December 2015

Innovations in safe use of waste for urban and peri-urban agriculture

Integrated School WASH in Surkhet, Nepal

Key lessons

Recognition is increasing for the value of municipal wastes: farmers are willing to use and pay for organic fertilisers such as urine, compost and co-compost. Local champions are paramount in the development of innovations – especially where, as in Nepalese culture, there is a social taboo on productive reuse.

Schools are good platforms for information dissemination, awareness-raising and capacity building. Most appropriate in Nepal (in Surkhet) are the agriculture /JTA (Junior Technician in Agriculture) schools, with simultaneous outreach to the surrounding communities and local authorities.

The integrated WASH systems at the selected Surkhet District schools have been successful in testing, awareness-raising and dissemination of an integrated WASH system at the institutional level.

The results obtained are used as a basis for further upscaling and commercialisation of the integrated WASH (and WASH school) systems. The integrated WASH concept and curriculum developed is widely promoted to other schools. The students, as WASH champions, will promote the concept at the community level.

FIETS monitoring reveals the important role of both multi-actor involvement and participatory piloting of innovations in creating change for financial and institutional sustainability.

Introduction

'Safe and productive use of solid and liquid waste' implies using rainwater or wastewater (treated or untreated) and organic waste (including human/animal excreta) in small-scale urban and peri-urban agricultural production, as part of resilient urban development. Within the framework of the WASH Alliance International (WAI), the RUAF Foundation, worked on this theme with local partners in five countries: Ghana, Nepal, Kenya, Ethiopia, and Bangladesh. The objectives were to:

1. put this theme on the policy agenda and to raise awareness among key stakeholders;
2. support innovations, demand creation and business thinking along the sanitation – agriculture value chain, and
3. support farmers and their organisations, in business development and in giving them a voice and place in city multi-stakeholder platforms.

RUAF and ENPHO worked in the Surkhet District – notably in Birendranagar Municipality, Subha Ghat Municipality and Kunathari VDC (Village Development Committee). With support from RUAF and WASTE, ENPHO has been promoting and developing innovations related to the safe and productive use in agriculture of WASH end products – such as faecal sludge, urine, organic material and waste water – while supporting the planning of the Birendranagar Municipality. One component of the promotion of safe and productive use of wastes has been the work of ENPHO, in collaboration with WAI Partners WASTE and RAIN, in developing, testing and promoting integrated WASH at schools. This involves rehabilitation of sanitation to include EcoSan (urine diversion), composting and gardening, as well as rainwater harvesting and biogas.

Schools, attended by people with young minds, are important entry points for innovations. Concepts or innovations introduced in schools gain wide coverage, as new insights and information are disseminated by students in their families and communities. Working in schools is effective because the learning environment is more open to innovation, with room for new information and experimentation. The project targeted students enrolled in the Junior Technician in Agriculture (JTA) course of Janajyoti School. The large inflow of visitors and guests from the governmental sector and political bodies, academicians, social workers, etc. at this school makes information dissemination through the demonstration sites more vibrant. This put the school in a good position to lobby for more resource generation and information sharing.

Integrated school WASH

Surkhet District covers an area of about 250,000 ha. The total population of its 40 VDCs and 3 municipalities exceeds 350,800 (44,000 households). Birendranagar Municipality is the regional headquarter of the Mid-Western Region; since the 2014 amalgamation of 3 other VDCs in the municipality, it is part of the greater Surkhet Valley Municipality, with a total population of 150,000.

Key challenges regarding safe and productive use of wastes for UPA are:

- lack of awareness and information on potential and available technologies at the community level in rural and urban areas;
- negative perceptions still held by many in the major cities of Nepal regarding the use of waste (especially human waste) for productive purposes, and the accompanying view that dealing with waste belongs to the role of the municipality or private waste collectors;
- lack of adequate technical capacity and service provision; and
- no real market as of yet, even though business opportunities are being identified, and no social entrepreneurs, though the latter can play an important role.

ENPHO and RUAF collaborated with schools in awareness-raising and further upscaling efforts. Since 2003, ENPHO has been testing and promoting urine application; with local farmers of Siddhipur, it has been testing EcoSan design and urine application. The innovation also includes additional composting with human urine and organics. A urine bank has been established in Darechowk, Chitwan by Mr Shreerendra Pokharel, headmaster of Majhgaun Lower Secondary School. In addition, he convinced the community to embark on a sanitation programme stewarded by the school, and adopting EcoSan. The financial side of urine bank Urine bank transactions are reflected in its tagline: “Take a pee, Make a rupee”.

In efforts to promote the safe and productive use of wastes, ENPHO has been working on integrated WASH at schools. Among the numerous ways schools can promote these innovations are demonstration, information dissemination, capacity building, policy lobbying and academic recognition. The JTA schools Janajyoti Higher Secondary School (HSS), Nepal Rastriya HSS and Shiva HSS have been selected for these efforts.

In 2012, ENPHO started with Shree Janajyoti HSS in Baddichaur, Kunathari VDC. Though the school is some distance from Birendranagar, it has many students who will go on to be professionally involved in agricultural extension and education. The school was established in 1973 at Baddichaur, ward no. 4 of Kunathari VDC, Surkhet District. The school has more than 960 secondary students, 81 in higher secondary and 43 in the JTA course, and 34 teachers.

The activities included rehabilitation of sanitation to include EcoSan (urine diversion), composting and gardening, as well as rainwater harvesting and biogas. By working with students, local communities and visitors, the project has helped to disseminate the information at various levels.

“If there is a good working relationship amongst the School Management Committee and the teachers, the school will achieve progress in the sector of innovative education and knowledge transfer.” *Narayan Sigdel; Principle, Janajyoti School, Baddichaur.*

For 15 years, Narayan Sigdel has been the principal of the Shree Janajyoti Higher Secondary School. His efforts as champion of the project have led to the development of various components, including the integrated WASH project, the research on application of compost and urine (from the improved EcoSan toilets), and the development of the curriculum. Students of a 15-month Junior Technicians in Agriculture (JTA) course, many of whom will become Agricultural Extension Facilitators, have been conducting research on various types of vegetables including chilli and brinjal (eggplant). In addition to the research activity, the school has been spreading the innovative concept among local farmers and visitors. Now, the school is also attracting the attention of other schools, and it has received about 30 million rupees (about 262,000 euros) in support from various sources. These funds will be used to further develop the school’s infrastructure and teaching. Sigdel is convinced that the current investment in research and infrastructure will yield returns in the form of trained human resources for the school and also the people of the Village Development Committee (VDC). This success story is currently being replicated in two other schools in Surkhet, and one in the municipality area.

Components and systems installed

Rainwater harvesting, including a Biosand filter


The new toilet facility has separate blocks for boys and girls.

Rainwater is collected from its rooftop and stored for drinking and other purposes. The stored rainwater is treated using a biosand filter system for drinking water for all students and teachers.
The system consists of a rooftop catchment of 42 square metres and a collection tank of 5,000 litres. The harvesting potential is 11,025 litres annually (425 litres in July 2015). The biosand filter system consists of 3 installed units, with a filtration capacity of 75 litres per hour. The storage tank has a capacity of 500 litres, which is used for multiple activities: toilet flushing, handwashing and gardening.

Toilet with urine diversion and collection

The upgraded toilet facility has 3 squat pans and 8 urinals. The collection of urine by the school is conducted through the diversion from the urinal. Urine is separated, collected and stored in a 500 litre tank. Due to the nature of the school calendar (many holidays each year), the urine produced is just sufficient for application testing.

Composting

The compost system has two different beds into which 1.5 kg of earthworms were initially introduced. Two batches of compost from paper and other organics have been produced to date for use in the gardens.

School gardens

The urine from urinals in both blocks is initially collected in a 500 litre tank and then stored in another, 1,000, litre tank for use in the school gardens. With the support of the project, the students of Janajyoti School worked with the school to do agricultural research on plant health and productivity. Various agricultural techniques and inputs were tested, including farming practices (farmers from surrounding communities were involved). They tested treatments with urine only, with urine and organic manure, and with chemical fertiliser on cabbage and potato, onion, brinjal, tomato, chilli and pea. The testing also included Integrated Pest Management (IPM). The results were positive and well accepted. Periodic monitoring was done by the teachers and the project.

Additionally, the project supports the school in developing its curriculum to include safe and productive use of wastes for agriculture (this curriculum is available at the ENPHO website).

Results

The innovations have made the Janajyoti School a centre of attention in the region, with frequent visits by political leaders and authorities. The school has also received material and assets, including land, from other stakeholders. After successful implementation at the Janajyoti School in Baddichaur, similar activities were started closer to and in Birendranagar, with two other schools: the Shiva Higher Secondary School (Latikoili) and Nepal Rastiya Higher Secondary School (Badakholi VDC).

Because the schools have a high influx of individuals from different levels (parents, local community, and local policy makers), the rate of information-sharing is high. In addition, the teachers and the students also conduct capacity-building activities at the surrounding community level. The activities include training and orientations, video screening, visits, etc.

One of the aims of working with the schools was to further institutionalise the productive reuse concept in the school and academia. A first step is the integration of productive use of urine in the school curriculum. The current curriculum has five major topics: introduction to agriculture, urbanisation and waste management; human waste: urine and compost; urine application in agriculture and guidelines; EcoSan; Business Development. ENPHO is in discussion with the Council for Technical Education and Vocational Training (CTEVT), the local curriculum board and the schools to introduce the course as a non-credited course in agricultural schools.

In addition, all the schools have been supported to start an operation and management fund that first focuses only on the school, with income from the sale of the products and co-funding by the school. In later stages it includes improving access to finance for surrounding farmers.

Project results:

- *Increased access to toilets for both boys and girls, including a separate urinal block with provision of water for handwashing;*
- *Rainwater harvested and used in gardens or for recharge;*
- *A working biosand filter for safe drinking water;*
- *Urine captured and stored, and used on the school gardens;*
- *Urine application tested for various crops in two cycles (report available);*
- *Composting conducted on the school premises with locally available organics and cow dung;*
- *Wastewater collected and used for groundwater recharging through a soakpit;*
- *Interest by other schools and replication of the concept at Shiva HSS and Nepal Rastriya HSS;*
- *Interest and also use of urine by community farmers;*
- *Training material and curriculum developed;*
- *Awareness raised among various visitors, including Government Officials and Municipal Water, Sanitation and Hygiene Coordination Committee (MWASHCC) members;*
- *An initiative started, with the 'innovation sustainability fund', to support entrepreneurs (students and local community).*

FIETS

Sustainability monitoring on safe and productive use of waste for agriculture was done with the adapted FIETS PME framework, developed by RUAF and partners (see separate fact sheet, www.ruaf.org). FIETS stands for Financial, Institutional, Environmental, Technical and Social Sustainability. The monitoring showed that, initially, the key actors involved perceived more impact on the social and environmental aspects. The technological sustainability was prominent, yet this gradually changed to other types of sustainability. At the end of the project, improvement was also seen in institutional and even financial sustainability.

Key issues were:
F: Ownership of the innovation and development of the operation and management fund by the school
I: Promotion of integrated WASH in relevant forums, and system replication in other schools
E: Use of organic and human waste, decreasing the emphasis on chemical fertilisers
T: Technology demonstration and technical knowledge generation
S: Increased information exchange amongst school students, Management Committee and community members.

Replacing chemical fertilisers with urine and compost and creating social sustainability in the community are key factors of these EcoSan interventions. With the inclusion of private sector actors (service providers and entrepreneurs) and a local microfinance institution, the financial sustainability increased. Business planning is integral component of the stimulated innovations.

Upscaling and outreach

The main outreach agents are the students taking the course, both in their own community and the community around the school. As the students will be extension agents in future, exposure to recycling and reuse will allow them to apply and disseminate this knowledge.

Further acceleration will be sought: on the one hand, in linking to commercial farming supported by trained JTA students, and on the other by developing an operation and management fund managed by the JTA school (a guarantee fund or linking with local MFIs). The fund includes the income from sales of the products from research plots, and also donations from the schools. The initial amount in the fund at each school is NPR 10,000. The fund is mobilised as a revolving fund and used by the school for investment in interested students. The fund will then be made available to those students who want to start as entrepreneurs, applying the urine application concept and productive reuse knowledge gained through the school. This includes technologies like EcoSan and biogas. After utilisation of the funds, students are expected to use the products and enhance their livelihood / income, thus being able to pay back the loan with nominal interest.

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This innovation brief is produced by ENPHO (Environment and Public Health Organisation) www.enpho.org and the RUAF Foundation (International Network of Resource Centres on Urban Agriculture and Food Security) www.ruaf.org, with support from WASTE (www.waste.nl) and as members of the WASH Alliance International (www.washalliance.nl), with funding from the Dutch Government.

WASH Alliance International is a multinational consortium of over 100 partners worldwide, working together with local NGOs, governments and businesses to make sure everyone on this planet has sustainable access to water and sanitation. The Nepal WASH Alliance (NWA) is a consortium of Nepali NGOs that collaborate with WAI. As a member of NWA, ENPHO implements the project "Safe and Productive Reuse of Waste for UPA" in Surkhet District in close coordination with local stakeholders and local government entities, and supported by the RUAF Foundation. The project on school sanitation was also supported by WASTE (www.waste.nl) and RAIN (www.rainfoundation.org).

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This innovation brief is part of a series of briefs on UPA, and is available on the RUAF, WASH and partner websites. The RUAF Foundation is a global network with member organisations in Africa, Asia, the Middle East, Latin America and Europe, together constituting a leading centre of expertise in the field of Urban and Peri-Urban Agriculture and City Region Food Strategies. RUAF seeks to contribute to the development of sustainable cities and feeding an urbanising world by facilitating awareness-raising, knowledge generation and dissemination, capacity development, policy influencing and design, and action planning regarding urban agriculture and resilient and equitable city-region food systems. RUAF facilitates the integration of agriculture and food systems in the policies and action programmes of city actors, with active involvement of all food chain actors.