Assessing the effect of human urine in composting

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Outline of the presentation

- Introduction
- Objectives of the study
- Methodology
- Findings
- Conclusion
- Acknowledgement

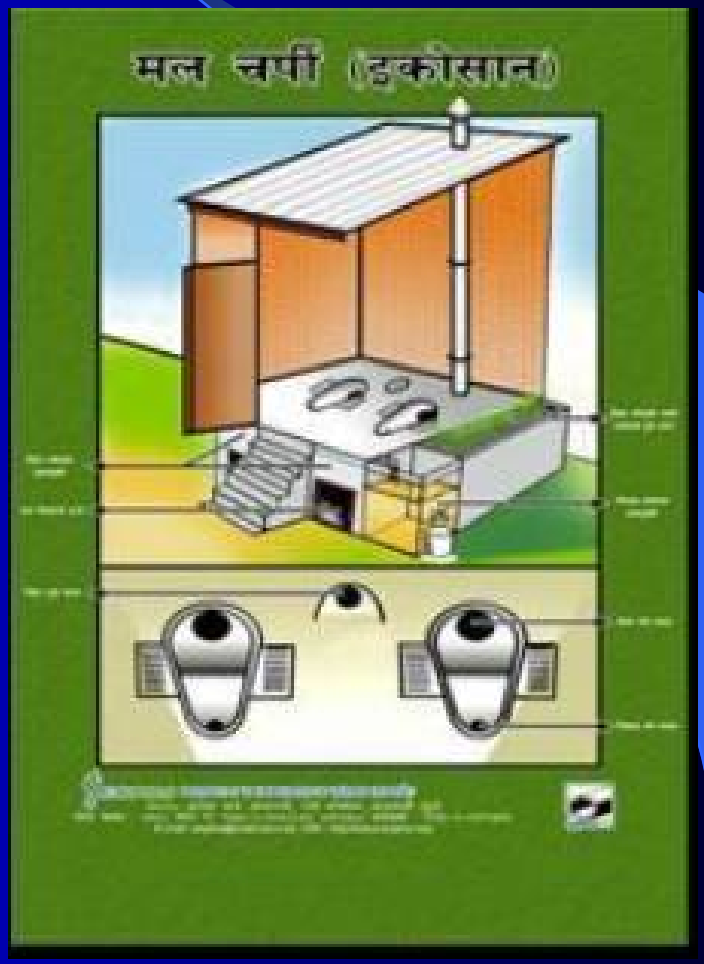
Introduction

- Solid waste management is taken as one of the burning issue.
- Among solid waste, more than 80% is organic. Hence effective Composting can be the best option for it's management.
- ECOSAN, a new toilet system in a field of sanitation has contribution in SWM.

Introduction (contd..)

ECOSAN

- Urine and faeces diverting toilet
- concept of reusing human waste as resource.
- Fertilizer value



Introduction (contd..)

- Out of the human excreta i.e. faeces and urine, urine has high nitrogenous fertilizer value than faeces
- Despite the fertilizer value of urine, it has several challenges to replace chemical fertilizer in the farmland:
  - Urea in urine degrade rapidly to the gases NH_3 and CO_2
  - Urine is too strong to apply directly in the field and should be diluted in order to apply directly in the plants.
  - Urine is **in liquid form** and thus **is not easy to transport** it as of chemical fertilizer.

Introduction (contd..)

- From study done in other countries,
  - Nutrient value of urine can be trapped through organic composting.
  - Urine applied compost accelerated the composting process as well as enhance the quality of the compost.
- In case of Nepal Compost using human urine has just introduced. Hence detail study has to be done .

Objectives of the research

Main Objective

- To assess the effect of human urine in composting process.

Other specific objectives

- To test the quality of compost with and without urine application
- To assess the appropriate dose and splits of urine application.

Methodology

Materials required

- 10 litre buckets
- Vegetables
- Straw
- Ash
- Soil
- Old compost
- Human urine

- Each bucket was filled with shredded composting materials.
- **2/3rd volume** i.e. the weight of 0.35 kg was filled **with straw** and **1/3rd volume** i.e. 1.3 kg by **vegetable waste, ash and old compost**

Methodology (Contd…)

Application of urine dose according to different application phases.

Dose	Splits		
	1 split	2 splits	3 splits
10% (1 L)	1000 mL	500 mL *2	333mL *3
15% (1.5 L)	1500 mL	750 mL*2	500 mL *3
20% (2 L)	2000 mL	1000 mL*2	667 mL *3

NPK value of 0.48 % N, 0.015% P and 0.07% K

Methodology (Contd…)

10 set of experiments including one controlled sample
3 replications of each sample,
30 set of experiments.

Methodology (Contd…)

- Compost was turned in every 15 days
- Temperature was measured daily.
- Quality testing
    - Physico chemical analysis
    - Maturity test

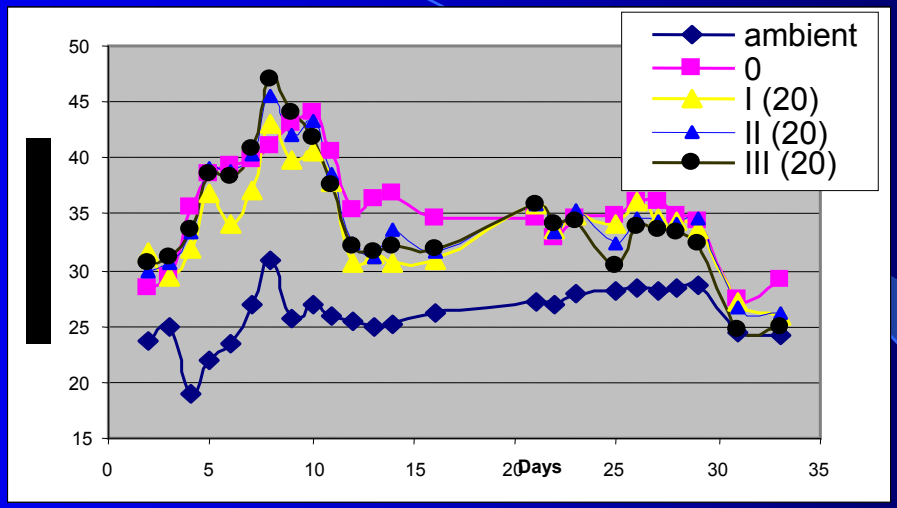
Findings

Temperature versus time period in composting process with different treatments

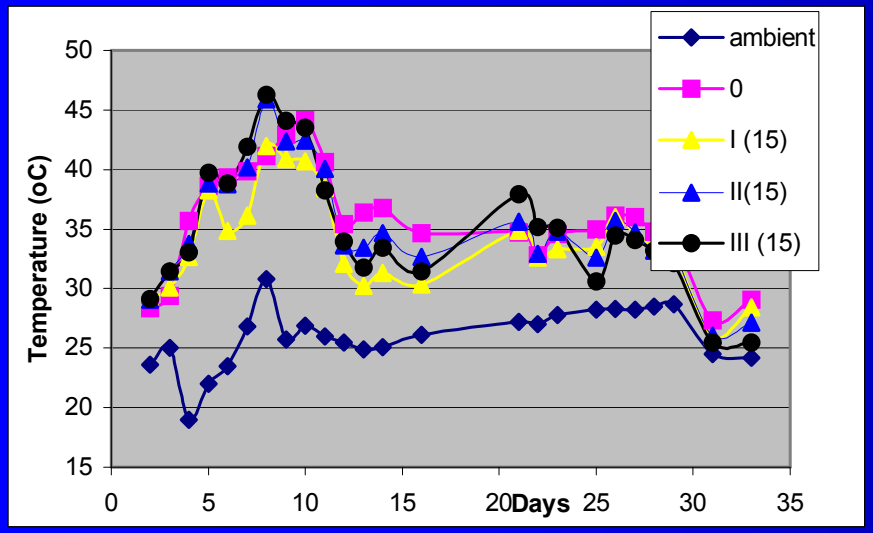
- Adding urine to the compost gave higher temperature in shorter time compared to that of without urine
- Among all the treatment, the highest temperature of 46.9 ^{o}c on the 8th day was observed in compost with 20% urine in 3 splits
- The highest temperature in the compost without urine was observed to be 44.2 ^{o}c only on the 10th day.
- In all the treatments, temperature slowly increased to certain level and slowly decreased after about two weeks and then reached around the ambient temperature.

Temperature Pattern

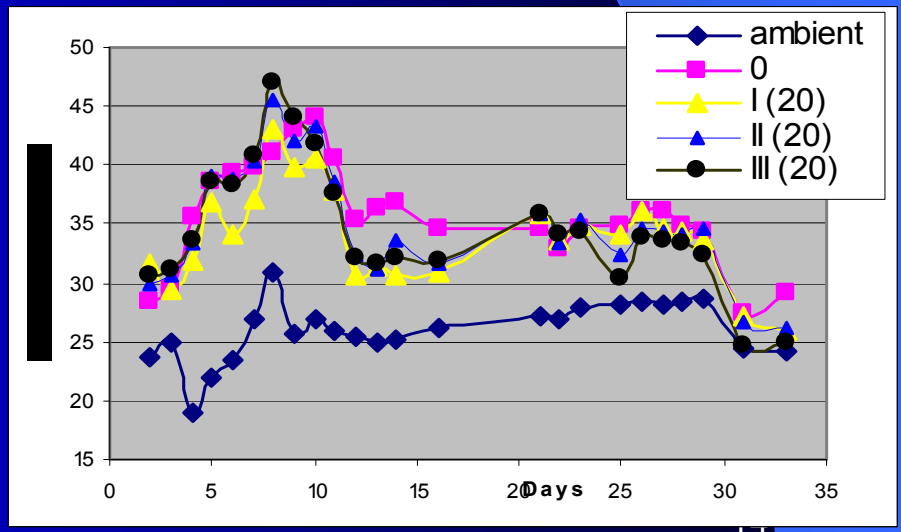
Graph I: Temperature pattern in 10% urine



Graph II: Temperature pattern in 15 % urine



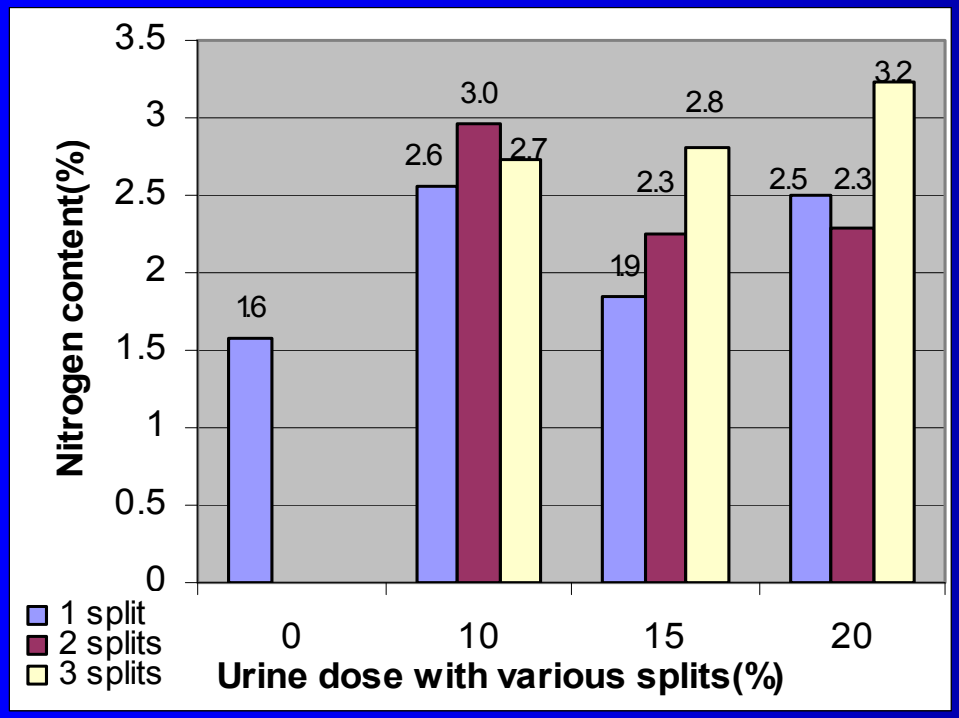
Graph III: Temperature pattern in 20% urine



Physico-chemical analysis of mature compost

NITROGEN CONTENT IN COMPOST

Nitrogen content in mature composts

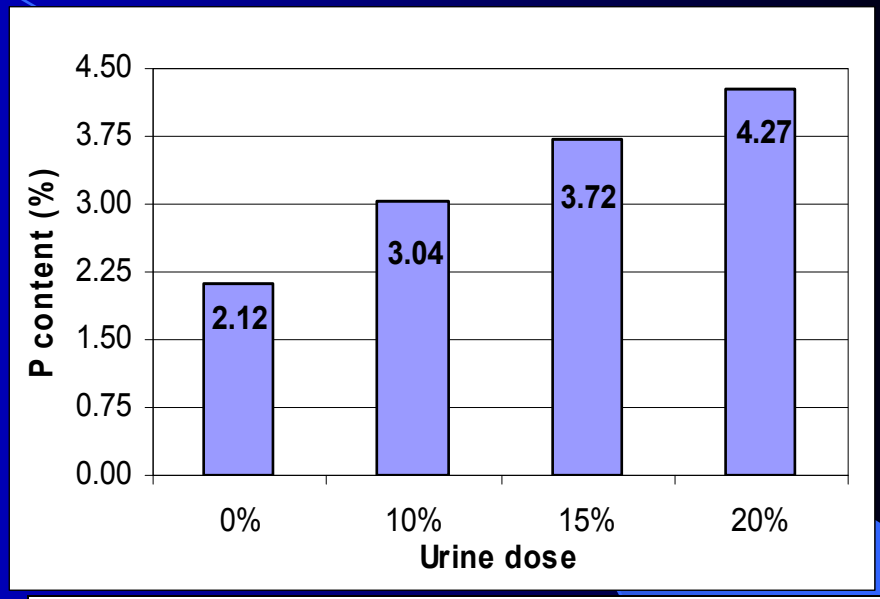


- The best result i.e. 3.23% was obtained in compost with 20% urine by volume in 3 splits
- The lowest Nitrogen content i.e. 1.57% was found in compost without urine
- Significant differences were seen in Nitrogen content among the treatments

PHOSPHORUS CONTENT

•Statistically no significant difference of phosphorus content was found among the treatments with different splits

•**Mean P content was taken** without considering the splitting of the dose



Mean Phosphorus content of mature compost

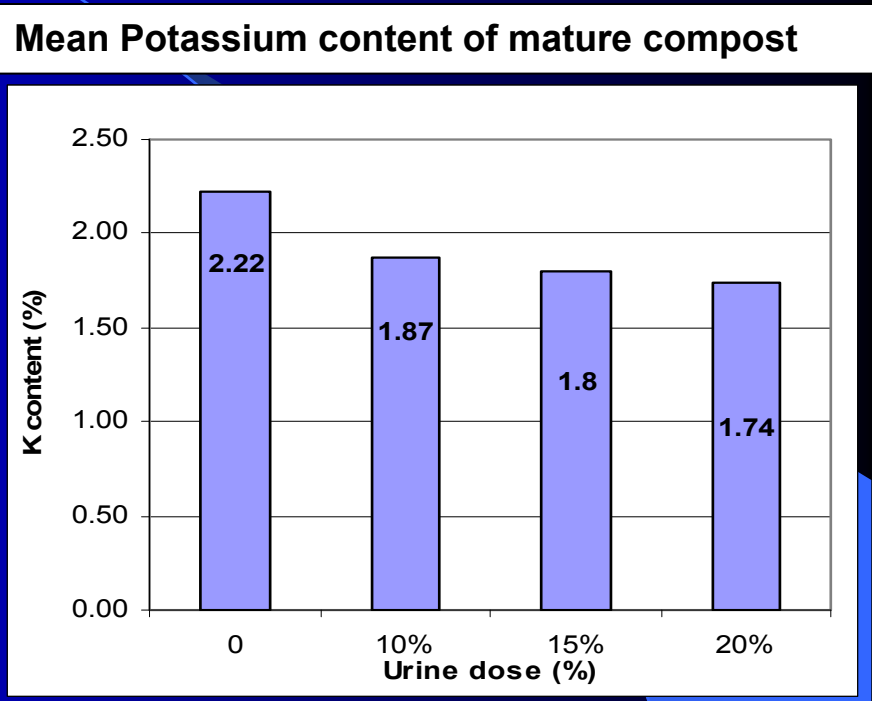
•Lowest content of Phosphorus was observed in compost without urine dose

•**Highest result was found in 20% urine application**, which was followed by 15% and then by 10% dose of urine

POTASSIUM CONTENT IN COMPOST

- Statistically no significant difference of potassium was found in all the treatments with diff. splits.

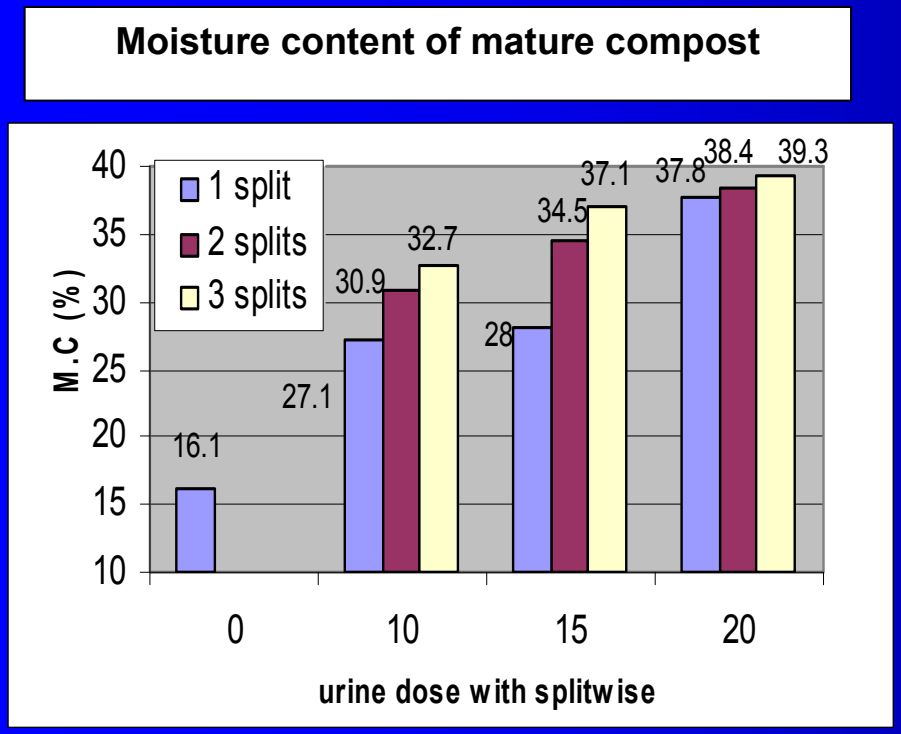
- **Mean Potassium content** of mature compost in different dose is showed in the figure.



- Potassium content was recorded to be **2.2% (highest) in compost without urine**.

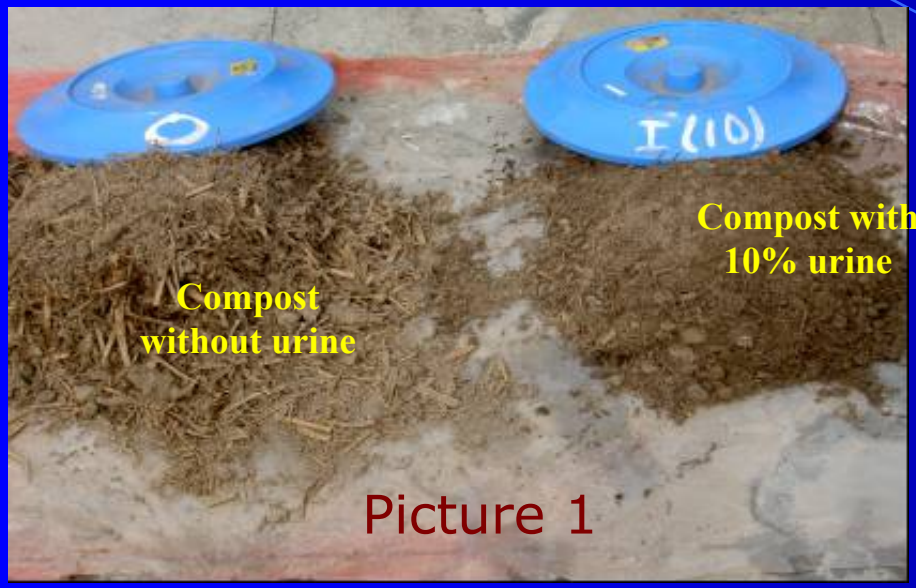
MOISTURE CONTENT IN COMPOST

Optimum MC = > 30%



- Highly significant difference in moisture content was found
- All the treatment, except compost without urine application, attained the standard moisture content.
- 1 split in 10% and 15 % were slight below the standard value
- **MC in compost without urine is far below the standard value**

VISUAL COMPARISION



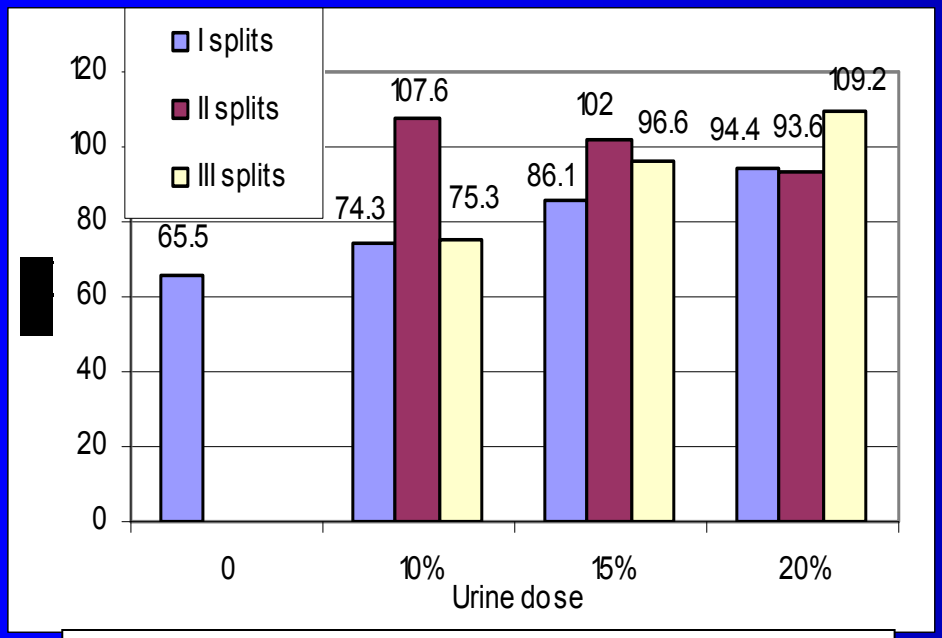
Picture 1

Picture 2

Picture 3

MATURITY TEST OF COMPOST

Compost with germination index up to 80% is accepted as the mature compost



Germination index of mature composts

- Urine dosing of 15 and 20% showed GI above 80%.
- Compost with **20% urine with 3 splits** showed **maximum GI** compare with other treatments.
- Compost **without urine-application** was recorded to have only 65.47% of GI, which is **below the maturity standard**.

Conclusion

- Urine **facilitated the composting process**.
- Urine enriched the quality of compost.
  - due to presence of high Nitrogen and Phosphorus content
  - with optimum moisture content
  - More mature product
- Potassium content decreased with urine dose.

Conclusion (contd…)

- 20% of urine by volume in 3 splits showed the best result in almost all parameters.
- However,20% dosing may varied with
  - Nutrient content of urine
  - Materials used in composting
- Considering Nitrogen concentration up to 0.8%, 10 to 20% of urine dosing is recommended.
- Hence urine composting can be one of the appropriate option for improving quality of compost and managing organic solid waste

Acknowledgement

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&

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THANK YOU


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Bhaktapur
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