are state of the art and have good management practices including time and temperature measurement. Particle size is  $> 12$  mm.
2. Practical experiences with process validation in The Netherlands was collected applying spot test analysis. Fresh municipal biowaste contains  $10^6 - 10^7$  cfu/gram E.Coli and Enterococcus. After sanitation  $\pm 5\log_{10}$  reduction of Enterococcus could be demonstrated. Levels in compost were less predictable because of regrowth. Values for E.Coli are normally  $< 1000$  cfu/gram after sanitation and in the compost. Salmonella is in most cases not detected in the compost.
3. Additional research and improved sampling showed that in untreated municipal biowaste Salmonella is normally present. At temperatures in the compost stock  $>50$  °C almost always E.Coli  $< 10$  cfu/gram, at temperatures in the compost  $>60$  °C almost always Enterococcus  $< 10$  cfu/gram.