RESEARCH PROGRAM ON Water, Land and Ecosystems

LED BY: IWMI International Water Management Institute

Growing fish in recycled water: *A sanitation solution?*

Background

Many wastewater treatment plants in developing countries are either dilapidated or not functioning properly. A key reason for this underperformance is the difficulty to secure even a relatively minimal budget for operation and maintenance from those managing the plants. As a result, it has become appropriate to effectively capture the economic value of treated wastewater by generating income that can be used to help finance the operation and maintenance of wastewater treatment facilities. The production of fish in treated wastewater is an example of such an income-generating activity.

The Kumasi example of treated wastewater-fed aquaculture

Chirapatre Estate in Kumasi (Ghana) has a population of about 1,800 inhabitants and the community is served by networks of sewer lines terminating in a community waste stabilization pond (WSP) system receiving residential wastewater for treatment. The WSP is one of the five separate small-scale sewerage treatment systems currently existing in Kumasi. Over the years, the maintenance of this facility has been a challenge for the Kumasi Metropolitan Assembly (KMA) due to inadequate funds, resulting in environmental pollution and causing inconvenience to the people of the Chirapatre suburb.

The Chirapatre wastewater treatment plant **before** the CapVal project (*photo:* Eric Nartey, IWMI).

Kumasi Metropolitan Assembly Working for a cleaner city

TRIMARK AQUACULTURE CENTRE

TREND TRAINING RESEARCH AND NETWORKING FOR DEVELOPMENT

RUAF Hivos people unlimited

JEKORA VENTURES Waste Management Professionals

World Agroforestry

Aqua for All

Kingdom of the Netherlands

Addressing the challenge using a business approach

The *Creating and capturing value: Supporting enterprises for urban liquid and solid wastes recycling for food, energy and clean environment* (CapVal) project facilitated a public-private partnership (PPP) between KMA and Trimark Aquaculture Centre, a private company led by a young entrepreneur, to ensure adequate operation and maintenance of the wastewater treatment plant, and to finance the process through the use of treated wastewater for aquaculture. This new business venture has three different revenue streams, which have been designed according to end-user (customer) preferences:

- Production and sales of fingerlings from brood stock cultured in treated wastewater. Thousands of fingerlings can be produced from a few catfish.
- Fingerlings produced from the brood stock could be cultured in tanks using locally available groundwater in concrete ponds. In this case, issues of customer perceptions about consuming fish reared in treated wastewater are avoided.
- Brood stock can also be sold directly to other farms.

The CapVal business venture has provided a source of revenue and has improved the financial and organizational sustainability of the Chirapatre wastewater treatment plant.

The win-win formula		
The public sector wins	**The private sector wins**	**Society benefits**
Savings on operation and maintenance expenses	Free infrastructure (capital expenditure) Free water and nutrients Revenue	Safe food, in particular proteins Improved health due to wastewater treatment achieved sustainably Improved livelihoods as jobs are created along the value chain
This sustains the operation and maintenance of the wastewater treatment plant		

The Chirapatre wastewater treatment plant **after** the CapVal project. The ponds for wastewater treatment (including solar-powered aerators to enhance biological treatment performance before being used in aquaculture (*photos*: Eric Nartey, IWMI).

Other variants of the business model, which are not implemented in this case, involve the use of treated wastewater for duckweed production to feed animals.

Achievement

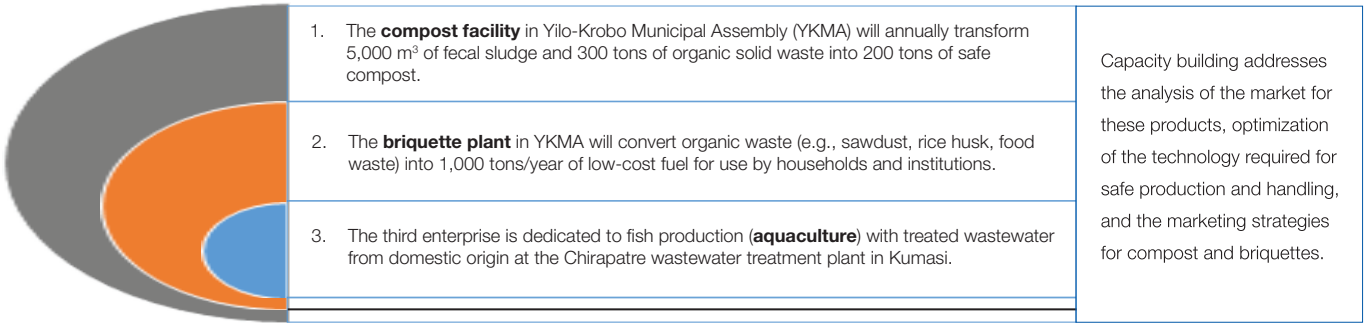
This aquaculture component of the CapVal project was adjudged the overall best innovative liquid waste management initiative in Metropolitan, Municipal and District Assemblies (MMDAs) in a 'Sanitation Challenge for Ghana (SC4GH)' on July 24, 2019. KMA won first place in the 'Metropolitan and Municipal Assembly Category' and received a cash prize of GBP 400,000 for scaling sanitation innovations. Trimark Aquaculture Centre won first place for the 'Private Partners' category and received a cash prize of USD 100,000.

The rearing of fingerlings in basins (*photos:* Mark Yeboah-Agyepong, Trimark Aquaculture Centre [left], Eric Nartey, IWMI [right]).

Catfish produced at the plant (*photo:* Mark Yeboah-Agyepong, Trimark Aquaculture Centre).

The CapVal project aims to increase **cost recovery** for better sanitation and waste management services, extend the lifetime of landfills, and reduce environmental impacts. The project will aim to achieve this through the creation of valuable products from waste, such as compost, fuel briquettes and wastewater-fed fish businesses (Figure 1).

Figure 1. The three interventions in the CapVal project to create valuable products from waste.



Project

- Title: Creating and capturing value: Supporting enterprises for urban liquid and solid wastes recycling for food, energy and clean environment (CapVal)
- Date of commencement: March 4, 2015
- Donors: Government of the Netherlands and project partners

CapVal project partners

Institution	Role
International Water Management Institute (IWMI)	• Project Lead • Overall technical guidance, agronomic trials and business modelling • Capacity building of partners and stakeholders
Jekora Ventures Ltd. (JVL)	• Operation and maintenance of the briquette and compost plants • Marketing of compost and briquette fuel
Trimark Aquaculture Centre	• Operation and maintenance of the aquaculture plant • Marketing of fish
Yilo-Krobo Municipal Assembly (YKMA)	• Monitoring of the briquette and compost plants • Facilitation of the business implementation • Land provision
Kumasi Metropolitan Assembly (KMA)	• Monitoring of the aquaculture plant • Facilitation of the business implementation • Land provision
World Agroforestry (ICRAF)	• Technical support on the briquette component
Training, Research and Networking for Development (TREND)	• Stakeholder engagement • Facilitation and management of PPPs
Hivos (previously the RUAF Foundation)	• Monitoring and evaluation • Stakeholder engagement

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