Urine and Faeces – Collection, treatment and use

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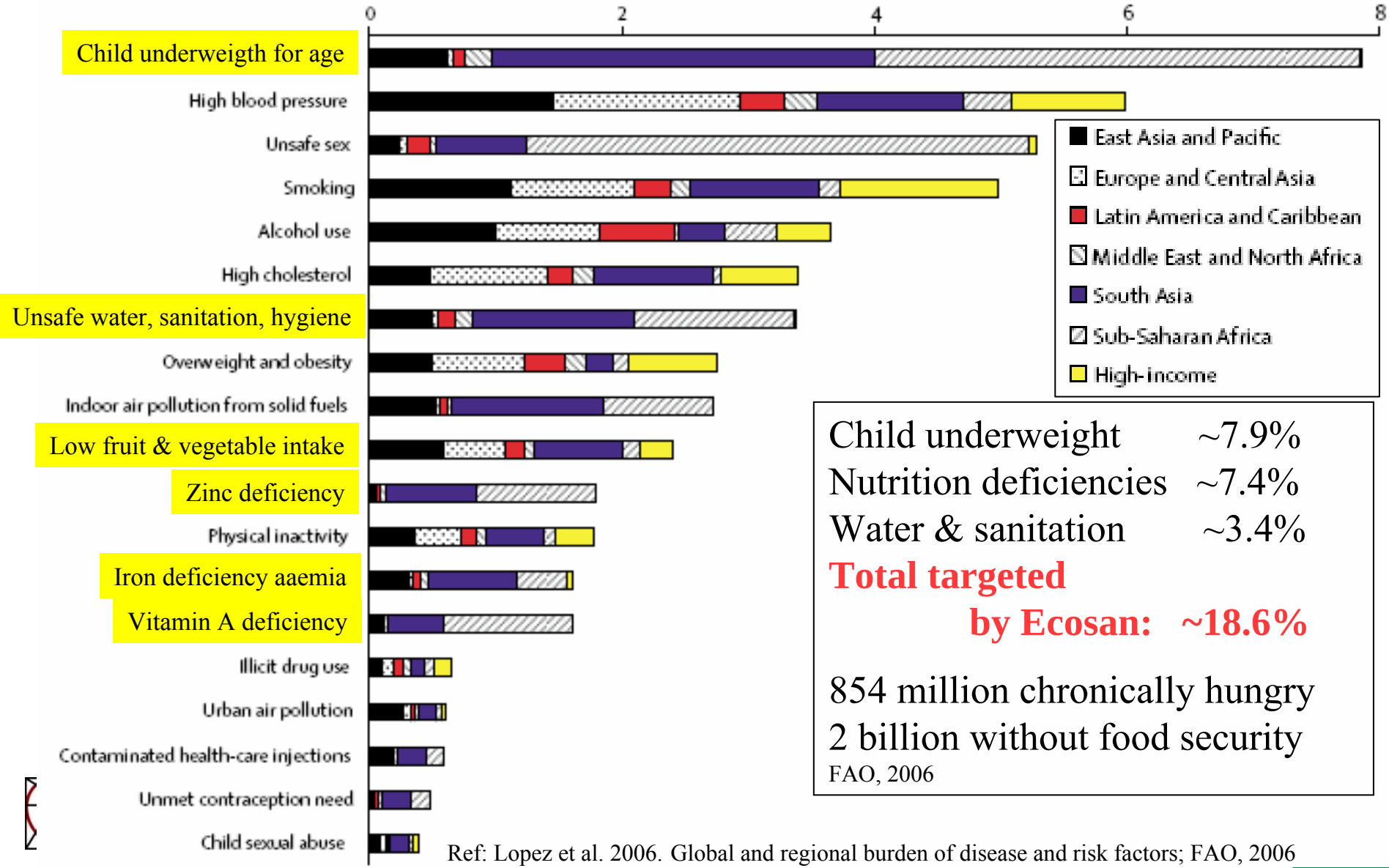
Global risk factors for disease and premature deaths (% of DALYs)



Child underweight ~7.9%
Nutrition deficiencies ~7.4%
Water & sanitation ~3.4%
Total targeted by Ecosan: ~18.6%

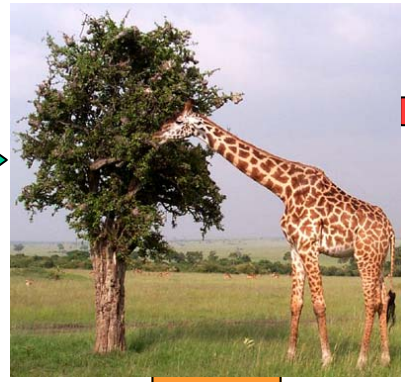
854 million chronically hungry
2 billion without food security
FAO, 2006

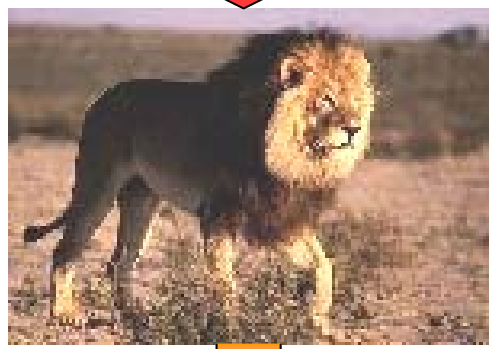
Ref: Lopez et al. 2006. Global and regional burden of disease and risk factors; FAO, 2006

Ecosan and UN Millenium development goals

- Goal 7. **Ensure environmental sustainability**
  - Target 10. Reduce by half the proportion of people without sustainable access to safe drinking water and sanitation
- Goal 1. **Eradicate extreme poverty and hunger**
  - Target 2. Reduce by half the proportion of people who suffer from hunger
- Goal 4. Reduce child mortality
- Goal 5. Improve maternal health

Carbohydrates, proteins, fats, etc





N, P, K, S, etc

Linear flow of plant nutrients in present food chain

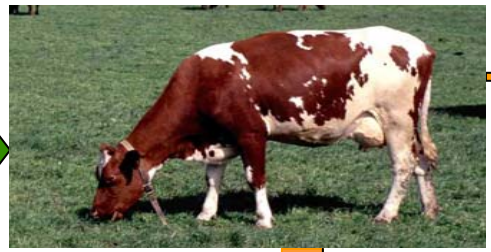


Photo ESRI.COM

Photo Mats Johansson

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Crop nutrient removal

Crop	Yield, kg/ha	Dry matter	N, kg/ha	P, kg/ha
Cereals				
Maize	4000	88%	51	9
Rice	4000	88%	45	11
Sorghum	4000	88%	56	9
Wheat	4000	88%	73	13
Wheat straw, crop above	5300	85%	21	3
Tubers etc				
Cassava root	20000	36%	32	1
Potatoes	25000	23%	83	13
Sweet potatoes	10000	59%	49	12
Others				
Banana fruit, ripe	25000	31%	67	8
Ground nuts, peanuts	1000	94%	37	4
Soybeans	1000	91%	54	5

Goal – healthier people and better environment by recycling nutrients in a safe way

Photo Mats Johansson

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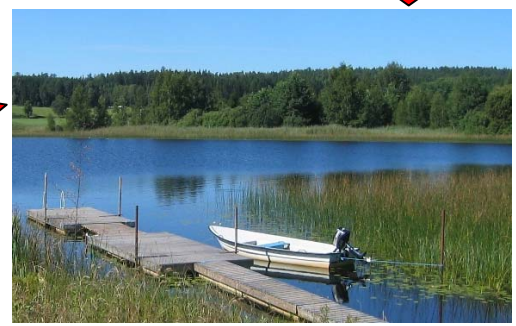
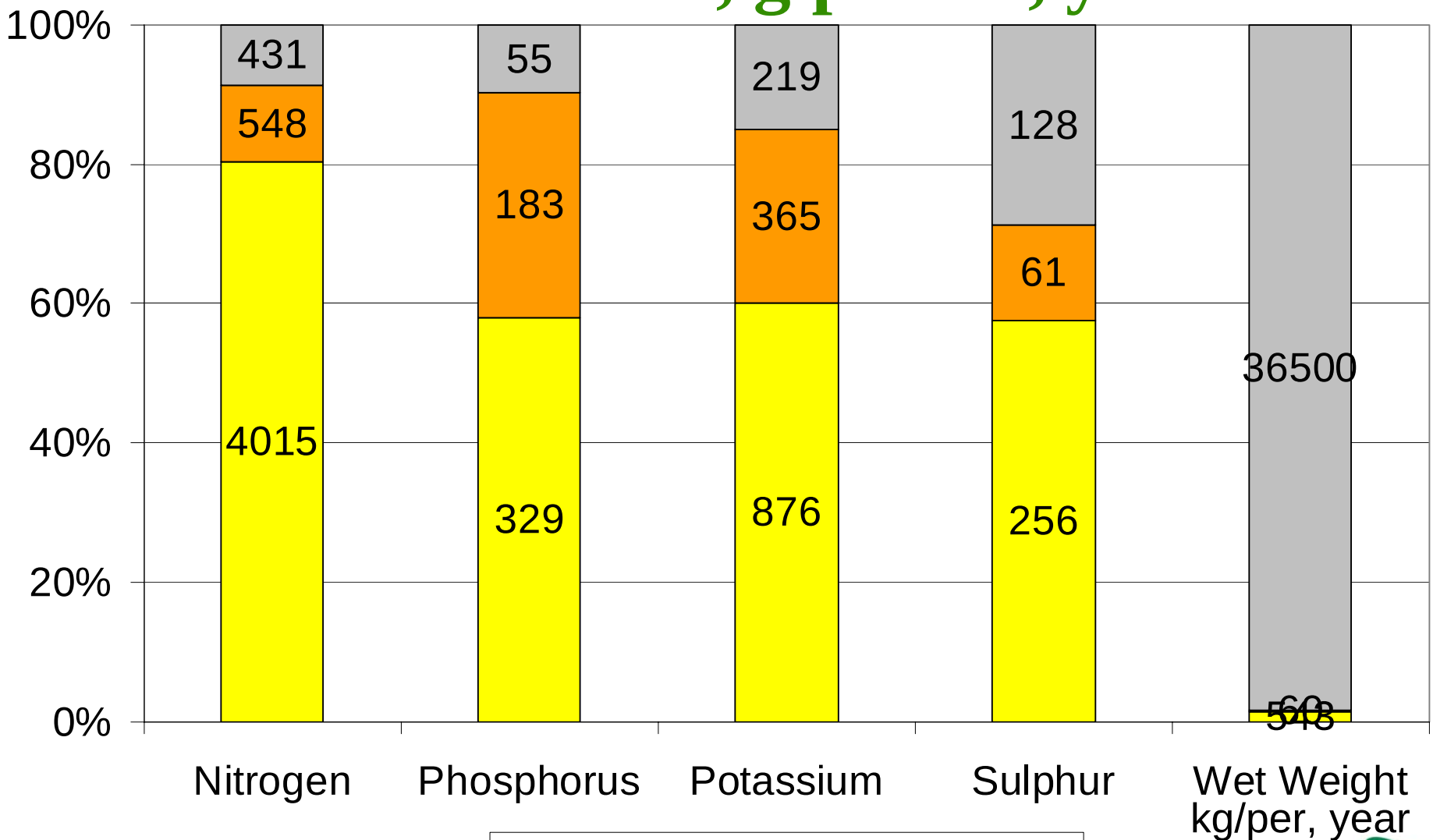


Photo Björn Vinnerås

Nutrient distribution in household wastewater, g/person, year



Toilets

Wost Man Ecology

Erdos, China
Photo Arno Rosmarin

Separett Villa 9000
Photo Håkan Jönsson

Cecar Anorve, Mexico
Photo Håkan Jönsson

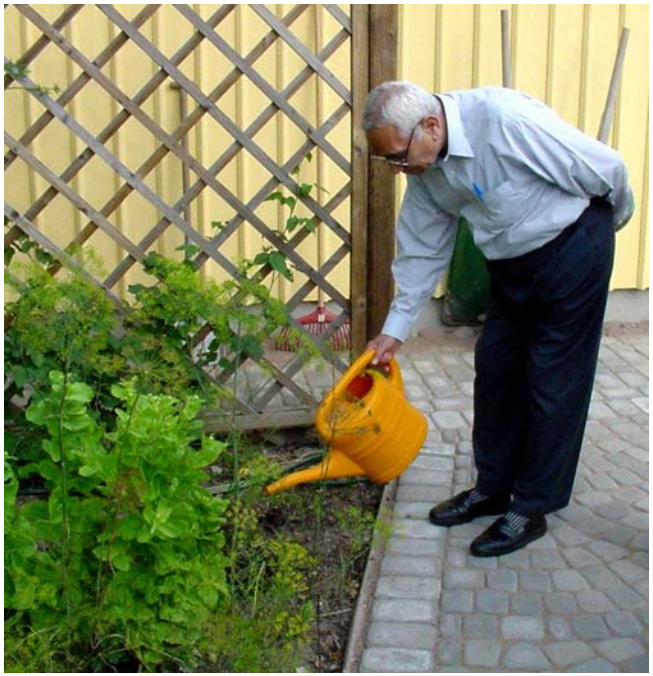
Gustavsberg
Photo Björn Vinnerås

Anfora UDD toilet, Mexico
Photo Håkan Jönsson

South Africa
Photo Håkan Jönsson

Urine collection and storage

Urine spreading



Relative yield of urine fertilized/no fertilized

Crop	Urine	Where/who
Spinach (Swiss Chard)	6.7	Zim (P. Morgan) Ethiopia (A. Sundin)
Covo	4.0	Zim (P. Morgan)
Lettuce	2.9	Zim (P. Morgan)
Onion	2-3	Zim (P. Morgan)
Maize	(≤35)	Zim (P. Morgan)
Leeks	3	Sweden (Båth)
Tomato	3.6	Zim (P. Morgan)

Photos: Peter Morgan

Photos: Håkan Jönsson

Faecal collection and composting





Photos: Håkan Jönsson

>50°C, >1 week

Photo: Charles Niwagaba

Ammonium treatment

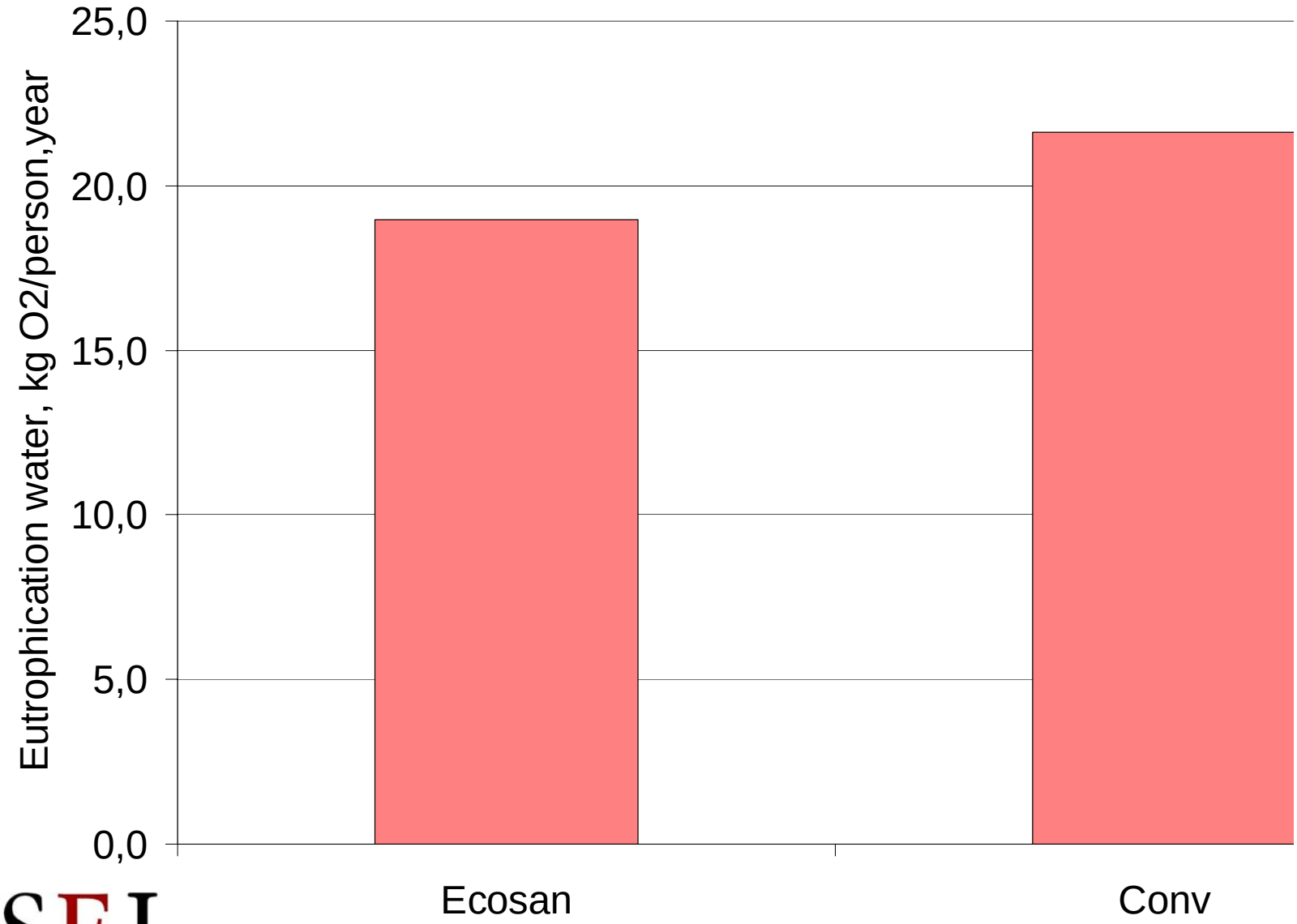
Temperature	Urea addition	Time for reduction of microorganisms corresponding to >6 $\log_{10}$ reduction in days			
		Bacteria		Parasites	Viruses
No ash amendment		*Salmonella*	*Enteococcus*	*A suum*	
14°C	2%	10	250	-	-
24°C	2%	2	70	120	200
34°C	2%	1	1	10	22
Ash amendment pH>11					
14°C	1%	-	-	-	-
24°C	1%	1	11	50	100
34°C	1%	1	1	10	2

Relative yield - faecal compost fertilized/no fertilized (P. Morgan)

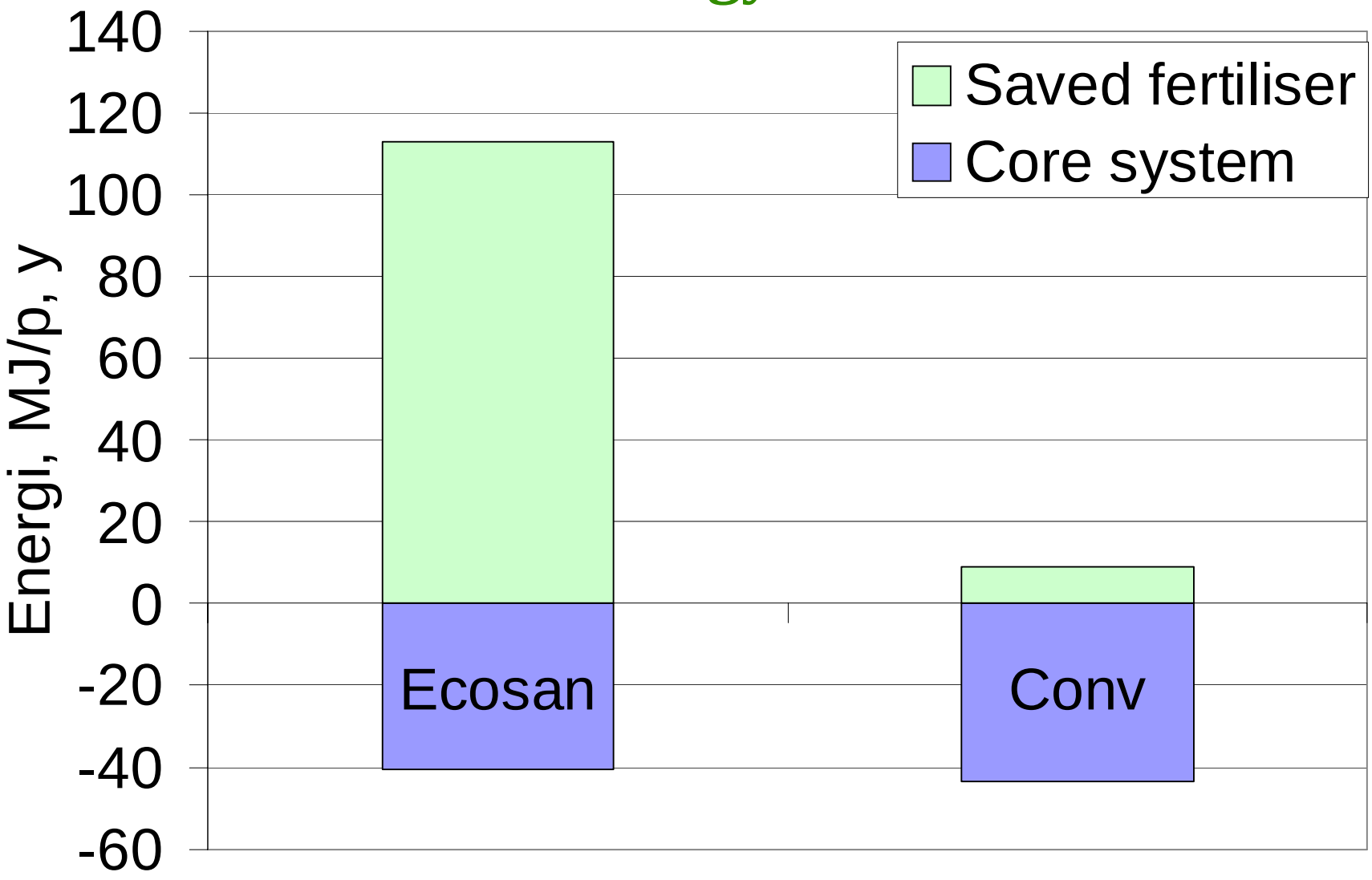
Plant, top soil type, growth period	Relative yield
Spinach on Epworth, 30 days.	7.6
Covo on Epworth, 30 days.	8.0
Covo 2. on Epworth, 30 days.	4.4
Lettuce on Epworth, 30 days	7.5
Onion on Ruwa, 4 months	2.8
Green pepper on Ruwa, 4 months	4.7
Tomato on Ruwa, 3 months	10.1

Experiments were done in pots, filled with 50% Fossa Alterna Compost (mix of urine, faeces & soil), and 50% poor soil, compared with 100% poor soil, see, Peter Morgan, 2003, Experiments using urine and humus…)

Eutrophication to water – max scenario



Energy balance



Conclusions

- Urine and faeces are good fertilizers
- Safe sanitization and makes them safe fertilizers, minimizing the risk of disease spreading
- Eutrophication is minimized and crops maximized by using urine and faeces as fertilizers
- Urine and faeces can be cheap fertilizers
- Enery is saved by using of urine and faeces as fertilizers.

Photos: Peter Morgan

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