

Sludge Treatment through Composting Prior to Reuse – The Alexandria Experience

Holding Company Capacity Improvement (HCCI)

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*Improving the Capacity of the Holding Company for Water and Waste
Water (HCWW) - Ministry of Housing, Utilities and Urban Development,
Egypt*

(EuropeAid/129937/D/SER/EG)



Holding Company Capacity Improvement
(PAO-SAAP / European Union)

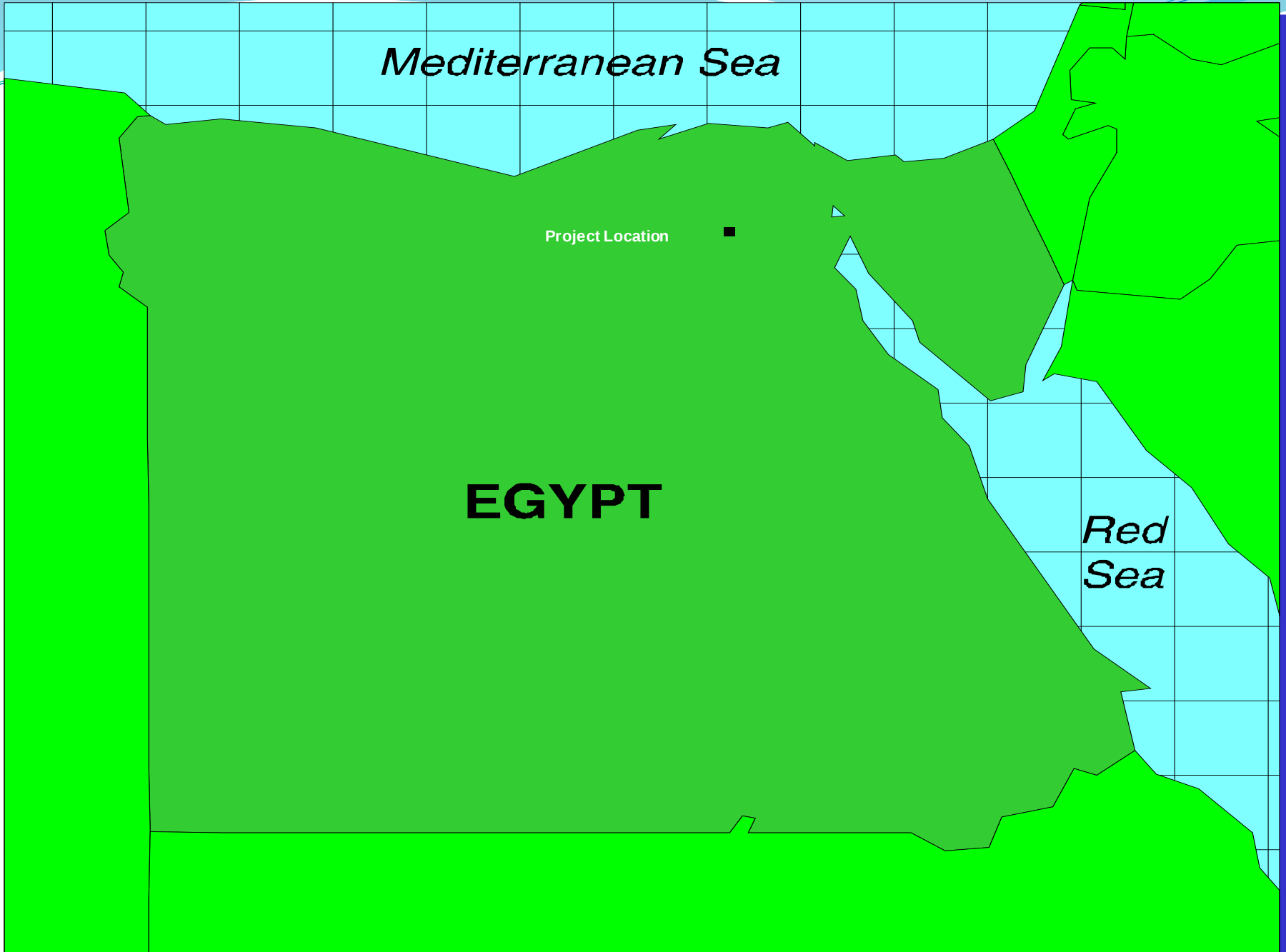


Mediterranean Sea

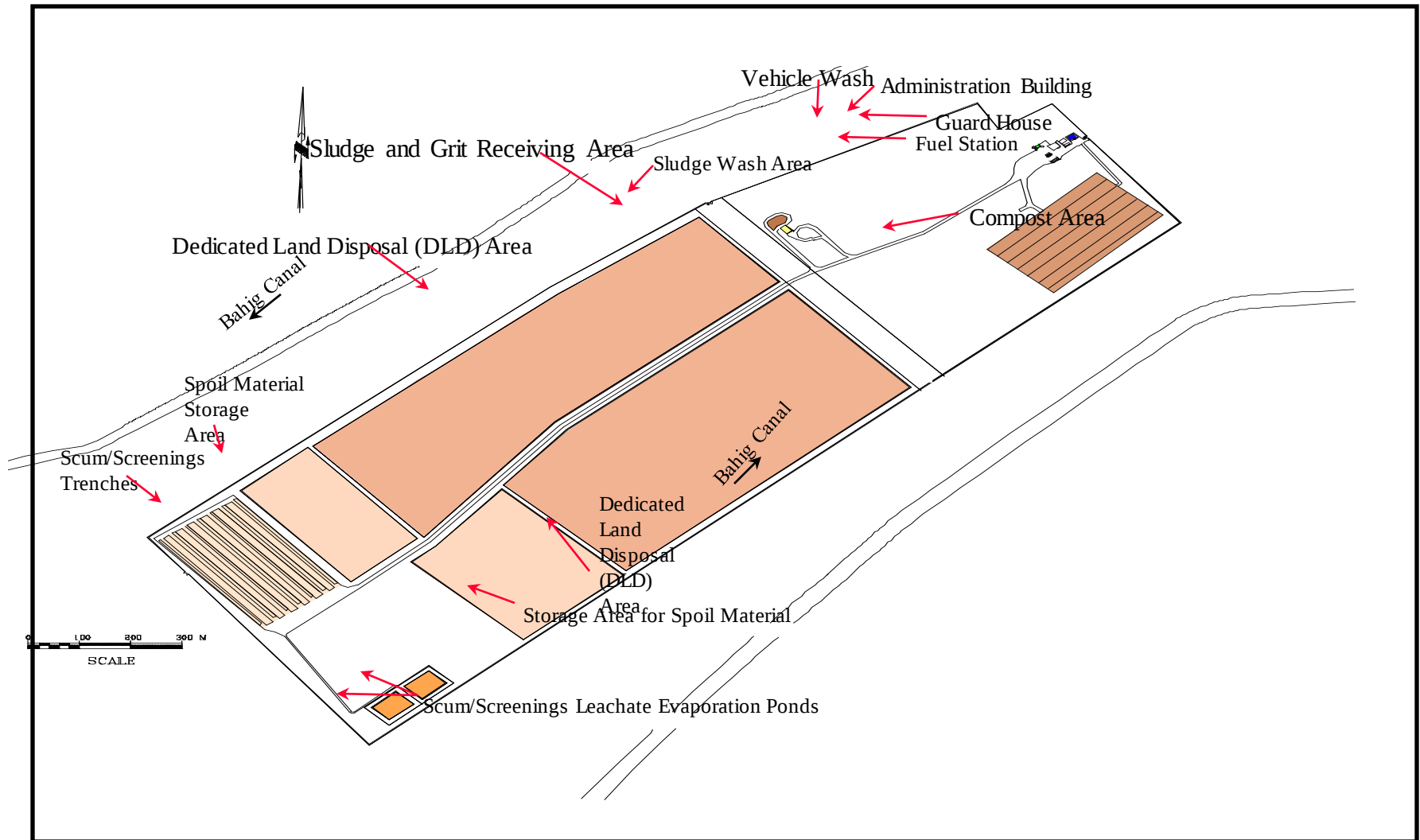
Project Location

EGYPT

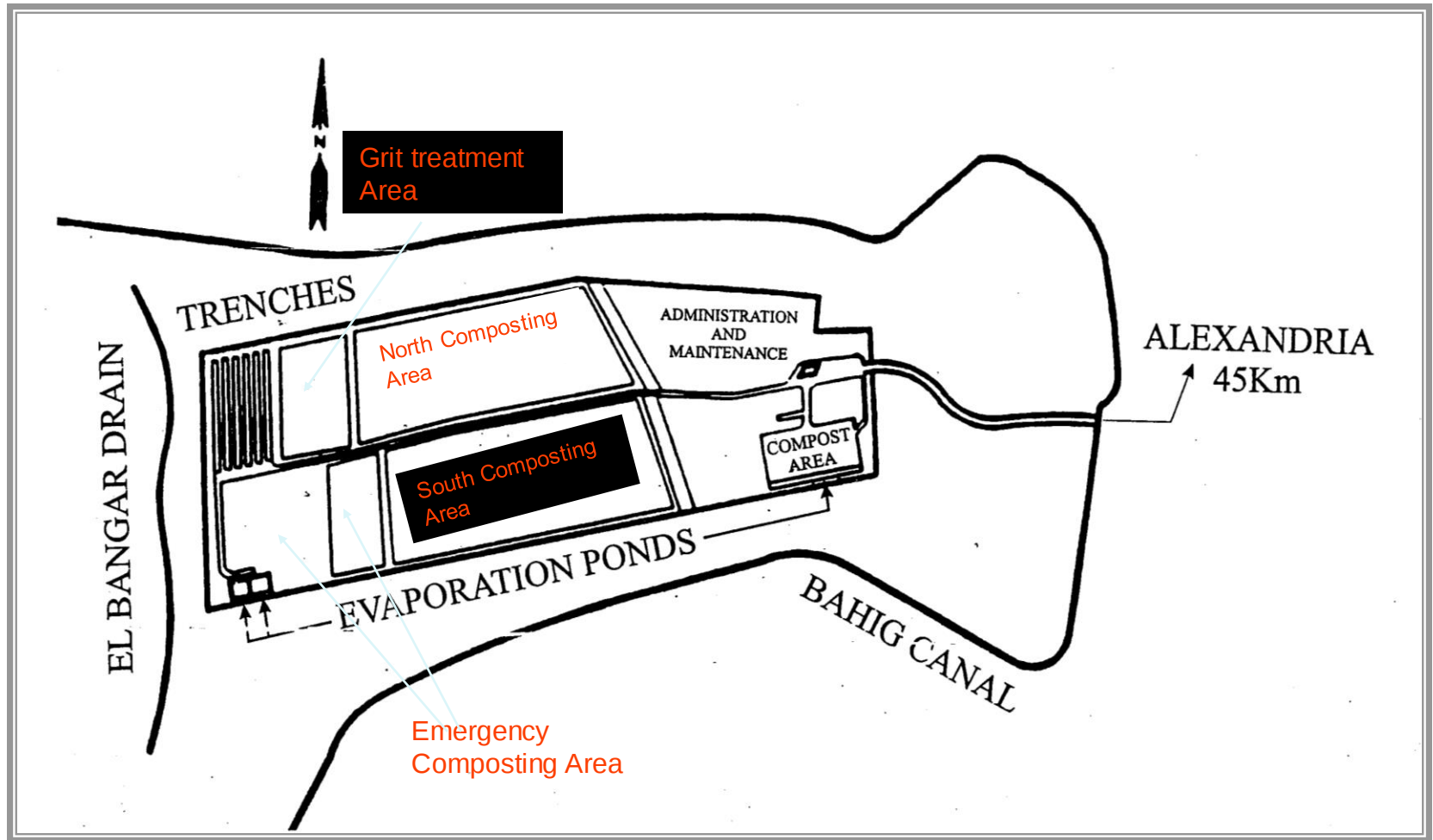
*Red
Sea*



FACILITIES OF SITE 9N



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Sludge composted at site 9 is mechanically dewatered sludge from the East and West treatment plants and some other smaller treatment facilities. Total quantity processed on average: 2,000 m³/d



Sludge mechanical dewatering through belt presses



Sludge is being transported to site 9 by trucks.



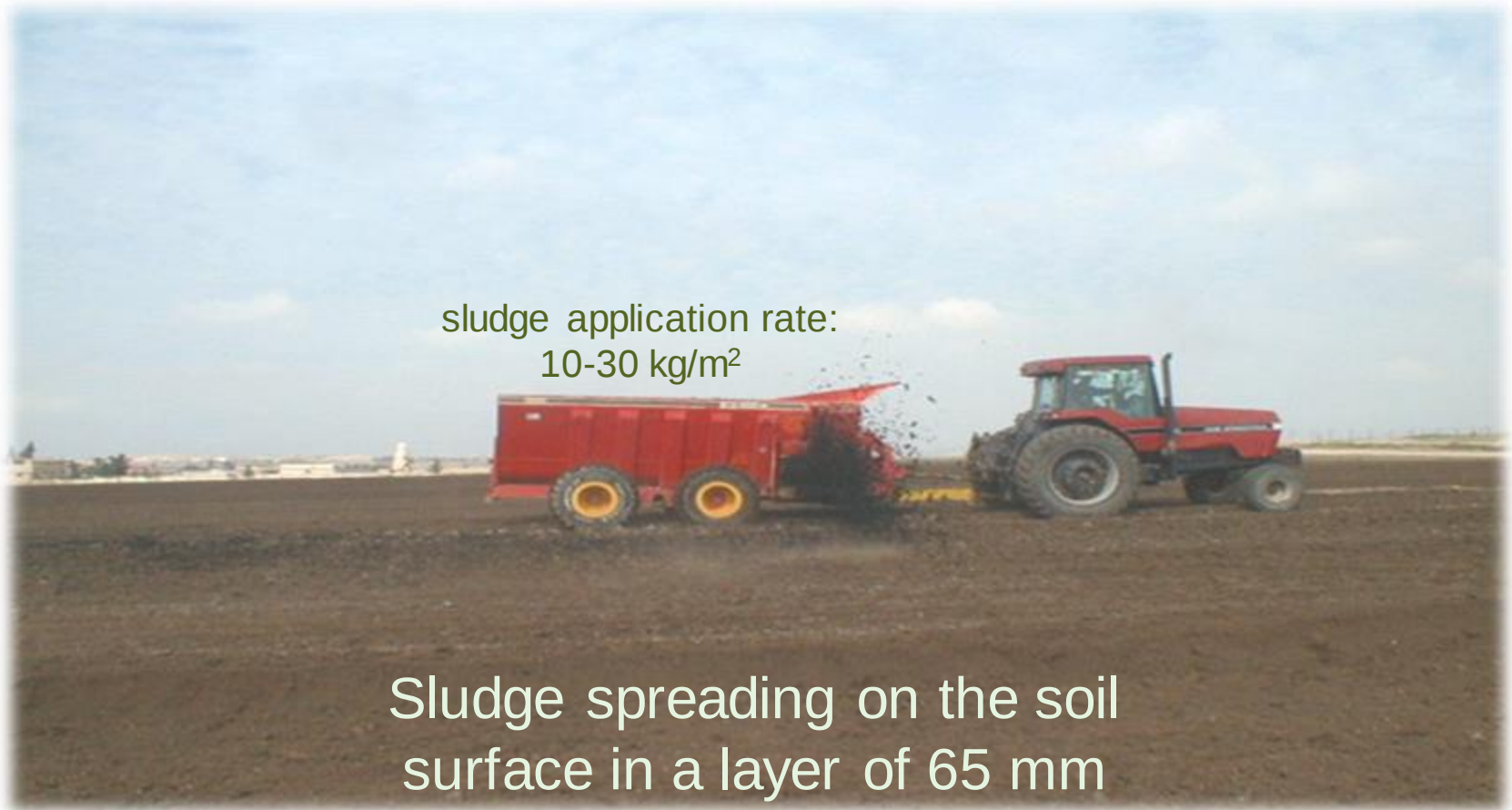
OLD SITE 9 N SLUDGE DISPOSAL SYSTEM DEDICATED LAND DISPOSAL (DLD)



Receiving area : sludge unloading into spreaders

Previous sludge disposal system

Dedicated Land Disposal (DLD)



sludge application rate:
 $10\text{--}30 \text{ kg/m}^2$

Sludge spreading on the soil
surface in a layer of 65 mm
thickness.

Previous sludge disposal system

Dedicated Land Disposal (DLD)



Problems with site 9N previous disposal system

Land disposal had some environmental nuisances associated, such as unpleasant odors and the attraction of flies. The neighbors near site 9 complained about it. Also there was the potential for serious groundwater contamination.

We began looking at other sludge treatment and disposal options. In 1995, we started pilot composting trials in order to determine optimal operating conditions in a large scale composting operation.

PREPARATION FOR FULL-SCALE SLUDGE COMPOSTING



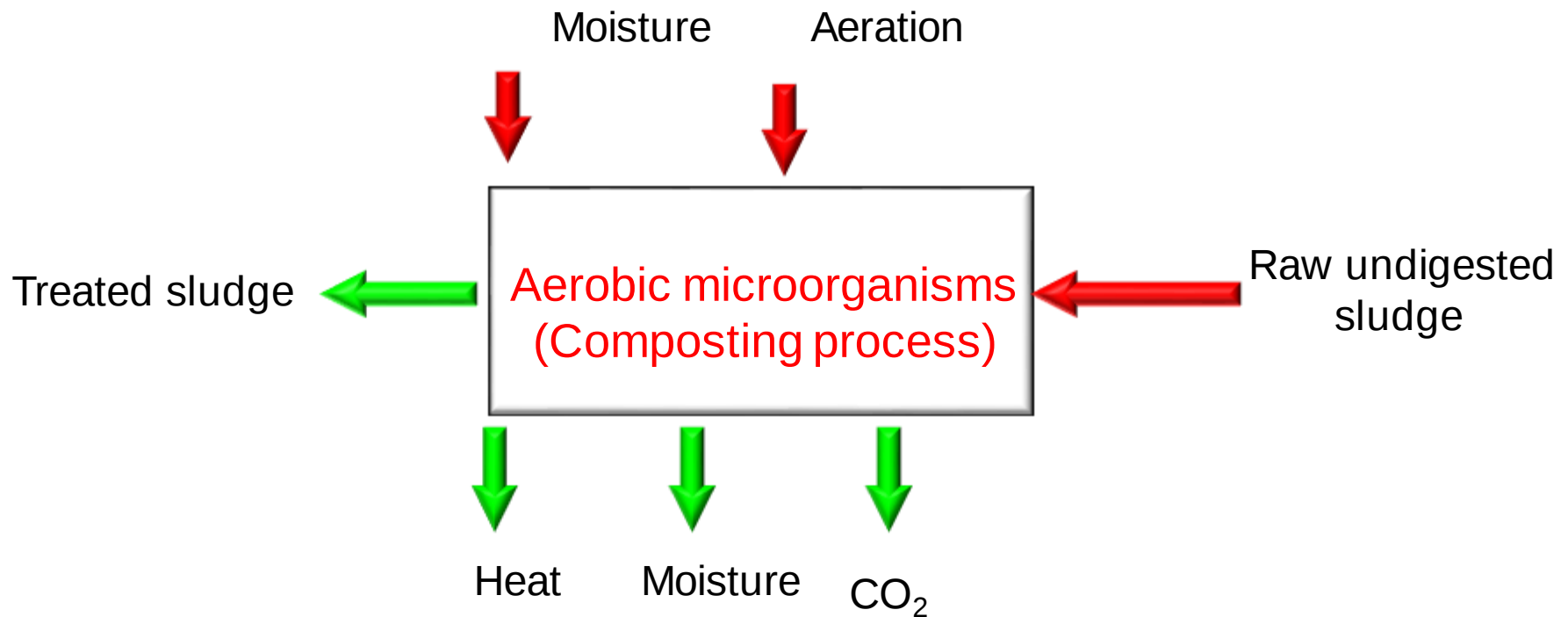
Composting Rules

- ✦ C:N from 25:1 to 40:1
- ✦ Moisture ~ 40 to 65%
- ✦ Oxygen > 5 ppm
- ✦ Temperature 55 - 65 °C for a total of 5 days

Why do it?

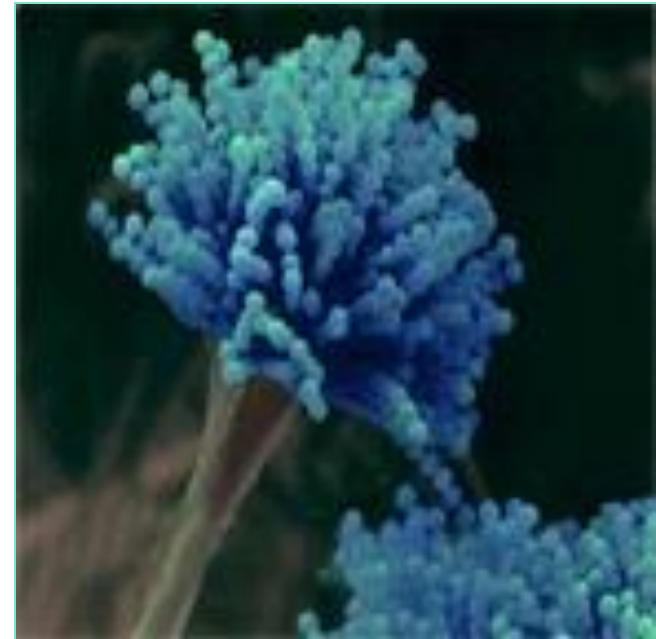
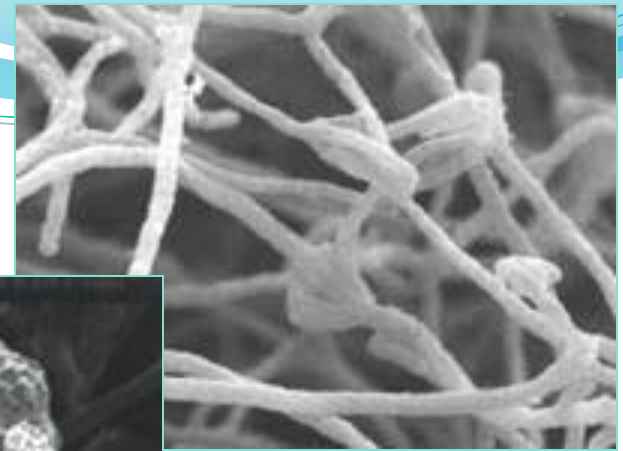
- **Dry matter/volume reduction ~ 50%**
- **Cheaper transportation**
- **Land apply at farmer's convenience**
- **Reduced odor**
- **Reduces fly and disease problems**
- **Can help manage storage capacity better**

Composting Operation Diagram



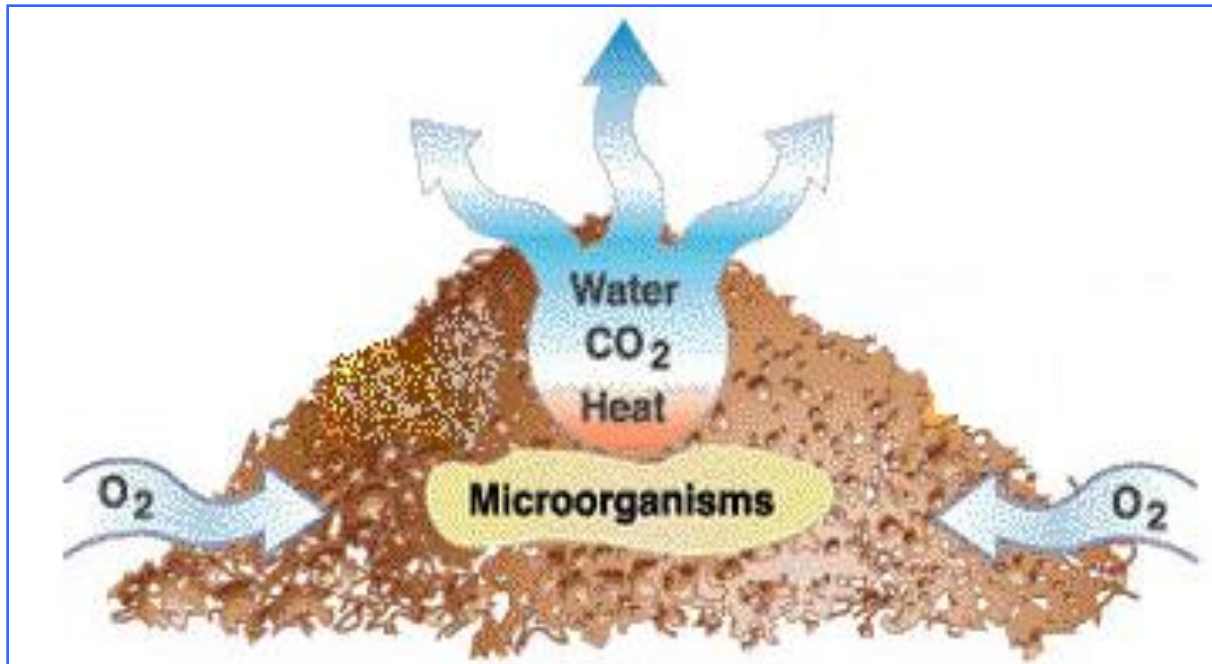
Bacteria, actinomycetes, fungi

How to eat
something bigger
than you are.....



Respiration

- Oxygen in – bugs oxidize carbon sources
- Energy used to build cells
- CO₂ and heat out



Site 9 N Sludge Composting Operation

First step: Windrow formation
Equipment used are trucks and loaders.



Site 9 N Sludge composting operation

Second step: Make windrow more homogeneous and adjust moisture content to optimal level (around 50 – 60 %)

Equipment used: Loader and composter



Site 9 N Sludge Composting Operation

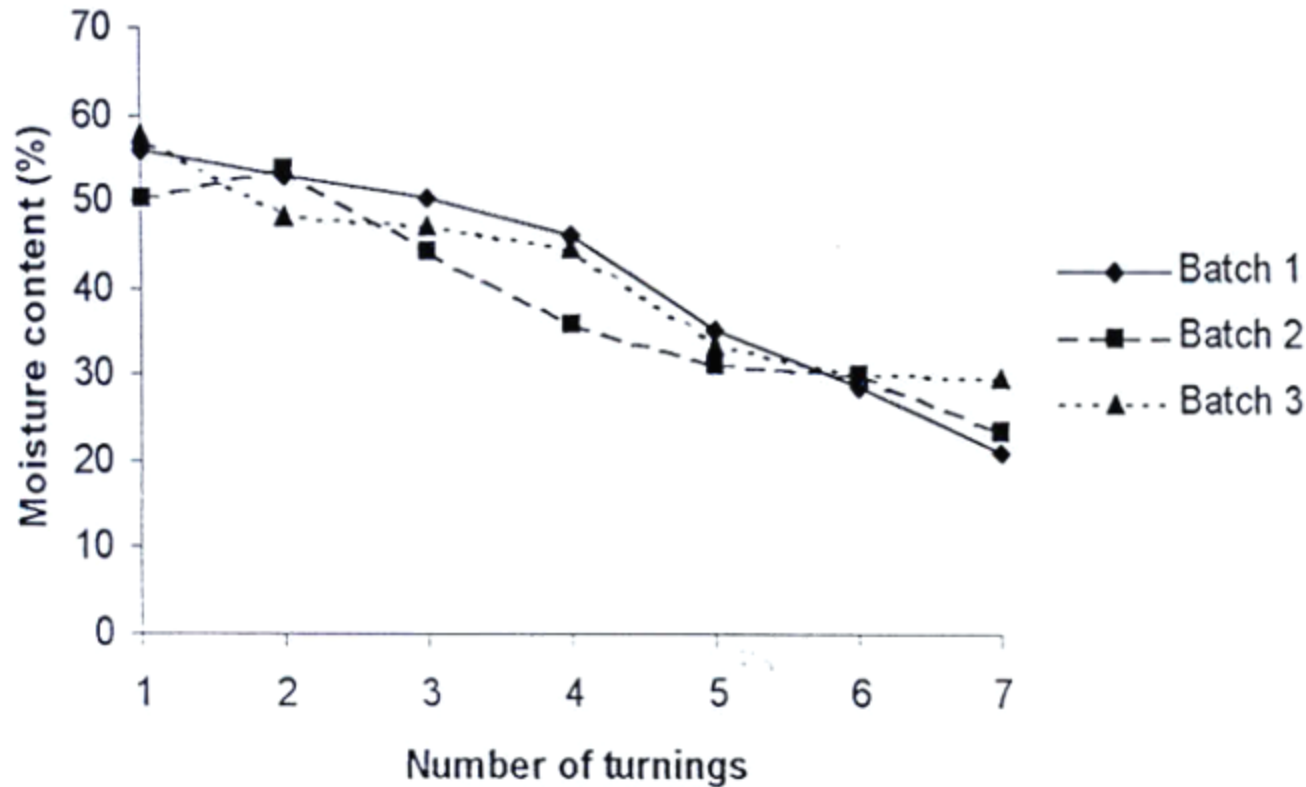


Figure 16 Reduction in moisture content of compost in relation to windrow turning

Site 9 N Sludge composting operation

Third step : Aeration with objective to maintain oxygen concentration in windrows above 5%.



Site 9 N Sludge composting operation

Forth step : turning windrows to aerate and to keep temperatures in the effective range of 55 – 65 °.



Site 9 N Sludge Composting Operation

Fifth step: maturation

Curing or maturing is a critical phase that follows thermophilic composting. During this period, which may last for several months, actinomycetes and fungi slowly break down the remaining digestible material.



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Raw Sludge Characteristics

- Moisture 70% - 80%
- Total solids 20% - 30%
- Volatile solids 65% - 70 %
- PH 7 - 7.5

Sludge characteristics after composting

• Moisture	10 – 20%
• Total solids	80 – 90%
• Volatile solids	35 – 45 %
• PH	7 – 7.5
• Nitrogen	1.2 – 1.8
• Phosphors	.8% - 0.9%
• Potassium	.3 – .4 %

Final Heavy Metals Concentrations in Sludge Compost

Patch 5 ppm	Patch 4 ppm	Patch 3 ppm	Patch 2 ppm	Patch 1 ppm	Safe limits ppm	Element	Element
635	759	721	840	774.2	2800	Zn	زنك
288	462	427	491	208.7	1500	Cu	نحاس
27	110	140	136	22.6	420	Ni	نيكل
2.6	9.7	8.5	10.5	1.0	39	Cd	كادميوم
66	171	163	182	265.7	300	Pb	رصاص
1.4	-	-	-	5.75	17	Hg	زئبق
153	105	105	104	20.4	1200	Cr	كروم
1	-	-	-	-	18	Mo	موليبدينم
2.5	-	-	-	-	36	Se	سيلينيوم
7.3	-	-	-	0.8	41	As	زرنيخ

Final Sludge Compost Quality

Value	Indicator	التحليل
5.2	E.C. dsm ⁻¹	التوصيل الكهربائي
7.1	pH	الحموضة والقلوية
39.4	O.M %	المادة العضوية
1.2	N %	النيتروجين الكلي
221	N, ppm	النيتروجين المتاح
0.41	P%	الفوسفور الكلي
140	P, ppm	الفوسفور المتاح
0.93	K %	البوتاسيوم
166	Mn, ppm	المنجنيز
161	Fe, ppm	الحديد
751	Zn, ppm	زنك

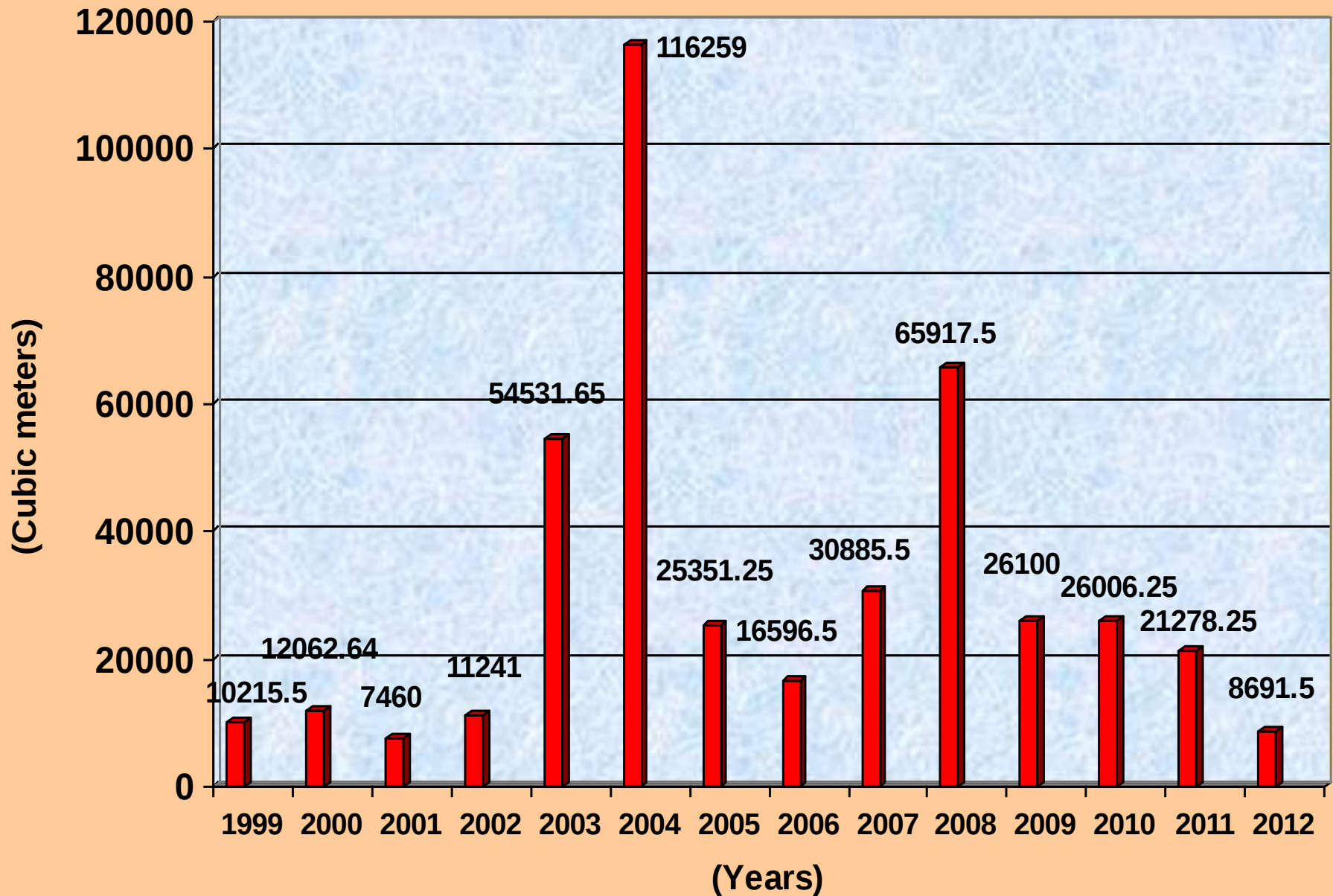
The microbiological characteristics of the final compost product

- **1- Free of pathogenic bacteria, such as:**
 - **Fecal coliform, Salmonella .**
- **2- Free of Eggs of Ascaris ova**
- **3- Free from weed seeds.**
- **4- Free of Nematodes.**



**At site 9 we have consistently composted
and achieved a high compost quality in a
safe and cost effective manner**

The quantity of sludge compost sold at site 9N



Application of sludge compost on corn trials



No compost added



After compost added at the
rate of
15 ton per feddan

Application of sludge compost on cotton trials



No compost:

Output is 5 tons per
feddan



With compost:

Output is 13 tons per
Feddan

Forest 9 N tells about the effectiveness of the sludge compost to gradually turn stony limestone into a fertile soil



Compost addition has created a happy and healthy forest



THANK YOU
This is the end
ATTENTION