Urine as fertilizer for vegetable production-case study from Nepal and Ghana

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Why Urine??

- It contains large amount of plant nutrients (NPK)
- Mostly free of pathogens
- Easily available and easy to handle
- Increase lifetime of pit latrine
- High fertilizer need to increase the food production.

Objectives

- Study the fertilizer value of urine in production of different vegetables.
- Practical demonstration of urine application.

Methods

- In Nepal:- Collection of urine, wood ash and manure from villagers, cultivation of different vegetables.
- In Ghana:- Collection of urine from urinal, mineral fertilizer (NPK), poultry droppings, cultivate cabbage.

Use of urine, wood ash, animal manure for vegetable production





Cultivation of cabbage using urine fertilizer in Ghana

Materials/data

Table 1. Physico-chemical parameters of soil and the fertilizer materials. (NPK unit for urine is g/L)(ND = Not determined, PD = poultry dropping, BLF= broadleaf mustard)

Materials	N (g/kg)	P (g/kg)	K (g/kg)	pH	Cond (µS/cm)	OM %	C (%)
Soil (DW)	4	0.02	0.2	4.7	82	1.8	
Manure (DW)	11	0.4	7.7	8.7	1787	17.9	
Urine	2.9	3.1	9.5	9	21803	ND	
Wood ash	0.9	0.2	ND	11.8	1310	ND	
Chemical characteristics of soil and other fertilizer sources in Accra experiment							
Soil	0.5	0.5	0.2	7.0	275		13.60
Urine	10.3	1.0	7.5	8.5	>3000		ND
PD	19.6	19.5	12.3	6.8	1650		15.41

Table 2. Design & amount (g/m^2) of different fertilizer and nutrients application

Subjects	Radish	Potato	BLF	Cauliflower	Cabbage
Plants/m^2	10	6	4	5	5
Urine+ash (N-P-K)	5.2-5.6-17.1	4.9-5.3-16.2	7.8-8.4-25.7	7.8-8.4-25.7	7.5-8.1-24.7
Manure (N-P-K)	5-0.2-3.5	4.8-0.2-3.4	7.3-0.3-5.1	7.3-0.3-5.1	7.4-0.3-5.2
Nutrients applied in experiment conducted in Accra					
Urine alone (N)					12
Urine + PD (N)					12

Materials and data contd…

Materials	N (g/kg)	P (g/kg)	K (g/kg)	pH	conductivity µS/cm	OM %	Carbon %
Soil (DW)	4	0.02	0.2	4.7	82	1.8	
Manure (DW)	11	0.4	7.7	8.7	1787	17.9	
Urine	2.9	3.1	9.5	9	21803	ND	
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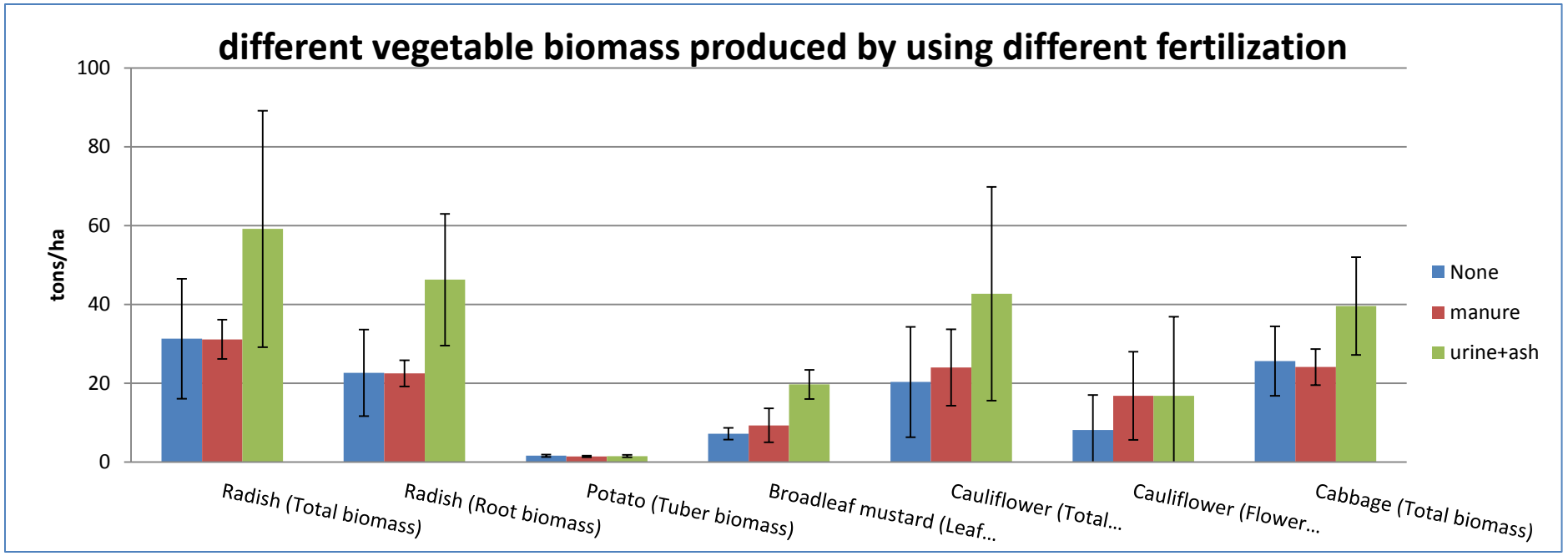
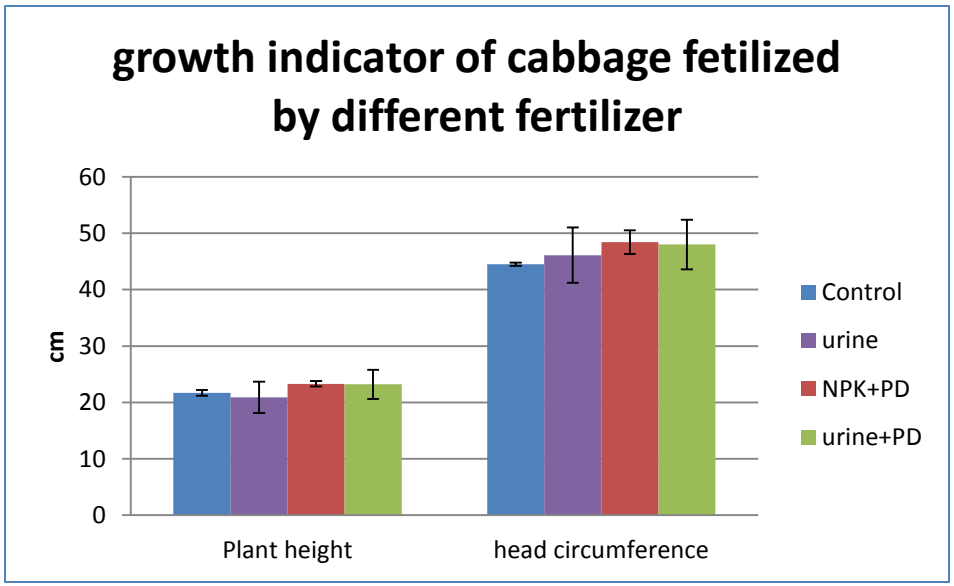
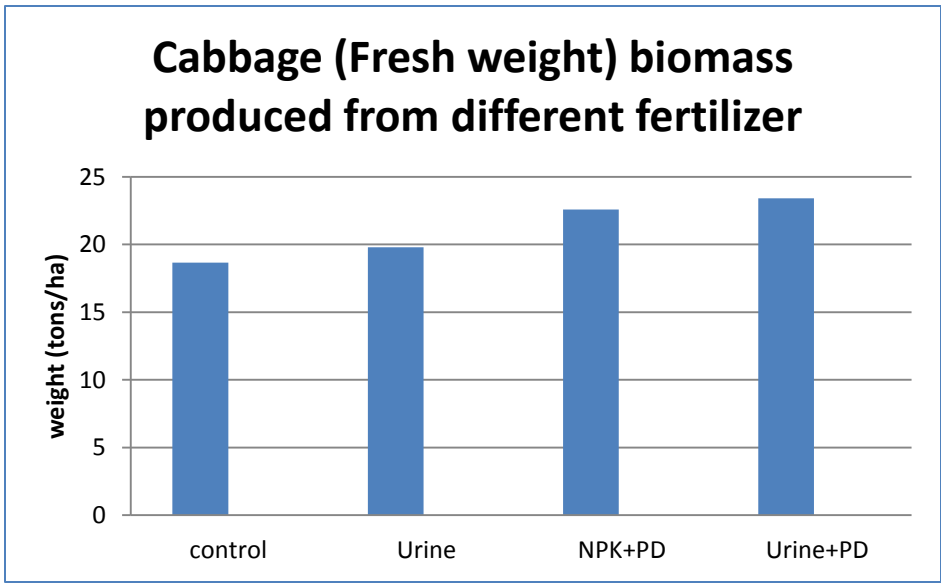
Physiochemical character of soil after cultivation experiments in Accra							
Control	0.27	0.59	0.55	7.4	417		
Urine alone	0.36	0.65	0.81	7.3	883		
NPK+PD	0.38	0.73	1.19	7.3	1293		
Urine+PD	0.45	0.75	0.92	7.3	1283		

Results


different vegetable biomass produced by using different fertilization
tons/ha
100
80
60
40
20
0
None
manure
urine+ash
Radish (Total biomass)
Radish (Root biomass)
Potato (Tuber biomass)
Broadleaf mustard (Leaf...
Cauliflower (Total...
Cauliflower (Flower...
Cabbage (Total biomass)


growth indicator of cabbage fetilized by different fertilizer
cm
60
50
40
30
20
10
0
Control
urine
NPK+PD
urine+PD
Plant height
head circumference


Cabbage (Fresh weight) biomass produced from different fertilizer
weight (tons/ha)
25
20
15
10
5
0
control
Urine
NPK+PD
Urine+PD

outputs

- In Nepal: N-fertilizer value of 4 liters urine is equal to the 1 kg of dry manure.
- Urine+ash can produce:- >24 t/ha radish root, >95 kg/ha potato tuber, >19 t/ha cauliflower total biomass and >15 t/ha cabbage total biomass compared to manure fretilizer.
- In Ghana: N-fertilizer value of 2 liters of urine is equal to 1 kg of poultry droppings.
- Urine produced 1.2 ton/ha more cabbage head biomass than control.
- Urine+PD produced 0.82 t/ha more cabbage head biomass compared to NPK+PD

Can urine fertilizer be a business?

- In general, there is no market price of urine.
- In Burkina Faso urine sell at US$ 0.21/20L (Schuen et al, 2009)
- In Ghana- 50kg NPK 15-15-15 fertilizer cost (US$ 14.00).
- 150 gN fertilizer cost US$ 0.28 (i.e.1 kg NPK, 15-15-15).
- N in stored urine in Accra is 10.30 g/L (Adamtey, 2010).

150 gN or 15L urine will cost US$ 0.14, half the price of mineral fertilizer.

- However, price of urine should be lower compared to mineral fertilizer because it is new/liquid resource in market.
- Urine is bulky so transportation cost should be considered.
- Awareness and practical demonstration program is important for marketing.

Conclusion

- Urine alone or mixed with ash or PD can be used as fertilizer for vegetable production.
- Use of urine fertilizer increase the agricultural yields

However,

Economic success of large scale urine fertilizer business needs further study.