

Optimization of composting parameters for the production of organic fertilizers from different organic waste materials

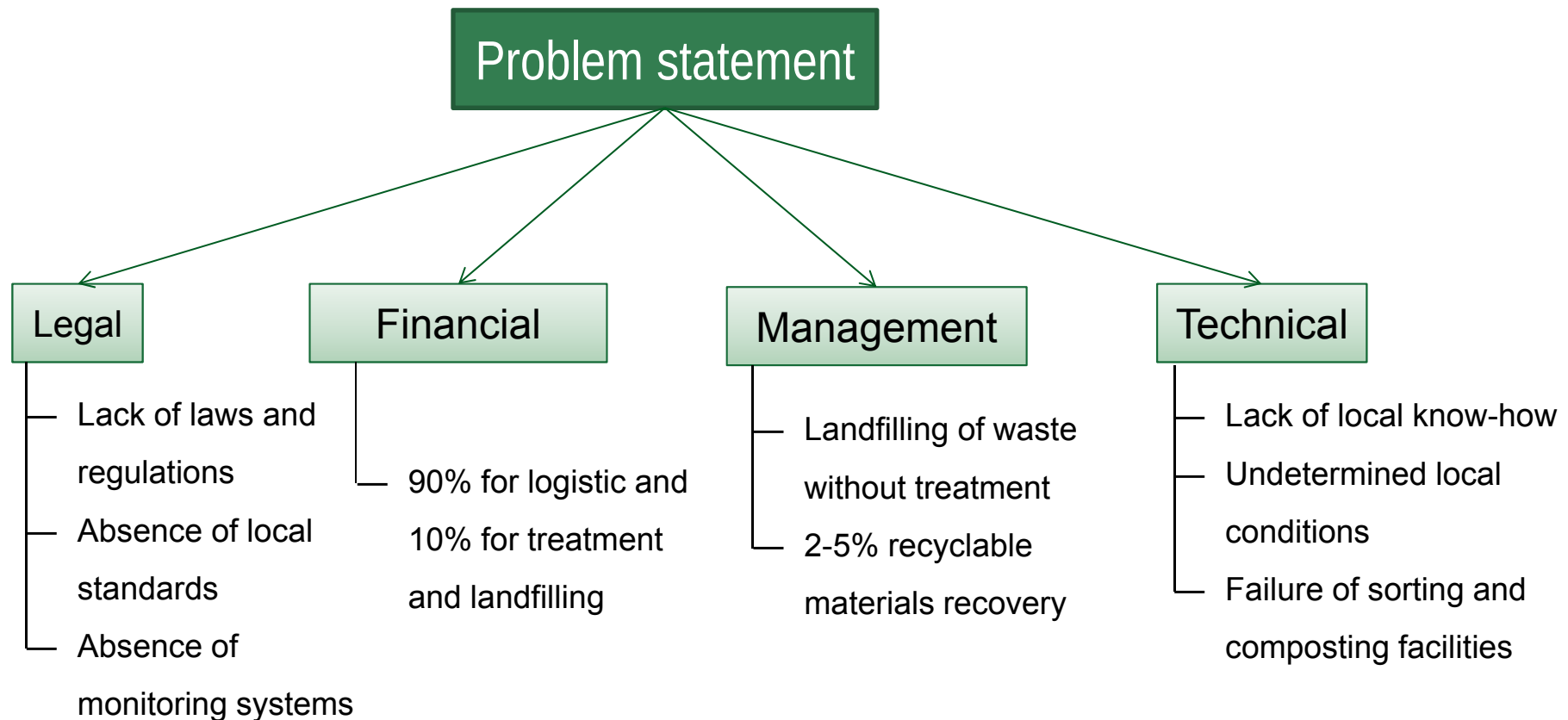
MSc. Safwat Hemidat

**ATHENS 2017 5th International Conference on Sustainable Solid Waste
Management, 21-24 June 2017, Athens, Greece,**

Outline

- Problem statement
- Background _Jordan
- Objectives
- Composting process of different organic materials
- Results of evaluation
- Recommendations

Problem statement



Background- Jordan

- Study area description -

- Jordan is home to 7.3 million inhabitants in a surface area covering around 89.328 km²
- Part of Jordan Al-Ghabawi landfill site was selected to carry out this study

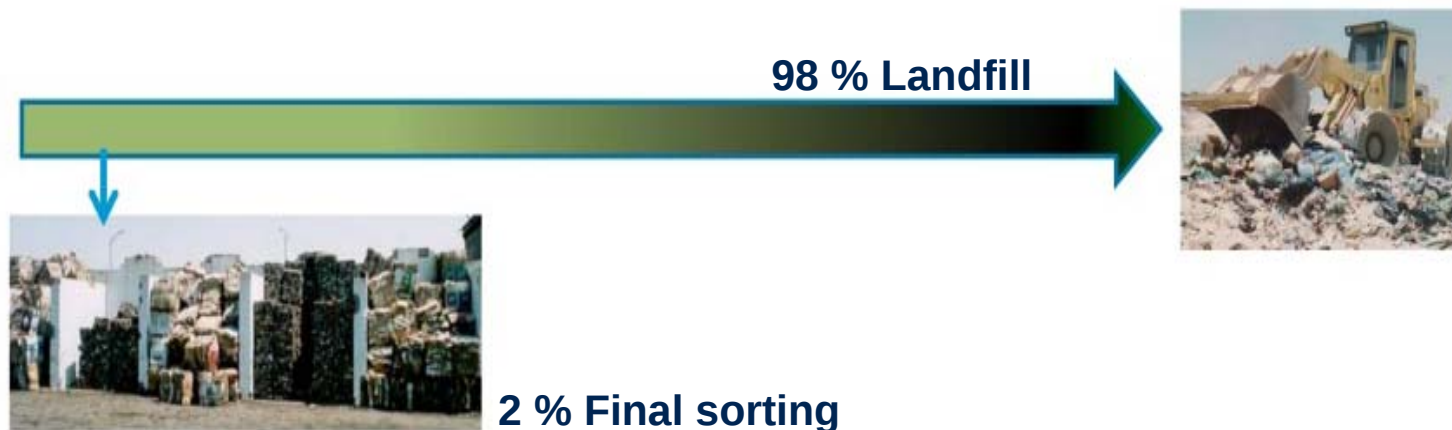


- Composting pilot plant location
(Al-Ghabawi landfill site)

Background- Jordan

- Facts & Figures -

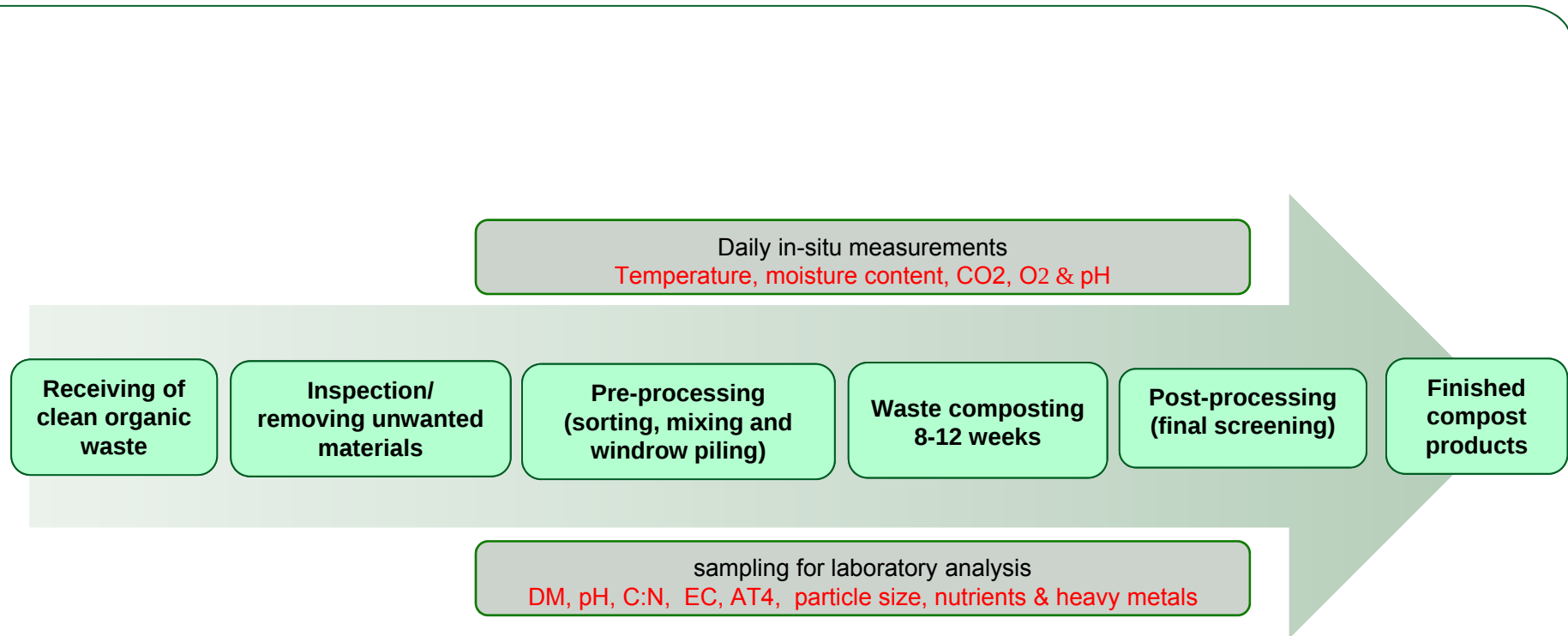
- 20-50% of the total municipal budget spent for solid waste management.
- Average daily waste generation per capita in Jordan is 0.9 kg/day.
- Quantities of MSW generated in Jordan : 6570 ton/day = 2,400,000 ton/year.
- More than 98% of the wastes generated in Jordan are deposited in different standard landfill without any treatment.
- No value of waste.



Objectives

- **The main objective** of this research was to provide a complete environmentally sound, affordable and financially waste management sustainable solution (treatment and disposal) for Jordan cities during adapting the technical requirements to the local condition.

Composting of organic materials - Methodology -

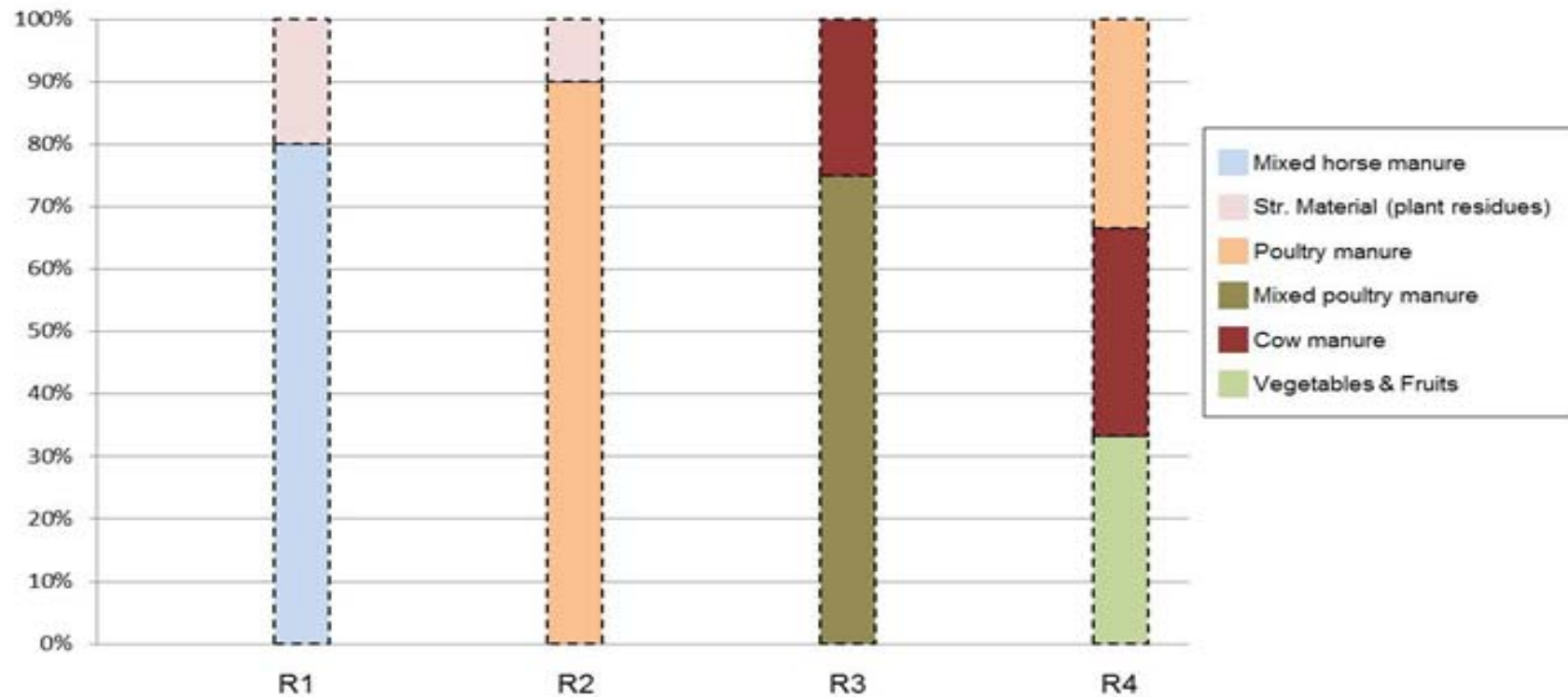


Composting of organic materials - Overview -



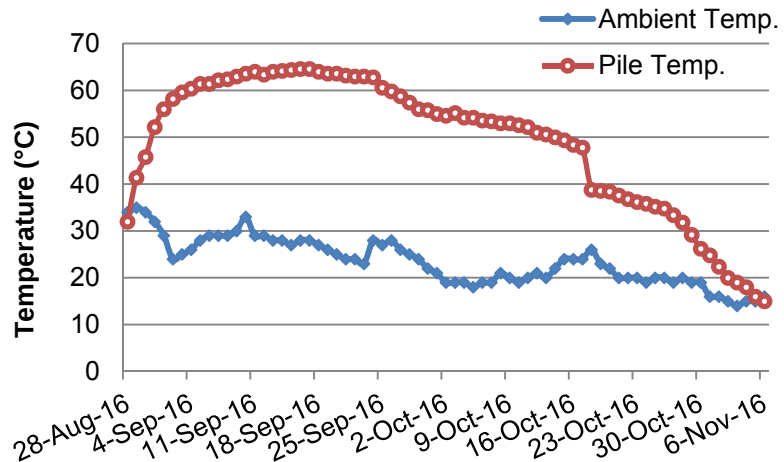
Composting of organic materials

- Composting input material-

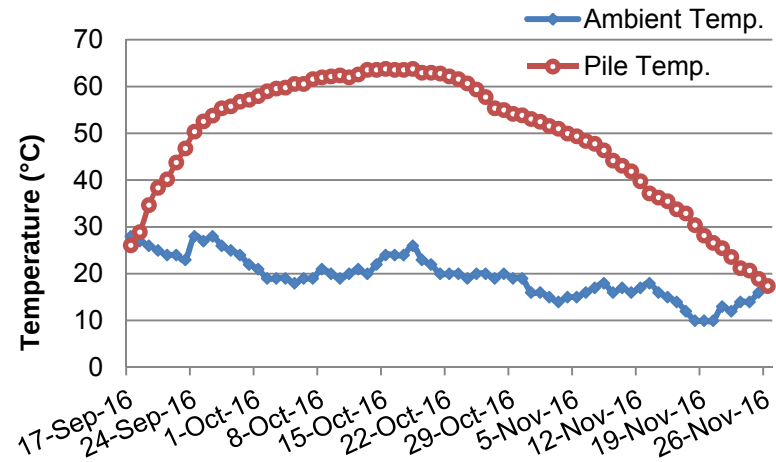


Results of evaluation

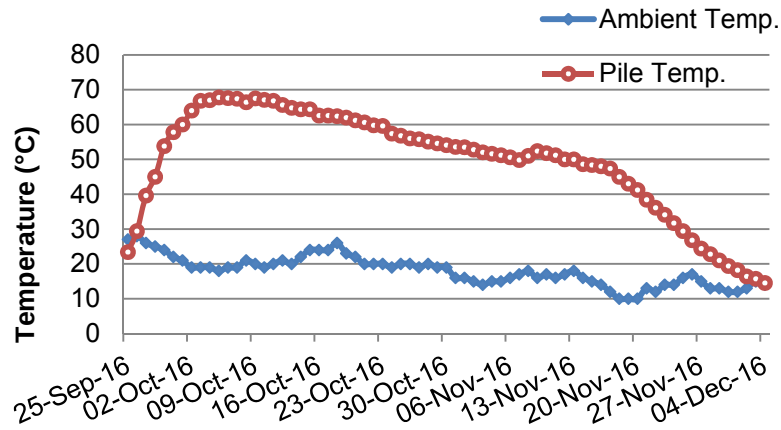
- Temperature profiles -



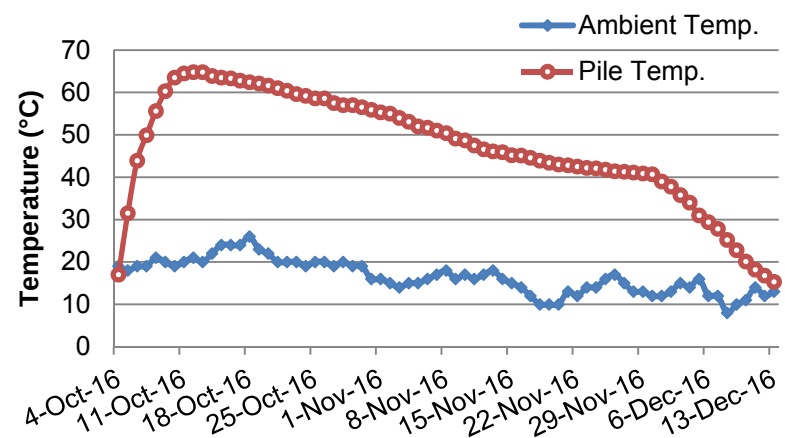
(R1)



(R2)



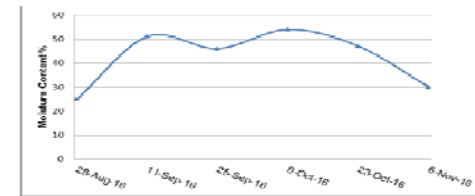
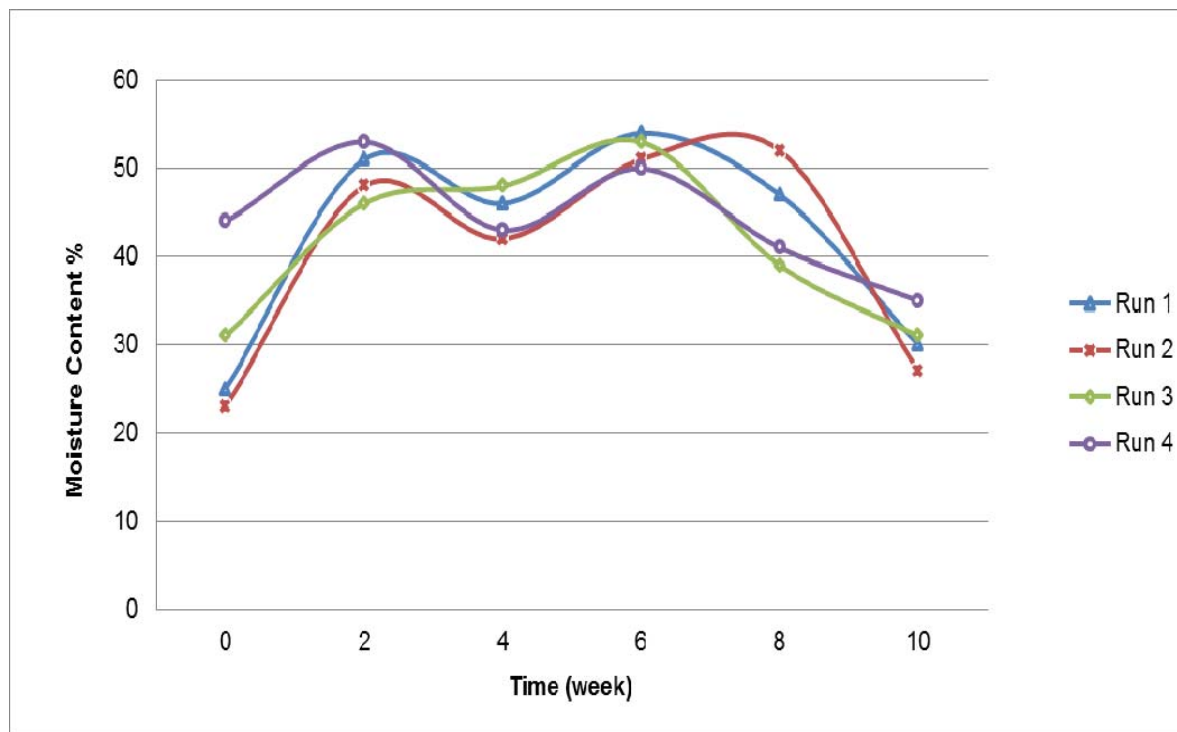
(R3)



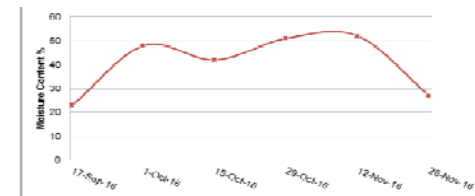
(R4)

Results of evaluation

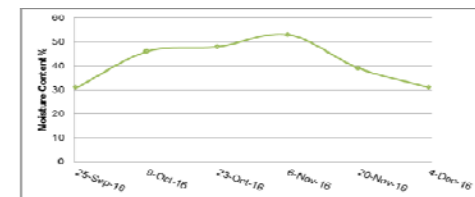
- Moisture Content profiles -



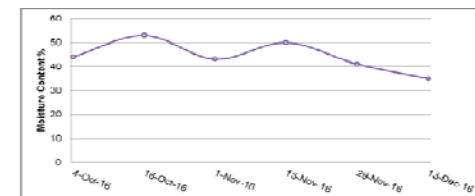
R1



R2

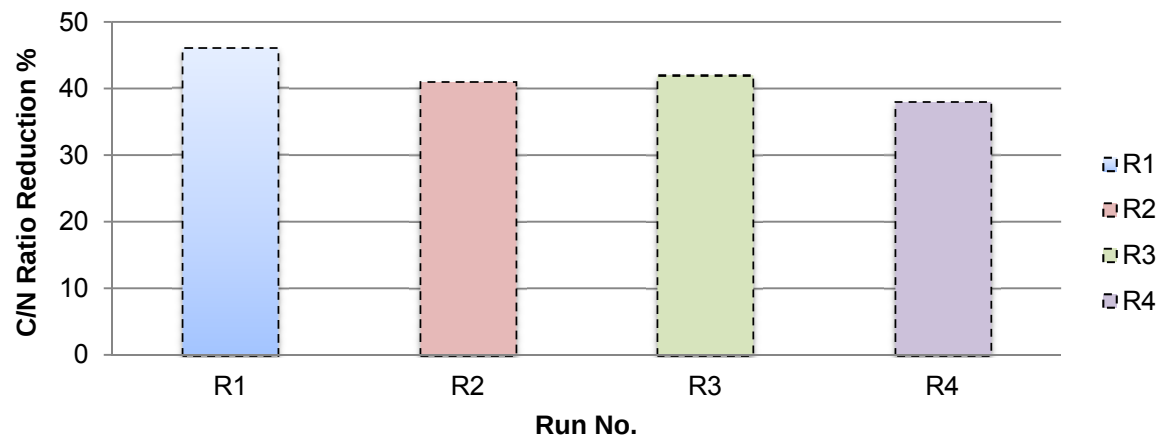
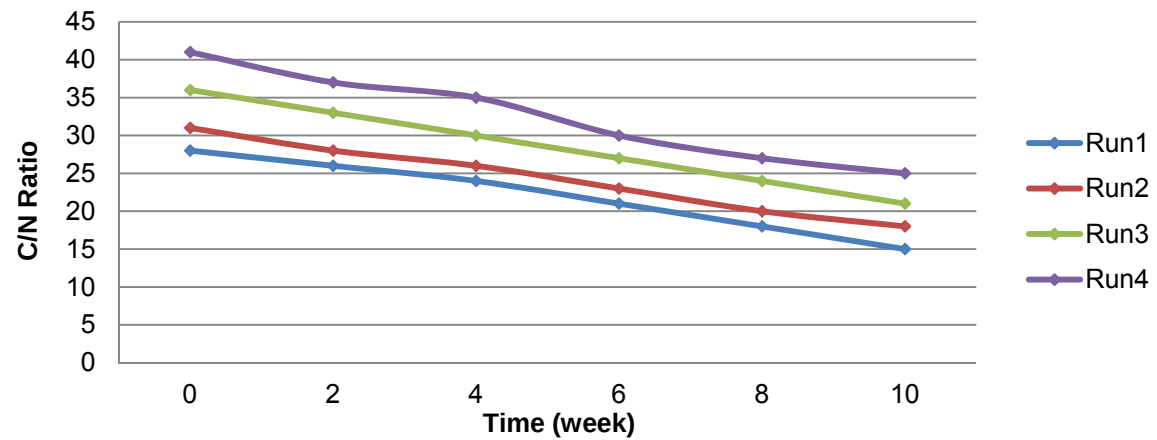


R3



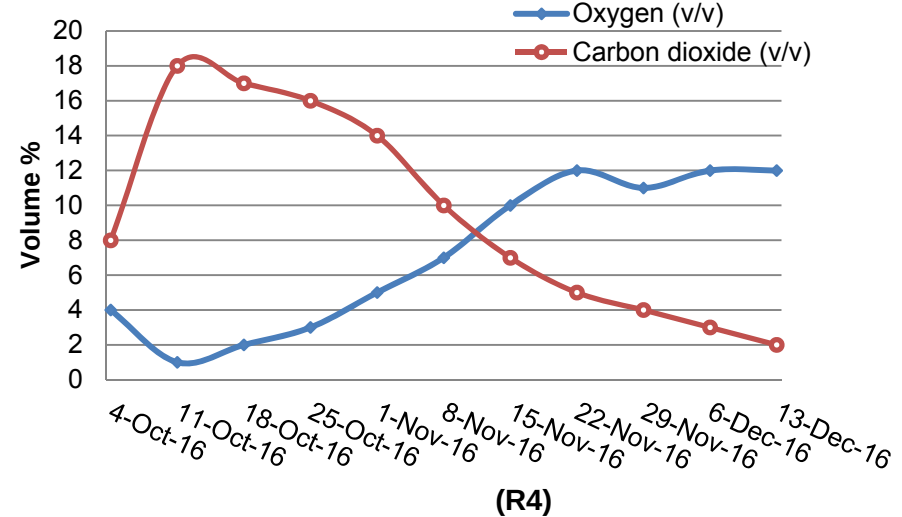
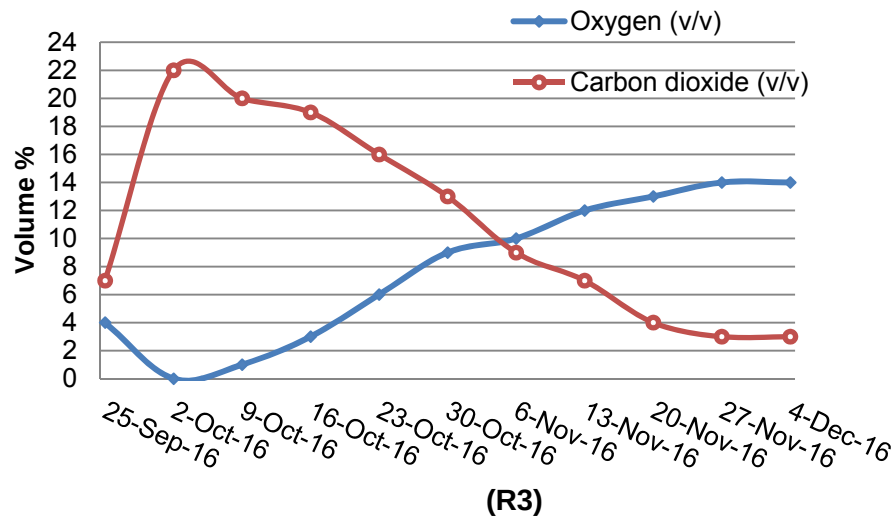
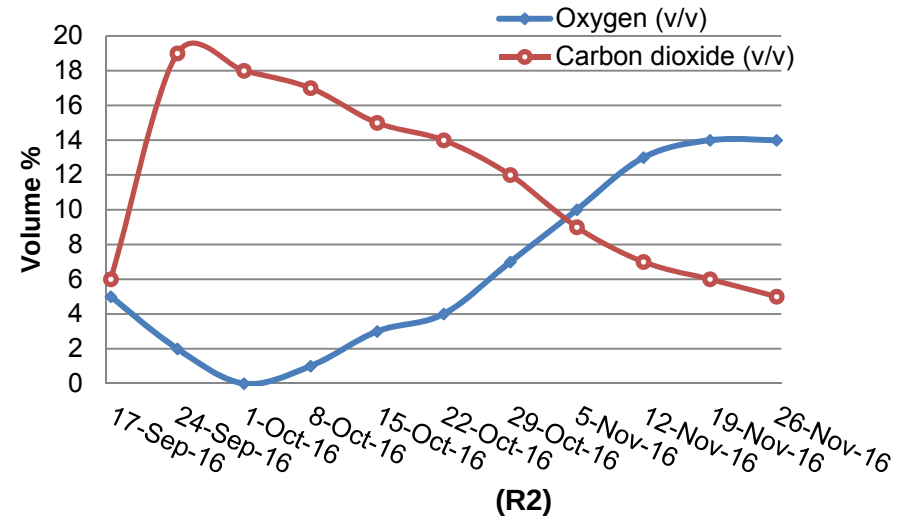
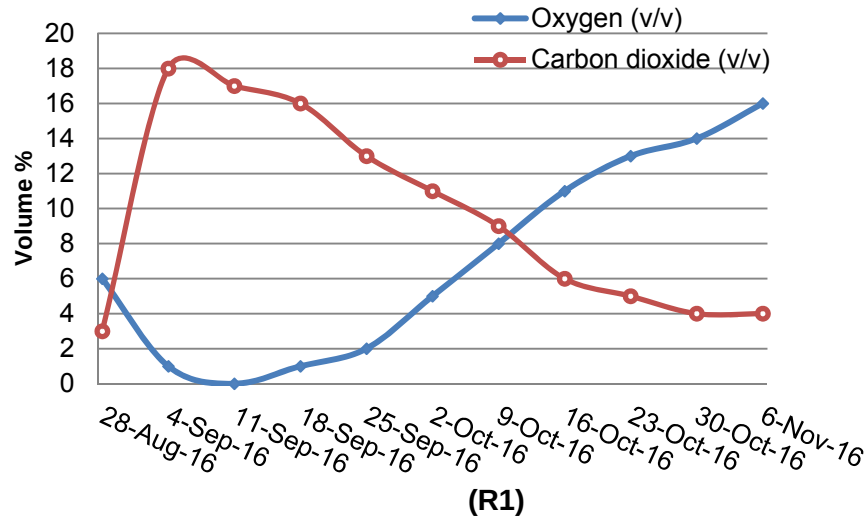
R4

Results of evaluation - C/N ratio profiles -



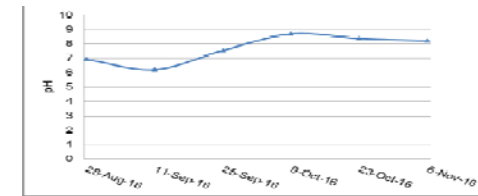
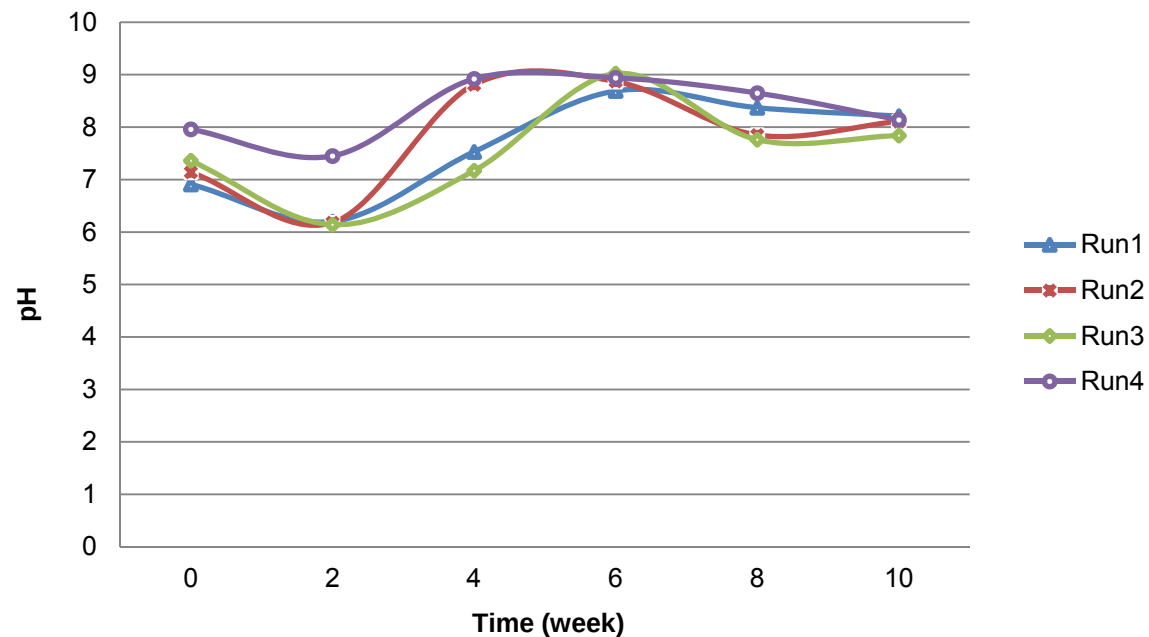
Results of evaluation

- Oxygen and Carbon Dioxide profiles-

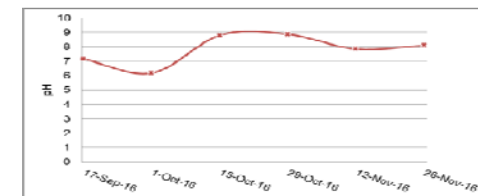


Results of evaluation

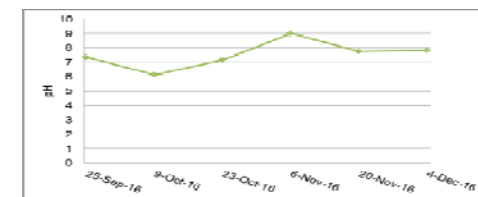
- pH profiles-



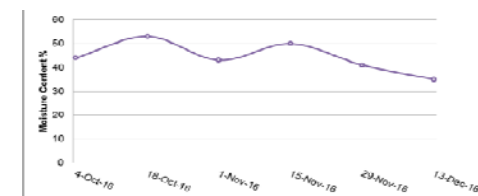
R1



R2



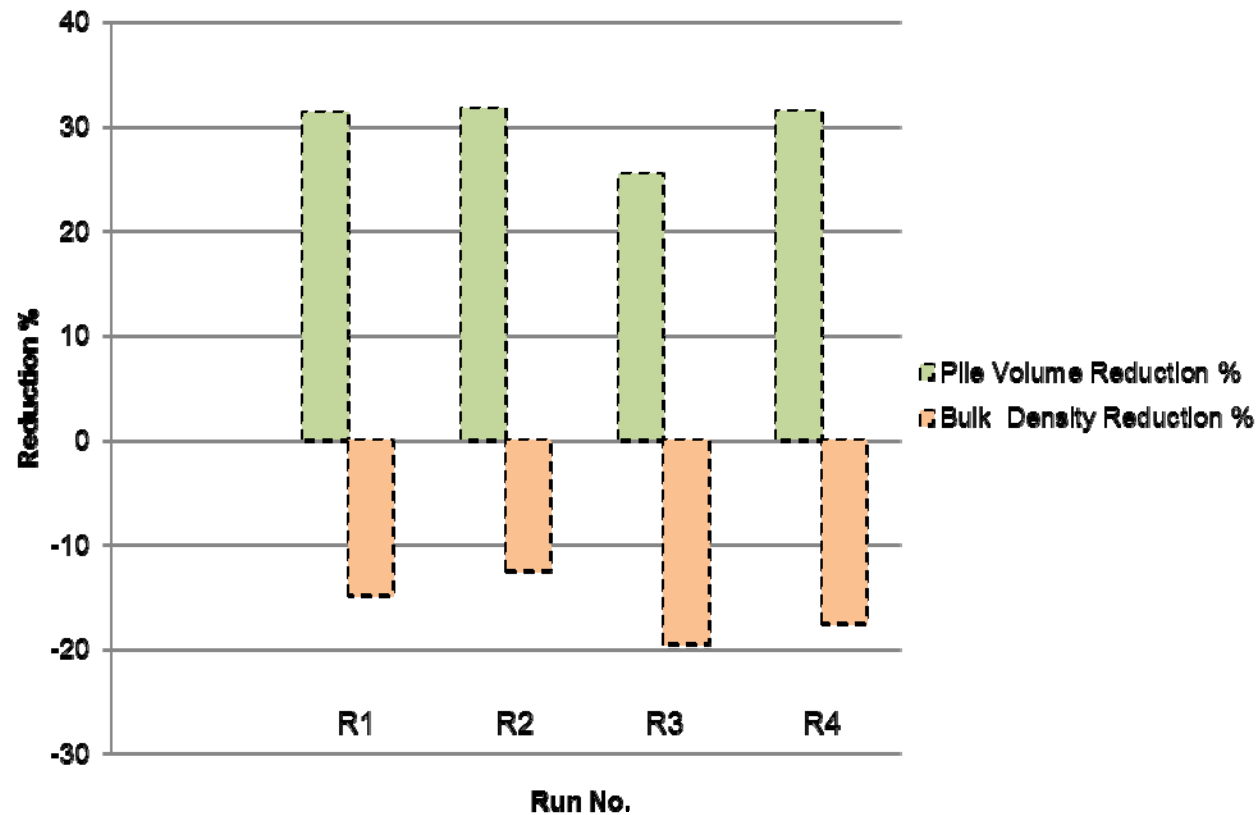
R3



R4

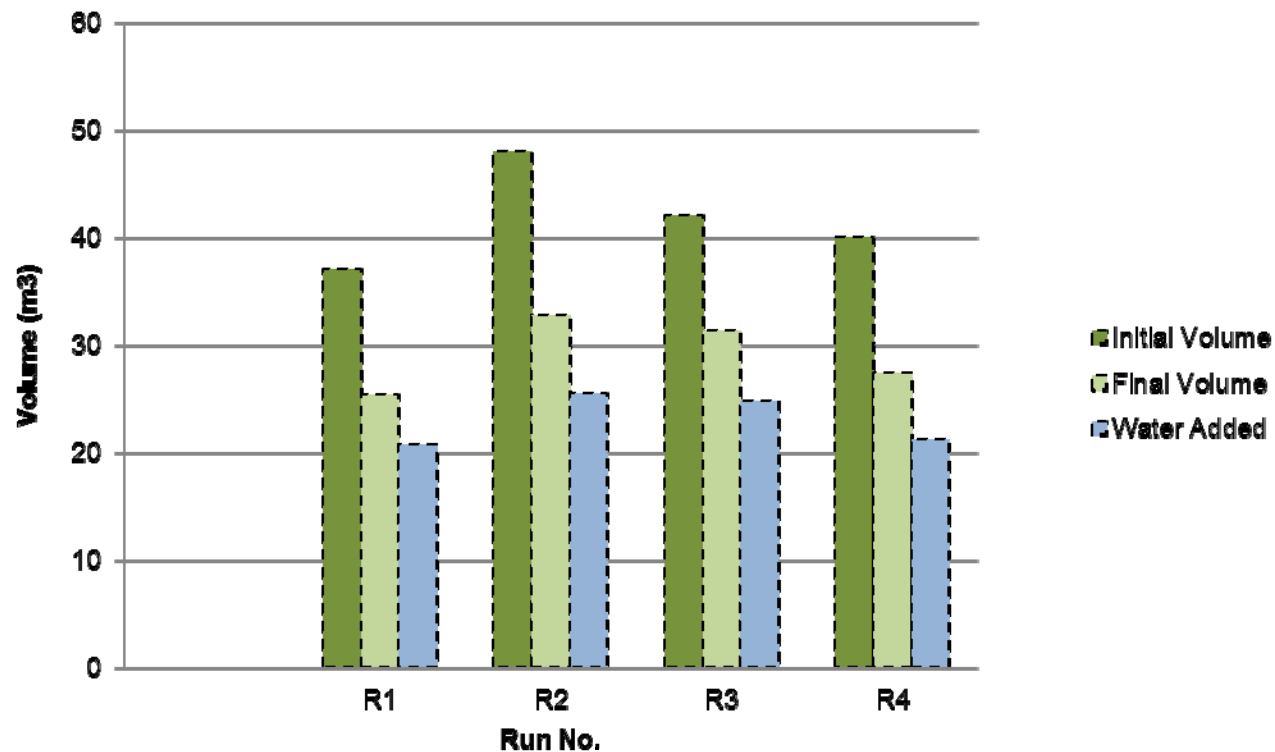
Results of evaluation

- Pile volume and bulk density reduction during composting -



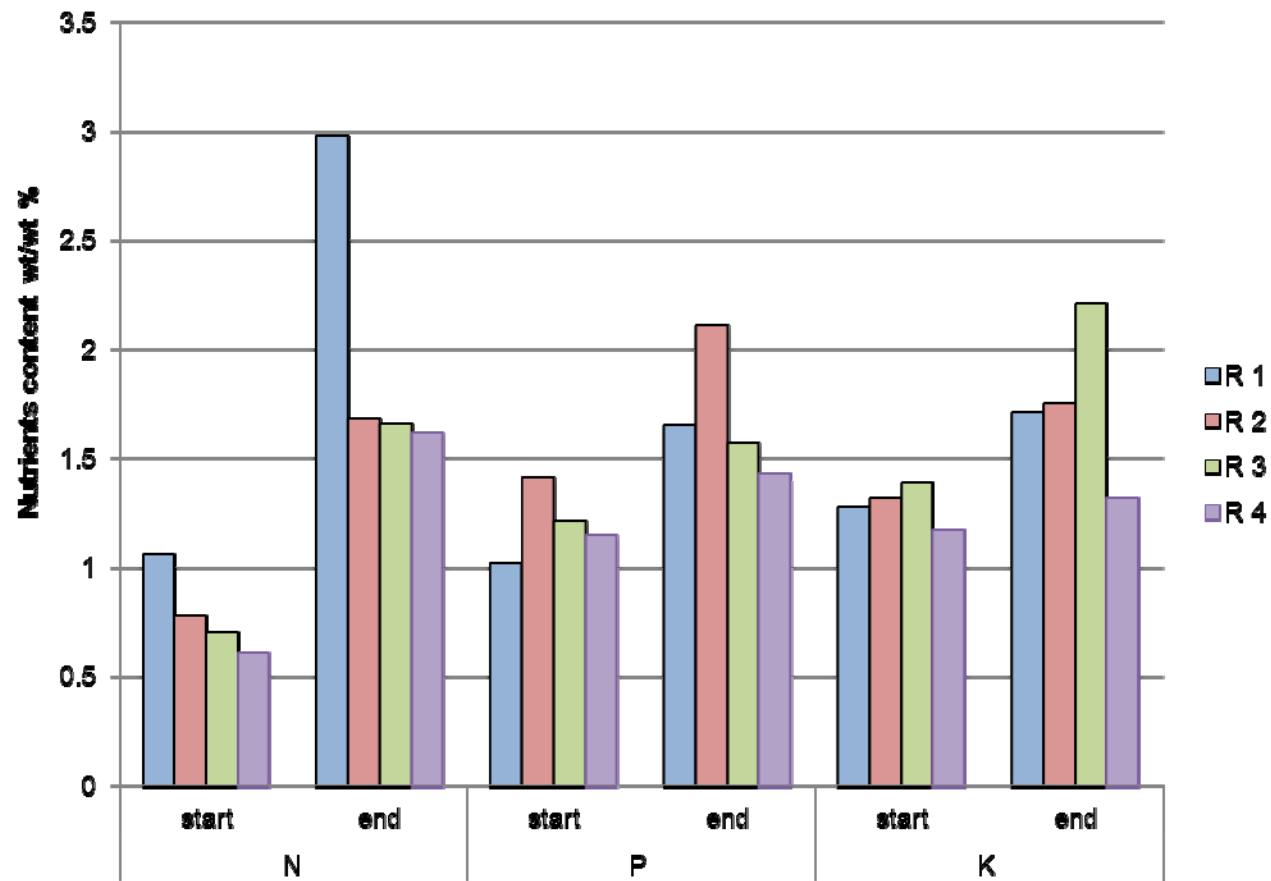
Results of evaluation

- Pile water consumption during composting -



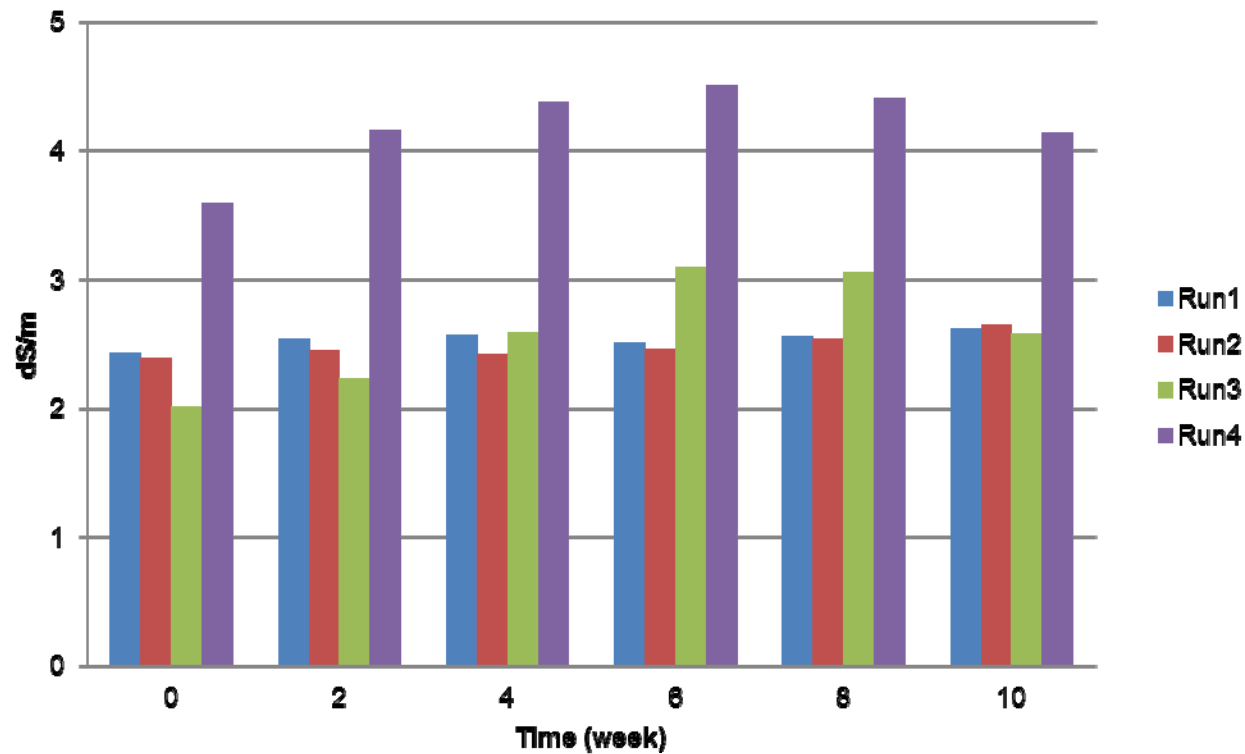
Results of evaluation

- Nutrients content during
composting wt / wt % -



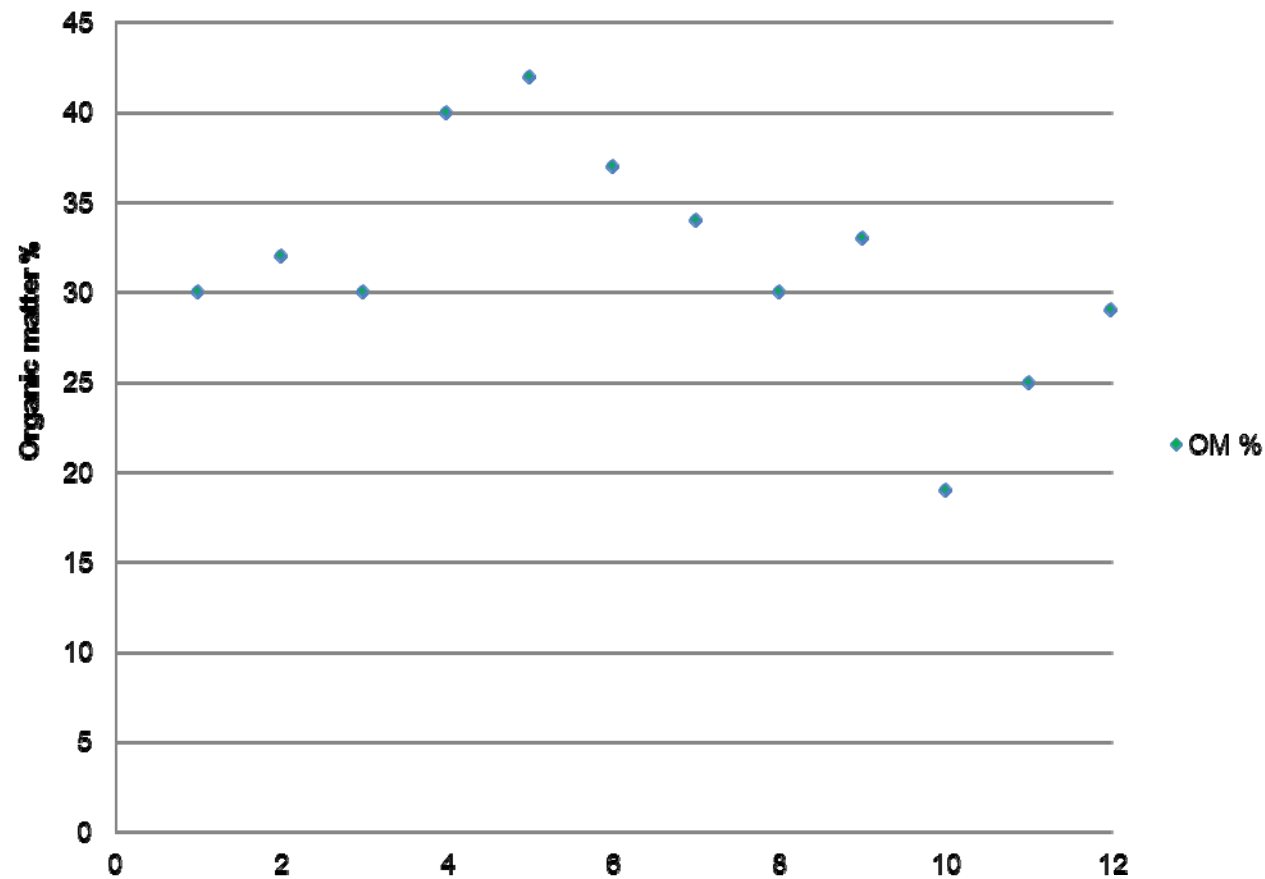
Results of evaluation

- Electrical Conductivity (EC)
dS / m -



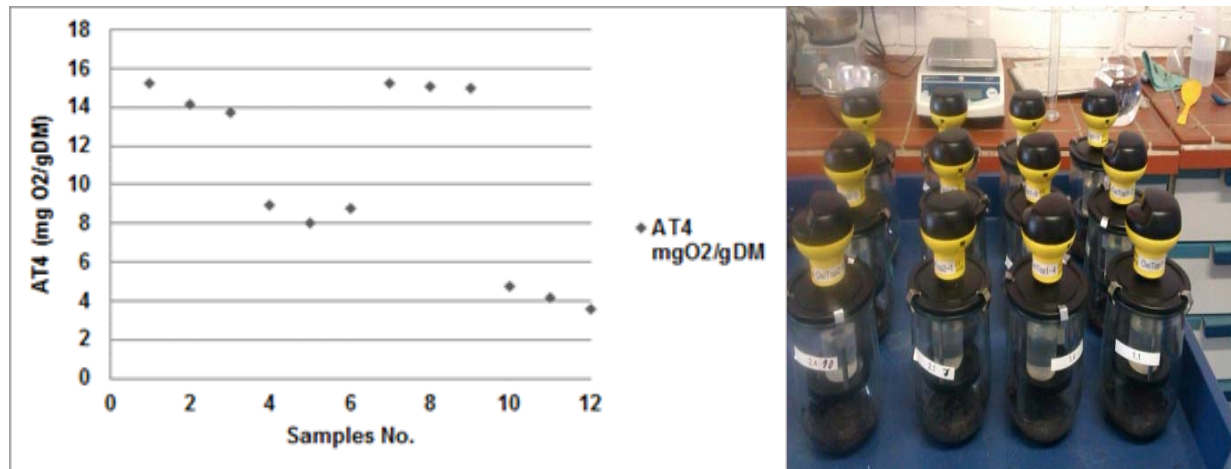
Results of evaluation

- Organic matter -

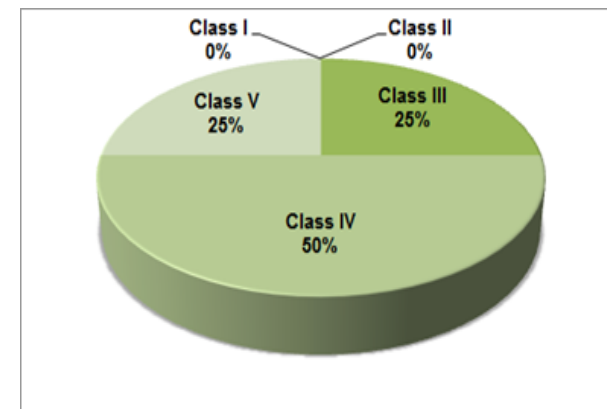


Results of evaluation

- AT4 analysis -

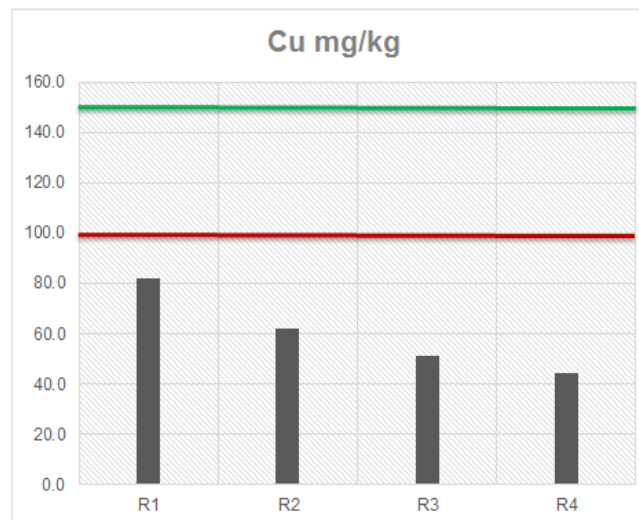
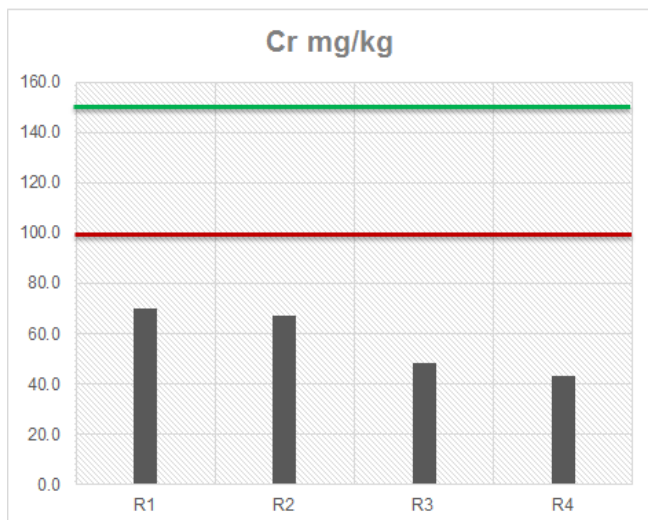
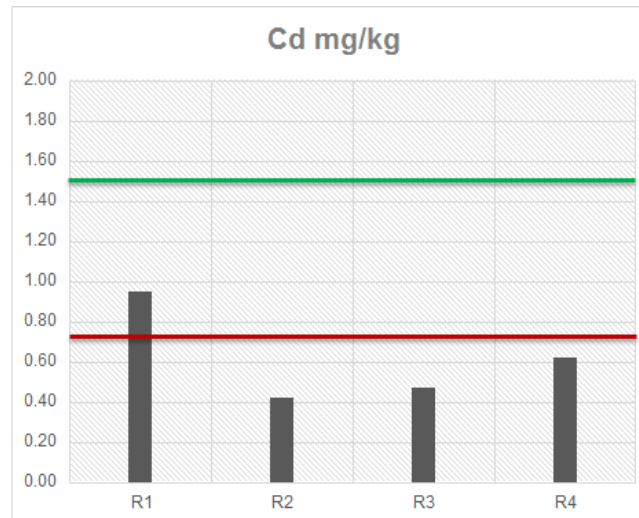
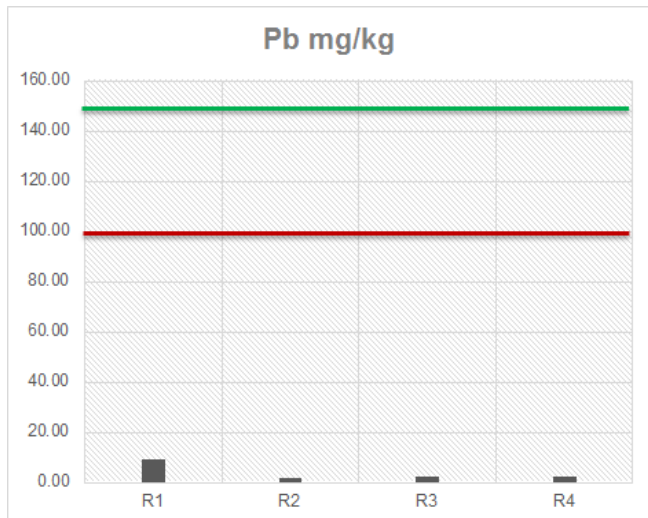


Rotting class	AT4 (mg O ₂ /g DM)	Classification of the samples tested	Product description
I	>40	0 %	Compost raw materials
II	40-28	0 %	Fresh compost
III	28-16	0 %	Fresh compost
IV	16-6	75 %	Finished compost
V	<6	25 %	Finished compost



Results of evaluation

- Heavy metals analysis -

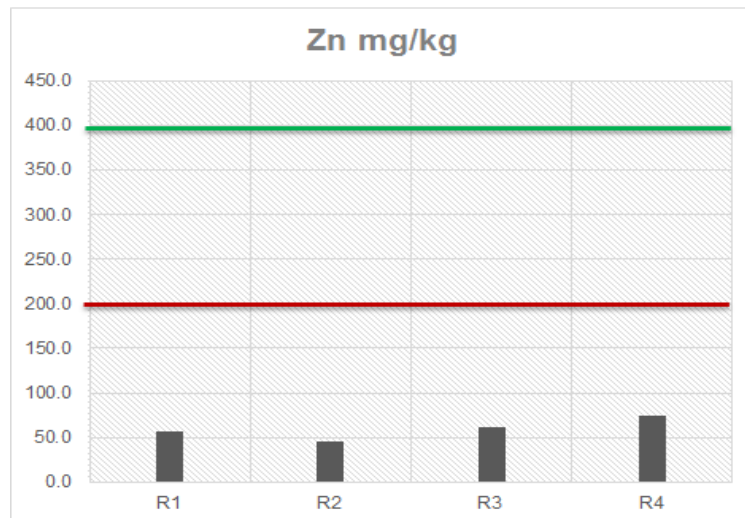
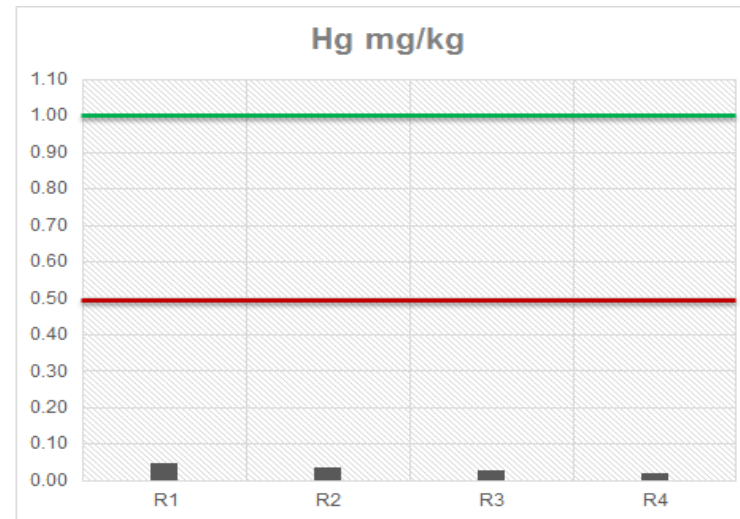
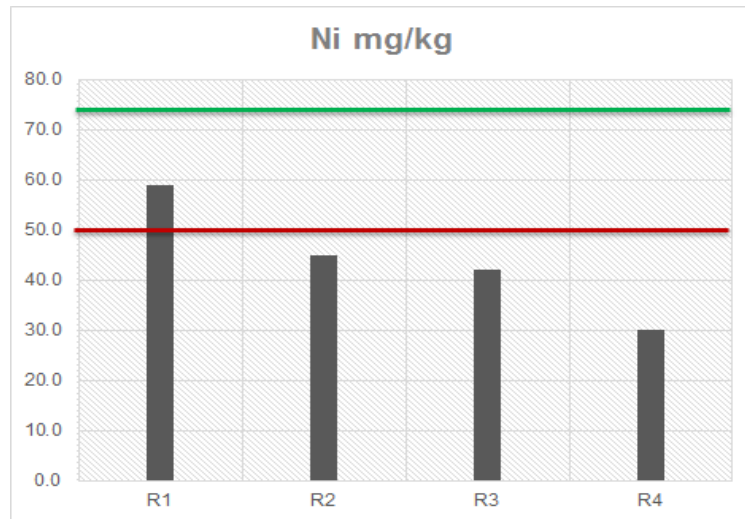


— EU countries (class 1)

— EU countries (class 2)

Results of evaluation

- Heavy metals analysis -



— EU countries (class 1)
— EU countries (class 2)

Conclusions

- Results of the experiment showed that composting of animal manure with plant residues, vegetables residues and bulking agent (sawdust) was carried out successfully under optimized conditions.
- Monitoring and control of the composting parameters is one of the most effective tools in the production of stable organic fertilizers.
- One conclusion is that the source separation, combined with effective composting process parameters, are regarded as the most effective and promising method for production of high grade compost. Another deduction is that the periodic mechanical turning using windrow method improves the gaseous exchange within the windrow piles, speeds up the decomposition rate, maintains uniform homogeneity, and hence minimises gaseous losses (especially ammonia).
- Overall, results showed that the source-separated organic waste approach proved to be efficient for the compost produced by this pilot project and holds the potential for a wider application.

Recommendations

- National laws and regulations in terms of organic waste collection, transfer and treatment, as well as standard values for defining compost quality for agricultural use, should be determined and enforced in Jordan.
- Public awareness campaigns for the use of composted organic waste products should be conducted.

**Thank you for
your attention!**

Contact:



MSc. Safwat Hemidat
+49 (0) 17680311725
Safwat.hemidat@uni-rostock.de