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Institute for Integrated Management  
of Material Fluxes and of Resources



# Biological treatment systems

Dr. Tamara Avellán  
Head of Water Resources Management Unit  
UNU-FLORES

World Water Week 2017  
Science faces practice: risks and benefits of wastewater  
reuse

Sunday 27 August | 09.00-10.30 | Room: FH 202

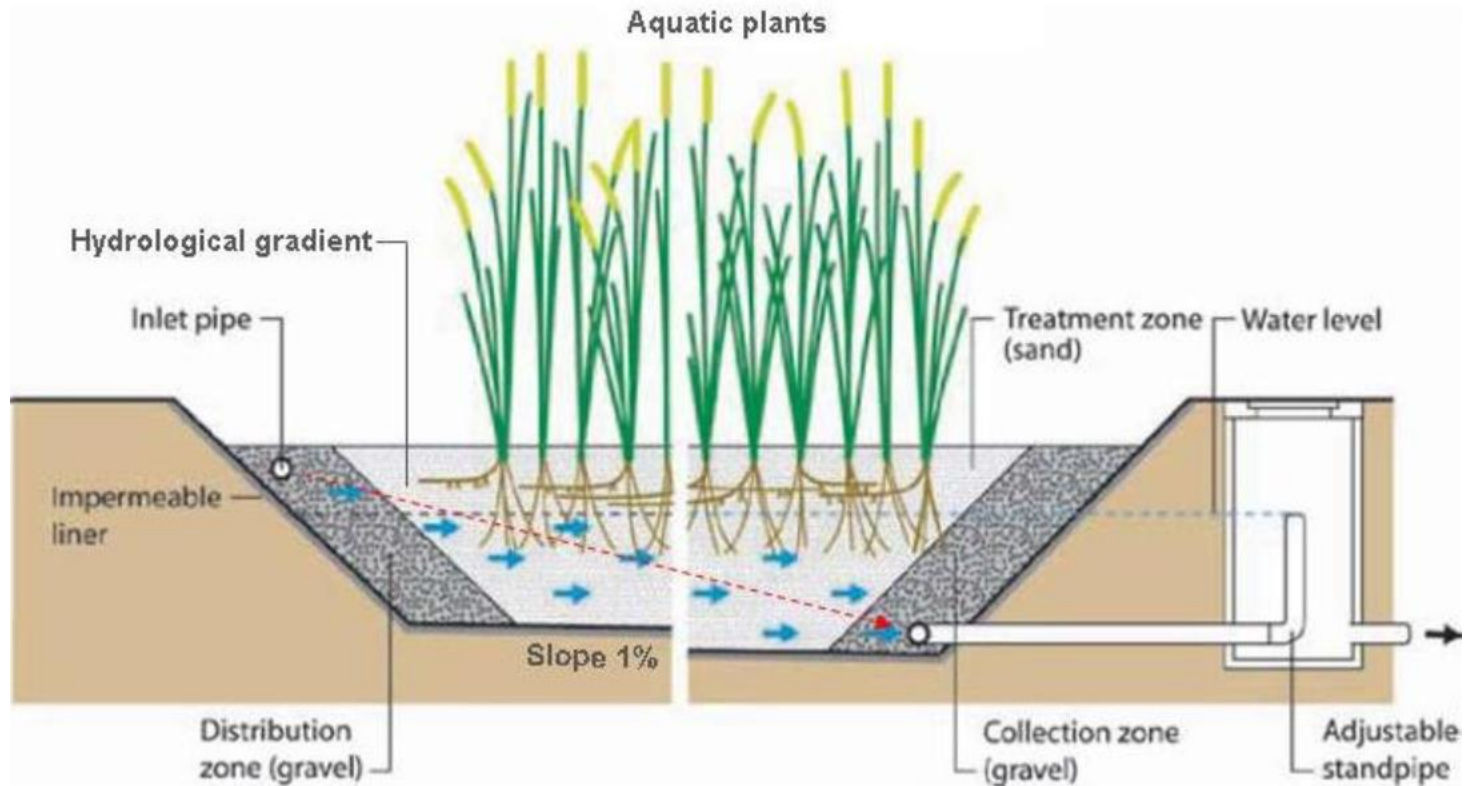


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# Wetlands treat wastewater





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# Wetlands provide energy



Biomass briquettes from *Cyperus papyrus*

## Heat Yield (MJ/kg)

<i>Cyperus papyrus</i>	18
Acacia firewood	19
Charcoal briquette	24
Anthracite coal	32

## Methane Yields (L<sub>N</sub>/kg)

<i>A. donax</i> (dried, untreated)	147 - 363
<i>A. donax</i> (pre-treated)	182 - 355
Corn	330 +/- 7
Sorghum	317 +/- 12
Rye	293 +/- 3
Triticale	340 +/- 5



<http://bio-gas-plant.blogspot.com/2011/05/biogas-gobar-gas-in-india.html>

Morrison, E.H.J., Banzaert, A., Upton, C., Pacini, N., Pokorný, J., and Harper, D.M. (2014). Biomass briquettes: a novel incentive for managing papyrus wetlands sustainably? *Wetl. Ecol. Manag.* 22, 129–141.

Corno, L., Pilu, R., Cantaluppi, E., and Adani, F. (2016). Giant cane (*Arundo donax* L.) for biogas production: The effect of two ensilage methods on biomass characteristics and biogas potential. *Biomass Bioenergy* 93, 131–136.

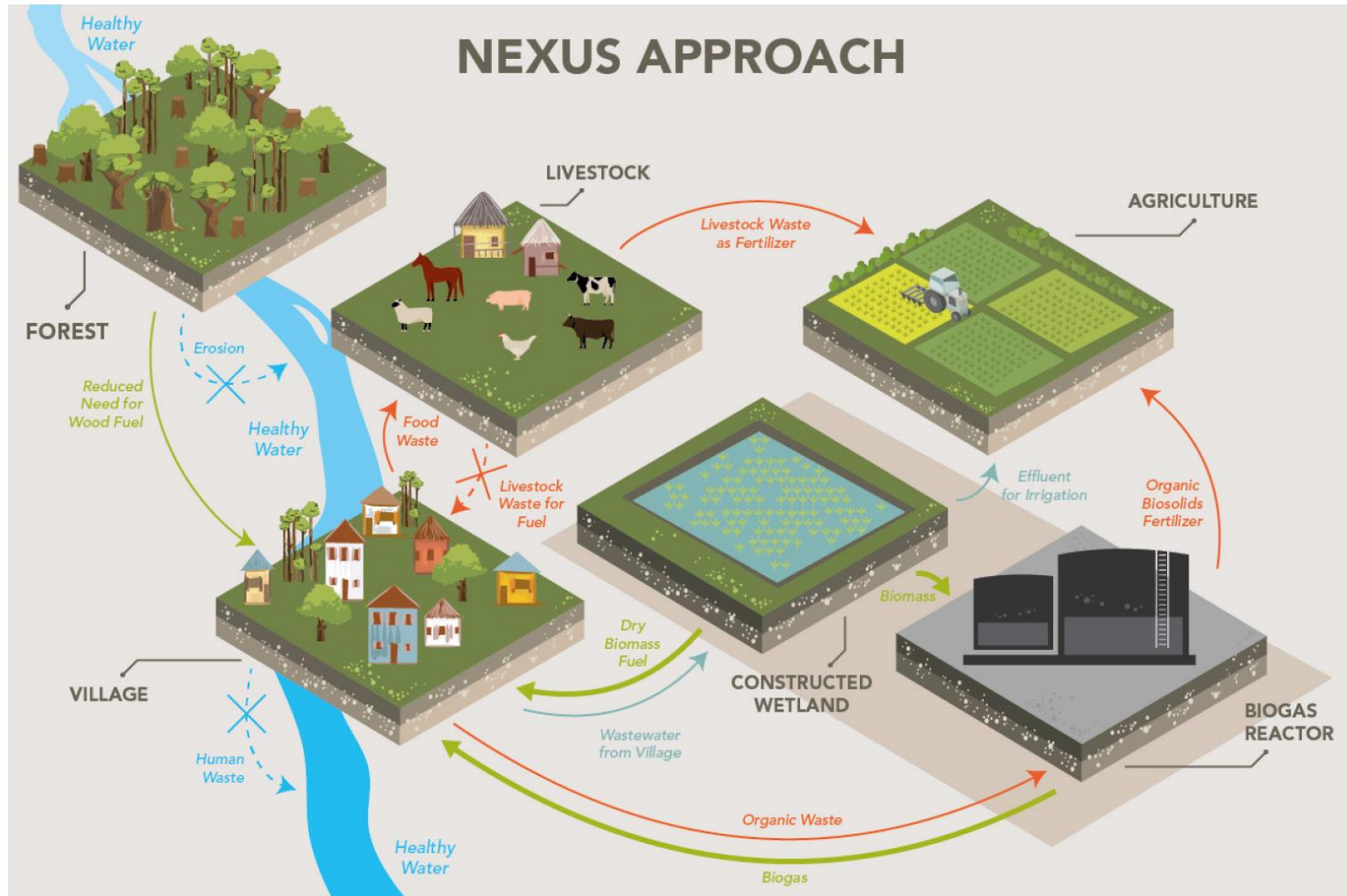


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# Wetlands can be multi-functional







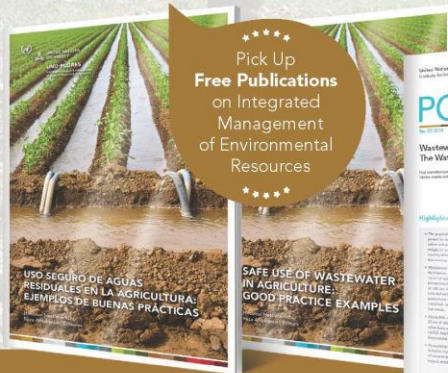
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## UNU-FLORES@ WORLD WATER WEEK

Exhibition Area, Booth 36



Pick Up  
**Free Publications**  
on Integrated  
Management  
of Environmental  
Resources



### MEET US



**Reza Ardakanian**  
Director



**Tamara Avellán**  
Head of Water Resource  
Management Unit



**Serena Caucci**  
Research Assistant in the  
Waste Management Unit



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Avellan, C. T., R. Ardakanian, and P. Gremillion. (2017). 'The Role of Constructed Wetlands for Biomass Production within the Water-Soil-Waste Nexus'. *Water Science and Technology*, February, wst2017106. doi:10.2166/wst.2017.106.

Gremillion, Paul and Avellán, Tamara (2016). *Wastewater as a Resource: The Water-Waste-Energy Nexus in Sub-Saharan Africa*. Policy Brief. UNU-FLORES.

**Thank you for your attention.**

**Danke für Ihre Aufmerksamkeit.**

Dr. C. Tamara Avellán

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Co-Conveners