

Safe nutrients, water and energy recovery – developing a business case for safe recovery

GRANT RESULTS SHEET



©IFAD/Susan Beccio

The **overarching objective** was to increase the scale and viability of businesses that productively and safely reuse water, nutrients and energy from liquid and solid waste streams

Goal and objective

Recovering water, nutrients and energy from otherwise wasted resources is increasingly important especially in regions where resources are limited, competition for resources is high and fertilizer reserves (like phosphorus) are declining. However, to date, such efforts have often been limited in size or duration partly because waste is not viewed as a resource, and sanitation or waste management in general are considered a public service rather than a business.

To move beyond technical solutions, the overarching objective of this grant was to increase the scale and viability of businesses that productively and safely reuse water, nutrients and energy from liquid and solid waste streams to enhance food security and livelihoods.

The goal of this grant was to provide best business case options to producers and consumers to recover nutrients, water and energy from agricultural and domestic wastes for food security and food safety. The project sought to identify innovative market-driven and scalable approaches to enhance the sustainability of agricultural production considering environmental and health requirements of immediate users and end-consumers. The development challenges were to:

- identify and share pathways with relevant stakeholders to make business cases more replicable, scalable and sustainable;
- strengthen national, regional and local stakeholder platforms (from agricultural and/or sanitation sectors) by extending their interest in knowledge of safe reuse as a business;
- formulate initiatives from donors, government departments and/or the private sector in order to incorporate project results.

Beneficiaries

Three major groups were targeted as users of the results from this research: (a) public/private sector; (b) business schools; and (c) donors/investors. The research findings provided ground for follow-up investments by producing a catalogue of resource recovery and reuse (RRR) business models. The catalogue will guide the replication and scaling out of the business models by donors, governments and the private sector. The global assessment of RRR business cases and derived learning and models will be highly applicable for most developing countries in Africa and Asia.



Facts at a glance

Grant implementing agency

International Water Management Institute (IWMI)

Theme

Water management and environmental issues, innovation and policy dialogue

Benefiting countries

Africa: Botswana, Burkina Faso, Ghana, Kenya, Morocco, Rwanda, South Africa

Asia: Bangladesh, China, India, Philippines, Sri Lanka, Thailand, Viet Nam, Uganda

Latin America: Brazil, Mexico, Peru.

Total programme cost

US\$990,000

IFAD contribution: US\$650,000

IWMI cofinancing: US\$340,000

Fund leveraging

Around US\$6.5 million from WLE, SDC and EU-IFAD and funds from WB-IFC and municipalities

Partners

National academic institutions in respective countries; local consultants

Effectiveness and duration

4 years (including a 9-month no-cost extension), 2011-2015

Linkages to IFAD investment projects

- Ghana: Root and Tuber Improvement and Marketing Programme (RTIMP)
- Uganda: Vegetable Oil Development Project (VODP)

Main results

Given its pioneering status, the project can be considered a complete success. It achieved a range of results with high potential for outcomes and long-term impact, reflected in a significant number of demands to apply its methodology and products (i.e. feasibility studies for the replication of business models):

- Sixty business cases from 24 countries around the world (see table below) were analysed and conceptualized under 21 models. These main project results will be published by Earthscan (Taylor & Francis) and placed in the public domain for wide distribution.

Asia and the Pacific	Latin America	West and Central Africa	Europe	East and Southern Africa	Near East and North Africa
Bangladesh India Nepal Pakistan Philippines Sri Lanka Thailand	Bolivia Brazil Mexico Peru Venezuela	Burkina Faso Ghana	Spain Switzerland	Botswana Kenya Mauritius Rwanda Uganda	Iran Jordan Morocco

- Eighteen MSc and three PhD students are graduating, or have graduated, based on studies linked to the project.
- The project catalysed follow-up grants and donor interest from the Swiss Agency for Development Cooperation (SDC) and the European Union (EU), worth over US\$2.8 million, while other donors, such as the Water and Sanitation Program of the World Bank (WB-WSP), started testing the local feasibility of the models.
- Sufficient awareness was raised on the issue of resource recovery and reuse, so that recovering and reusing resources (<https://wle.cgiar.org/RRR>) is now one of the eight flagship issues of the Consortium of International Agricultural Research Center's (CGIAR) research programme on Water, Land and Ecosystems (WLE).
- In India and Nepal, WSP and the United States International Development Cooperation Agency (USAID) are interested in further feasibility studies, with the first study already under way.
- In Kampala (Uganda), work on RRR business models and the testing of their feasibility in the local context has generated significant interest among donors, and private and public entities.
- In Lima (Peru), research results from the project will be incorporated into the city master plan on urban development. There is a foreseeable great potential for new investments in RRR initiatives both by public and private entities.
- The Sri Lankan Government signed a memorandum of understanding (MoU) with IWMI to pilot a waste-to-fertilizer facility in Kurunegala.
- Stakeholder platforms were organized in eight countries.
- Cambridge Judge Business School signed an MoU with IWMI to integrate the business models into business school curricula for online courses and summer schools, with the financial support of the German Federal Ministry for Economic Cooperation and Development (BMZ).

Lessons learned

- The analysis of empirical RRR business cases and development of business models was a pioneering task and did not come with a well-established base of literature that is usual for so many other researchable subjects. Thus, the development of a framework to guide the research was required: considering the little knowledge available on this subject, a

continuously adaptive and iterative process to the methods was adopted, which required more time than usual. It is thus important to plan for a time buffer to cope with unexpected delays, especially with primary data-based research.

- A key constraint to analysing and developing RRR business models was related to data accessibility. Many cases came from the informal and private sectors, where data did not exist. In the case of larger-scale businesses, issues related to intellectual property limited access to data and oftentimes required non-disclosure agreement. To improve accessibility to data, it is important to:
 - establish relationships with relevant entities to build trust via dialogues (e.g. entrepreneur summits for key relevant stakeholders such as financial institutions, regulators, policymakers);
 - create incentives particularly for private sector entities, for example, through exposure to donors by means of features in business case/model catalogues; access to information on in-depth feasibility studies in different geographic settings for business expansion.
- With cases distributed over nearly 24 countries, the administrative (contractual) work and travel duration to stakeholder meetings were more time-intensive than anticipated. The use of national partners was instrumental for the successful progress of research activities, in particular for data collection, and to establish relationships and communicate with local institutions and key stakeholders.
- While a gender perspective was an important component to assess in this project, a key challenge was to capture it given the limited access to or existence of disaggregated data. Additional avenues for consideration of gender dimensions were explored in a follow-up project on assessing the RRR investment climate.

Estimated benefits from implementing safe business models in Peru and Uganda

The research project has resulted in the commitment of international funding to implement safe RRR business models in Kampala and Lima, and roll-out related sanitation safety plans.

In Uganda, SDC in collaboration with the German Agency for International Cooperation (GIZ) is undertaking an initiative to implement human waste-based businesses to produce fertilizer in Kampala. The initiative, currently in its initial stages, is expected to benefit 15,000 farmers in peri-urban and rural Kampala, by increasing their access to alternative agricultural fertilizer inputs. Additionally, annual net benefits are expected from employment generation (estimated at US\$688,000), averted health costs thanks to waste treatment (estimated at US\$7.5 million), and net greenhouse gas (GHG) emission savings (estimated at US\$2.8 million).

In Peru, another initiative to implement a wastewater reuse business model is underway in Lima. The reuse components to be considered are still under discussion. In the case where water reuse, energy and nutrient recovery are considered to complement the wastewater treatment plants in Lima – a city that generates 0.61 million m³ of wastewater every day – net environmental benefits can be estimated for: reduced surface water pollution (US\$1.6 million); reduced GHG emissions (US\$47.3 million); and improved soil health (US\$1.2 million).

Way forward

The project proved to be a good investment with returns exceeding its value several times over within the project lifespan. The main innovation was to add a business dimension to natural resource management and to the waste sector (including sanitation), which normally fully depend on public subsidies. The resulting analysis of business options and models, which either increase cost recovery or generate profit, has garnered keen interest from a myriad of stakeholders (e.g. donors, sanitation service providers, entrepreneurs) for more feasibility studies and the actual implementation of RRR. The project catalysed a new thinking about opportunities to recover resources that were otherwise lost (water, nutrients, energy) and to direct them to more sustainable crop production and systems that were more resilient to soil nutrient depletion and climate change.

Develop more business models

- IWMI is currently working with a research/policy/investment broker to further boost the **impact pathway** (<https://waterandfood.org/our-approach-2/>) of the RRR programme.

The project catalysed follow-up grants and donor interest from SDC and the European Union, worth over US\$2.8 million



Investing in rural people

IFAD contact

Audrey Nepveu

Technical Specialist, Water and Rural Infrastructure
Email: a.nepveu@ifad.org or water@ifad.org

Regional division contacts

Ulac Demirag

Email: u.demirag@ifad.org;

Alessandro Marini

Email: a.marini@ifad.org



Partner contacts

Pay Drechsel

Project Coordinator
Email: p.drechsel@cgiar.org

Miriam Otoo

Economics Researcher
Email: m.otoo@cgiar.org

For feedback and queries:
Email: ptakmmailbox@ifad.org

- WLE has taken up the issue under its Recovering and Reusing Resources (<https://wle.cgiar.org/RRR>) flagship, channelling approximately US\$3.6 million annually to develop additional knowledge on the topic.
- Additional studies are needed on the investment climate for green businesses, including RRR. These studies should be accompanied with guidelines for investors to access innovative funding mechanisms.

Implement what is now known

- The business models developed can now start to be implemented, and the significant interest from the diverse stakeholders indicates great potential for scaling up. Several of the models are currently being tested for implementation, including in IFAD's future investment in Benin.
- Adequate monitoring of and learning from implementation experiences will contribute to better understanding on how to support the development of more of these businesses.

Leverage uptake of these research results

- A key activity will be to present research results in training materials for various business schools. This will further mainstream the implementation of successful business models for reuse together with private investors and entrepreneurs, urban and peri-urban farmer associations, agriculture and health departments, and municipalities in various developing countries.
- Organizing regional marketplaces would create opportunities to link entrepreneurs and investors.
- At the global level, a decision support system would facilitate the undertaking of feasibility studies for RRR business models as these are based on modelling capacity for different demand/supply scenarios.

Knowledge generated

Significant efforts were made to support the exchange of results with relevant stakeholders to increase the project's visibility, multiply advocacy opportunities and increase influence. Knowledge-sharing included:

- City workshops held in different countries: Bangladesh (Dhaka), Ghana (Kumasi), India (Bangalore), Peru (Lima), Uganda (Kampala) and Viet Nam (Hanoi)
- International platforms such as the Stockholm World Water Week allowed greater outreach and a link to the World Business Council for Sustainable Development
- Production of free, international, public goods (publications, methodologies and databases) to facilitate knowledge-sharing
- An MoU with Cambridge Judge Business School to collaborate on the integration of the business models into business school curricula for online and executive courses.

The knowledge shared has contributed to achieving the project goal and objective in a number of ways.

- The first catalogue of RRR business models illustrated through a variety of existing business cases (60 cases from Africa, Asia and Latin America) for resource recovery and reuse can guide the set-up and out-scaling of projects and enterprises by donors, governments and the private sector.
- Methodological guidelines were developed to assess RRR cases and develop RRR business models for implementation. They provide a solid foundation for other research teams on testing the feasibility of replicating and scaling up the conceptual business models developed.
- The assessment and recommendation of alternative regulatory approaches, instruments and institutions will serve to promote entrepreneurship in the RRR sector. The assessment consists of detailed feasibility study reports on technical, market and financial feasibility, potential health and environmental impact assessments, and institutional and regulatory environment as related to the RRR sector for four project cities supported by SDC co-funding. These additional studies served to share information with other sectors and partners that are needed to up scale the results.