

# **Chicken manure drying at Keskinoglu Manisa, Turkey Environmental aspects assessment**

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# 1. Background



- Dutch Ministry of Economical affairs, agriculture and innovation: EVD PSO Environment programme,
- Aim: to target significant environmental improvements on a sustainable basis, in Georgia, Ukraine, Russian Federation and Turkey,
- By: pilot investments in environmental, private sector
- Sustainable: economically and environmentally
- Mix of hardware, knowledge and project management
  
- Client: Dorset Green machineries

# Turkey – chicken manure



- Fast growing country, fast growing chicken meat and egg production
- Poultry farms concentrated in a few areas
- Huge size enterprises
- Lack of regulation on manure disposal:
  - > most of manure disposed on land
  - > risk on soil/ground water and surface water contamination (N, P)
  - > loss of valuable nutrients
  - > odour problems

## 2. Aim of the study



Comparison of the environmental aspects of the current chicken manure composting process at Keskinöğlü, with the Dorset drying system

### 3. Situation and processes - Keskinöğlü poultry



- Located in western Turkey
- Current: 1.5 million chicken
- Manure treatment by composting
- Compost sold as fertiliser
- Odour complaints in “episodes” during the year up till several kilometers



# Location









# View on composting facility



# Inside the composting facility

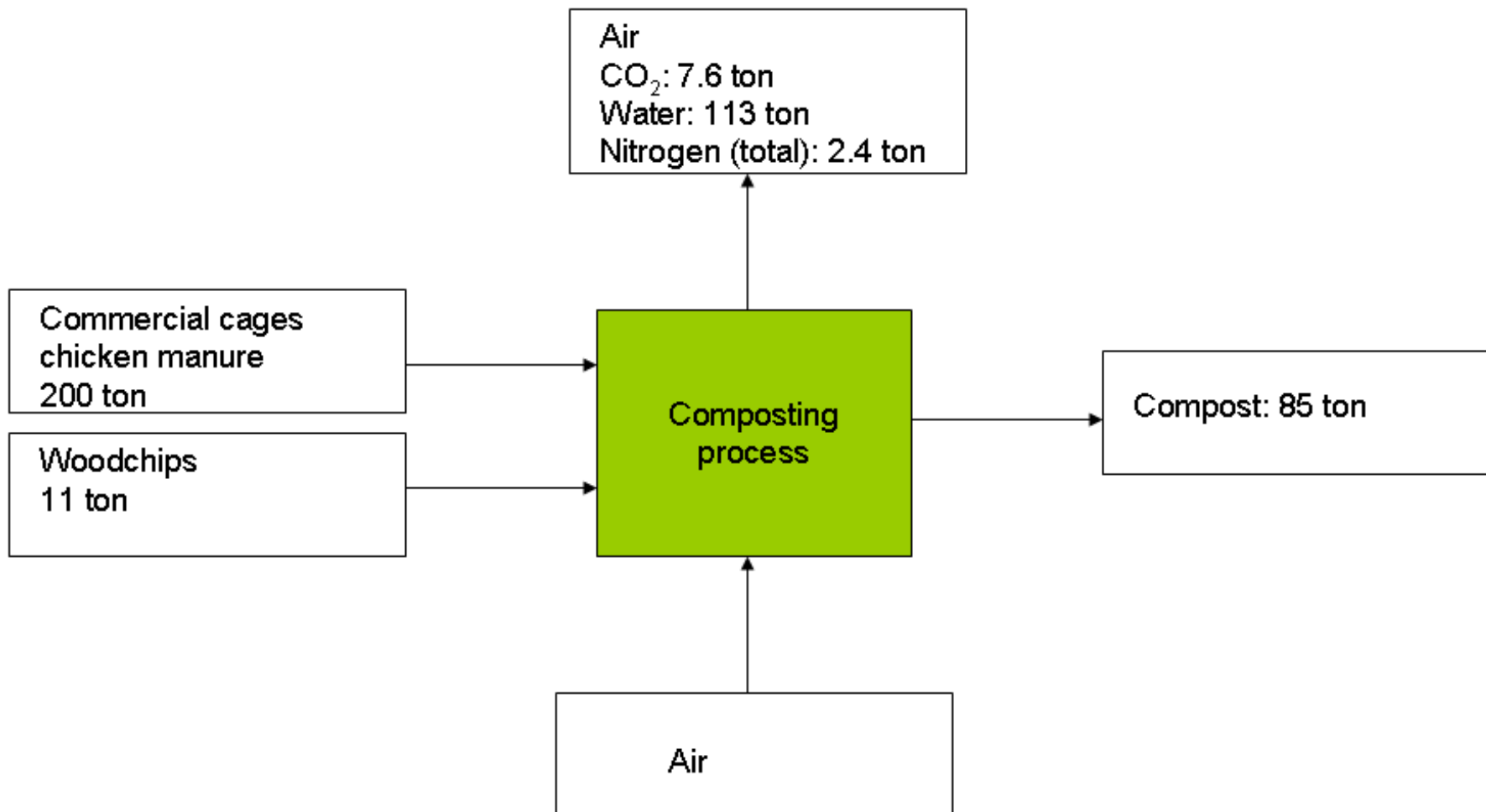




# Composted chicken manure: Organica



# Composting process





# Dorset Drying process (belt dryer)



# Dorset Drying process (belt dryer)





# Room between stable and drying unit

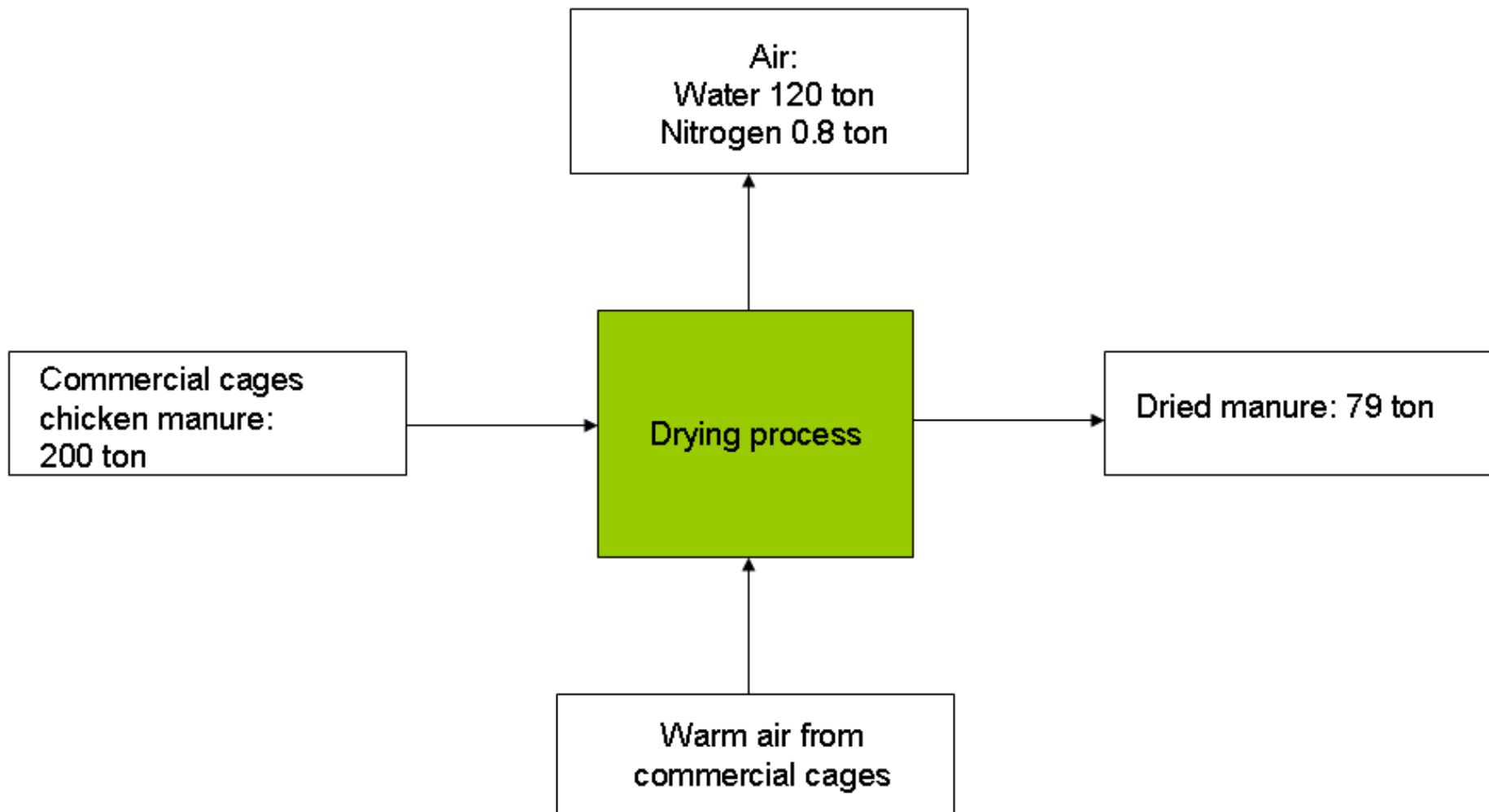


# Turning of manure





# Drying mass balance scheme



# 4. Methods



- Inspection of installations and environmental assessment
- Preparation of mass balances
- Ammonia (emission) measurements:
  1. Dräger tubes (0 – 600 ppm)
  2. Xtralis ammonia monitor (0 – 100 ppm)

# Composting plant: emissions from doors and windows





# Measurements in practice





# 5. Results measurements



- Dräger tubes: 150 - > 600 ppm
- Ventilation estimated by flow measurements in doors and windows
- Xtralis:
  - composting : out of range (>300 ppm)
  - dryer : no logging at regular interval, disturbances

# Evaluation of odours/health effects



Effect parameter	Threshold value	
	[ppm]	[mg/m <sup>3</sup> ]
<b>Health Effects:</b>		
- Acute	1.7	1.3
- Chronic	0.1	0.076
<b>Odour threshold</b>	<b>0.7 – 2.5</b>	<b>0.5 – 1.9<sup>1)</sup></b>

- 1) the odour threshold is in the same concentration range as irritation takes place.
- 2) Odour thresholds as determined according European Olfactometric Standards (ref. 3, Buijs, Geuratlas)

Evaluation criteria: an hourly concentration of 1.5 mg/m<sup>3</sup>



**Table 3.3:** Occupational health standards on ammonia

	[ppm]
<i>USA (OSHA)</i>	
TWA (8-hour average)	25
STEL (Short Term exposure)	35
IDLH (Immediate Danger to Life/Health)	500
<i>Netherlands (MAC)</i>	
MAC 8-hour average	20

Near openings composting facility,  $\text{NH}_3$ -concentrations more than 600 ppm were measured!



# 5. Results



- Current Composting plant:
  - \* not functioning well -> instable product
  - \* far from IPPC Best Available Techniques:
    - insufficient aeration
    - no controlled ventilation by stack
    - no waste gas treatment (NH<sub>3</sub>, odour)



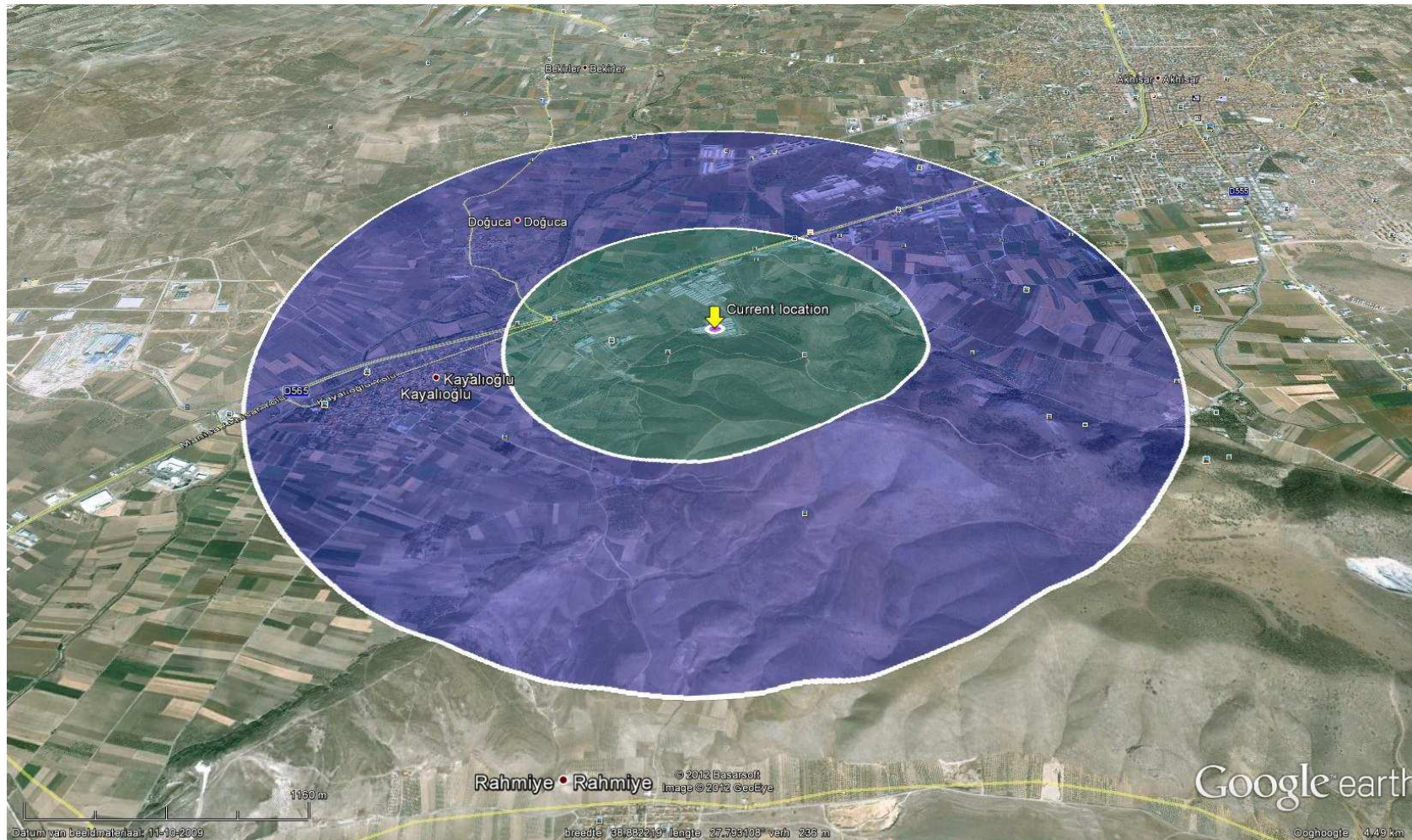
- Based on measurement results emissions have been calculated
- EPA SCREEN model
- Calculates worst hourly average concentration
- Reasonable comparison with Stacks
- No meteorological dataset necessary
- Fast result (Indicative)



1. Current composting practice
2. Drying instead of composting
3. Drying + bio scrubber (90% reduction)

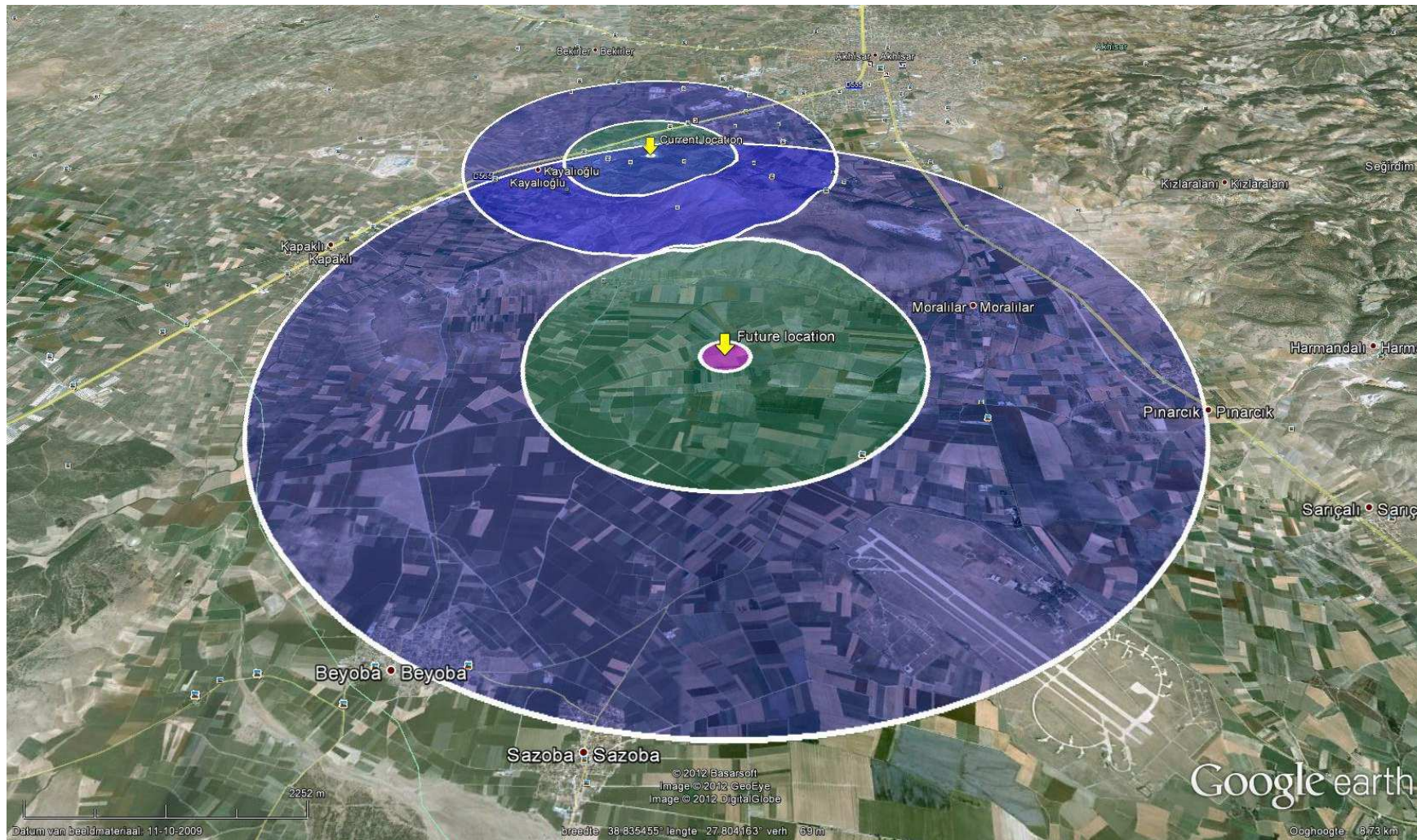


# Future situation (current location)

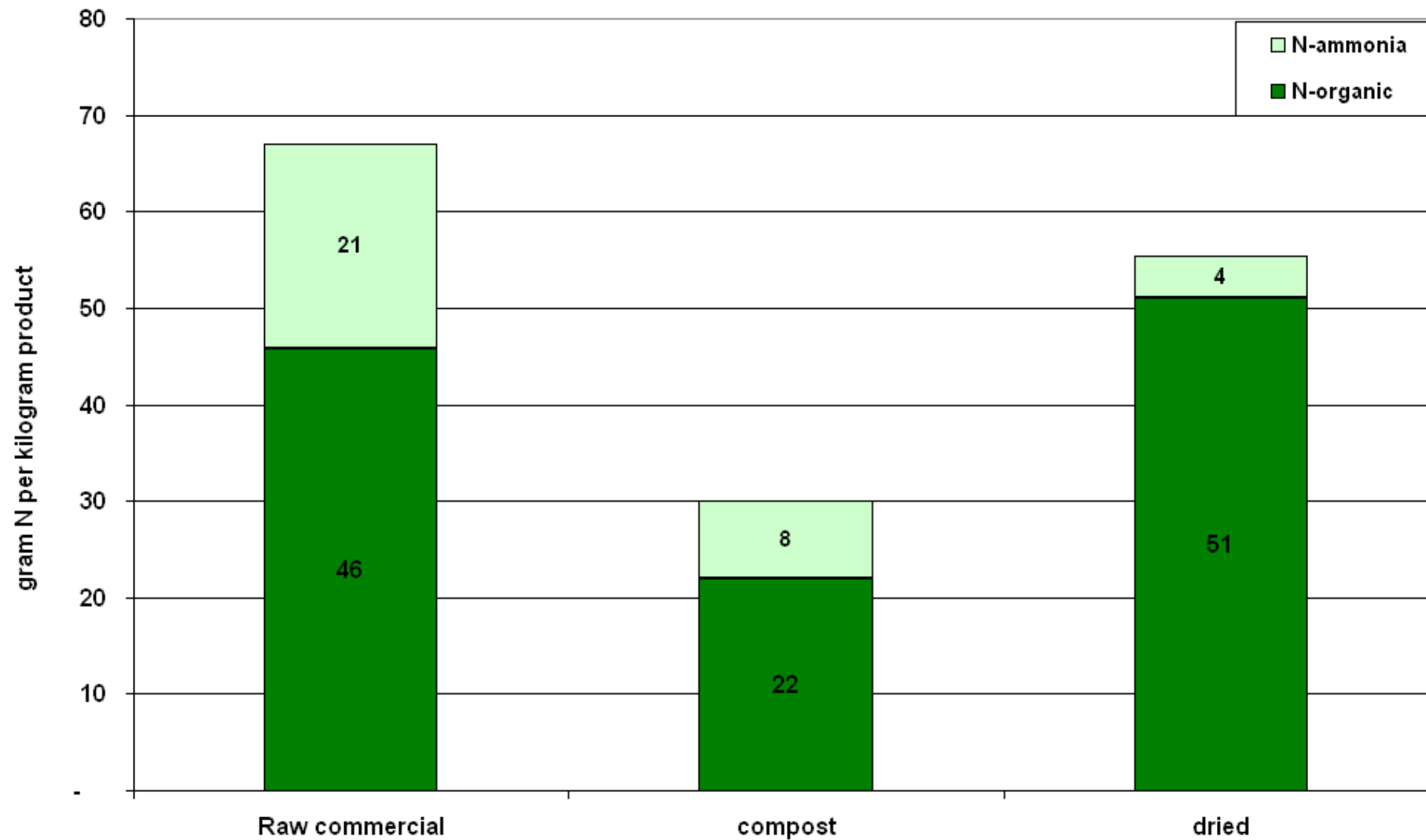




# Future expansion



# Nutrients: N-contents







- Turkish legislation:  
C/N ratio should be between 15 – 25
- EU regulations:  
nutrients: based on maximum load/land area
  - > both composted and dried chicken manure have C/N ratio lower than 15.
  - > needs to be addressed to Turkish ministries of environment and agriculture

## 6. Conclusions



- Current chicken manure composting process is not well developed:
  - > moderate product quality (instable)
  - > loss of N-content
  - > not according EU Best Available Techniques
  - > negative impact on workers conditions and ambient environment (ammonia, odours)
- Dorset drying process:
  - > stable product with higher N-content
  - > less  $\text{NH}_3$ -emissions (e.g. with bio scrubber application)
- Turkish legislation on C/N ratio 15 - 25 is limiting factor for application of drying technique.