

Title	Closing the nutrient cycle to improve food security	
Donor	BMZ ¹	
Period	Jan. 2015 – Dec. 2017	
Budget	Cambodia 600.000 € India 800.000 € Latin America 850.000 €	
Project Coord.	Alex Campbell (Cambodia) Tanvi Sahni (India) Pedro Kraemer (Latin America)	
Researchers	William Musazura (South Africa) Matti Hanisch (technical backstopping)	

Partners	BORDA HQ, CDD² India, ESC³ Cambodia, BORDA LA, UKZN⁴ South Africa
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Project description	<p>Project motivation: Much literature is available about agricultural re-use and recycling of wastewater and organic solid waste. However, conditions vary considerably and few studies assess projects on the ground. This often leads to concerns about producer and consumer safety, especially regarding food production. This research aims to improve the confidence in such practices by investigating and documenting the re-use and recycling of various types of human waste materials (e.g. waste water, faecal sludge, co-composted organic material) in different countries.</p> <p>The investigations: In cooperation with UKZN, BORDA investigates re-use aspects of human waste derived materials involved in agricultural food production under controlled field conditions at the Newlands Mashu field laboratory (Durban, South Africa). Additionally, similar re-use practices are assessed under field conditions and for different sanitation & agricultural systems in Cambodia, India and Latin America.</p> <p>Research under controlled conditions in South Africa: Material: Treated domestic wastewater Treatment: DEWATS (Settler, Anaerobic Baffled Reactor, Anaerobic Filter, constructed wetlands) Research Questions:</p> <ul style="list-style-type: none"> • Depending on effluent quality, how much water is needed to irrigate certain crops? • How much land is needed to completely utilize the effluent of the treatment plant without negative implications for the environment or the people living in the vicinity? • Which nutrients can be recovered by the plants/additional nutrients have to be supplied? • What are safe ways of propagation/risk reduction for potential operators and customers regarding farms irrigated with treated wastewater? • What are feasible or alternative cultivation systems, e. g. hydroponic systems etc.? <p>Research under practical conditions in the project countries: Material: Treated domestic wastewater, untreated wastewater, material from dry toilets, effluent of a faecal sludge treatment plant. Treatment: Various technologies depending on the type of reused material Research Topics:</p> <ul style="list-style-type: none"> • Risk reduction for farmers using human waste derived materials, and for end-users of agricultural products • Economic feasibility of systems utilizing human waste derived materials for food production • Re-use derived agricultural products and benefits for involved communities • Possible impacts of practices on the environment • Resilience of concerned agricultural systems to climatic and environmental influences
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Key words	Food security, re-use, human waste derived materials, DEWATS for food, nutrient cycle
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¹ BMZ - Federal Ministry of Economic Cooperation and Development, ² CDD - Consortium for DEWATS Dissemination, ³ ESC - Environmental Sanitation Cambodia, ⁴ UKZN - University of KwaZulu-Natal