Case study of sustainable sanitation projects

Rural community and school UDD toilets in Misamis Oriental, Libertad, Initao and Manticao, Philippines

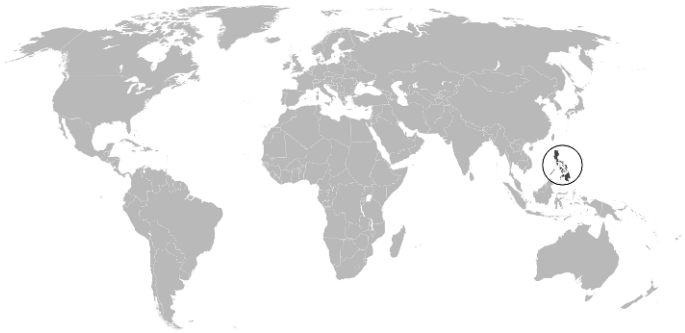

Fig. 1: Project location

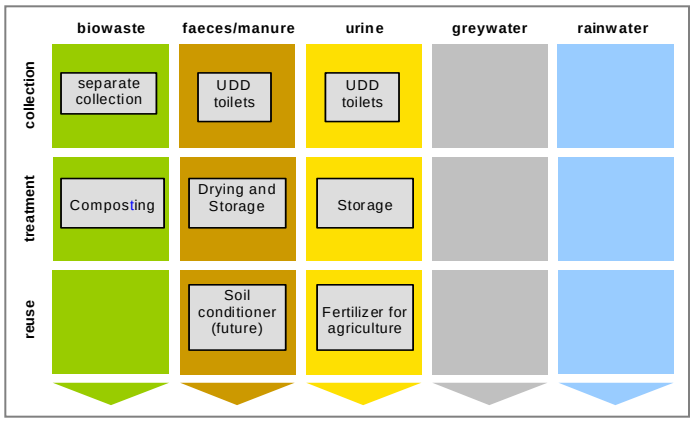

Fig. 2: Applied sanitation components in this project

1 General data

Type of project:

Rural community and school toilets (pilot scale)

Project period:

Start of planning: February 2006
Start of construction: March 2007
Start of operation: August 2007
Monitoring and support period: March 2007 to present (and ongoing)

Project scale:

23 community ecosan UDD toilets at "barrio centres" and at primary schools (at 14 different locations), frequented by an estimated total of 1,000 people

Address of project location:

Municipalities of Libertad, Initao and Manticao in the province Misamis Oriental, Philippines

Planning institution:

Water, Agroforestry, Nutrition and Development Foundation, Inc. (WAND)

Executing institution:

Same as planning institution

Supporting agency:

German Federal Ministry of Economic Cooperation and Development (BMZ) through the German Doctors for Developing Countries

2 Objectives and motivation of the project

The main objective of the project is to improve the lives of low-income, marginalized farmers through the improvement of sanitation, promotion of sustainable farm-based livelihoods, and mobilization of the communities so that they live dignified lives with full participation in the democratic society.

These improvements will come about by – amongst other initiatives - installing community toilets[1] where local people can get organic fertilizer for their seedling nurseries and plants (a community toilet is a toilet building where local people share its use and upkeep). Furthermore, toilets were also built at local primary schools.

Fig. 3: Ecosan UDD toilet (painted concrete pedestal) at Libertad Municipality (photo: E. Sayre, March 2008)

3 Location and conditions

Misamis Oriental is a province in the Philippines located in a region called Northern Mindanao, about 1 hour and 20 minutes flight from Manila[2]. Its capital and provincial center is Cagayan

[1] In this document, „community toilets" are understood to be the same as „public toilets".

[2] The Philippines is divided into three island groups: Luzon, Visayas, and Mindanao. These are divided into 17 regions, 81 provinces, 136 cities, 1,494 municipalities, and 41,995 barangays or barrios (www.wikipedia.org).

de Oro City. Misamis Oriental is composed of 24 municipalities, most of which are located along the coastline. The province has different types of industries such as agriculture, forestry, food processing, metal, mineral, and chemical industries.

The ecosan projects are established in the municipalities of Libertad, Initao and Manticao which are located 40 kilometers west of Cagayan de Oro. In these municipalities, 95% of the population consists of farmers. The average household size is quite large (7 members).

Most families are small-scale farmers with an average of less than 1.5 hectares per family. About 12% of the rural population consists of land owners. The main staple crop is corn and the perennial crop is coconut. Other crops grown are banana, tobacco and vegetables. The average income per family is € 60 per month.

Most families have poor sanitary conditions and lack proper toilet facilities. 42% of the residents have no toilets but defecate in open fields or in creeks and rivers (the other 58% of the population use either open pit latrines or flush toilets).

This results in a high prevalence of parasites, worms, and transmission of communicable diseases within the local residents. It is estimated that up to 60% of the children are infected by intestinal parasites.

In rural areas of the Philippines, the under-five mortality rate[3] is currently approx. 35 children per 1000 (http://www.childinfo.org/mortality.html).

Fig. 4: Two double-vault ecosan UDD toilets in Sinalac Elementary School in Initao Municipality – one for boys, one for girls. The school has 230 pupils; it also has 2 conventional toilets, being pour-flush with pit (photo: E. Sayre, Feb. 2008).

4 Project history

The Water, Agroforestry, Nutrition and Development Foundation (WAND) is a local NGO with its main office in Lubluban, Libertad, Misamis Oriental. WAND started as a localised initiative implemented in 2003 in 2 barrios in Mindanao. The German NGO "German Doctors for Developing Countries" is WAND's long-term partner supporting its agro-forestry and small scale agriculture initiatives since 2004. The introduction of ecosan is an offshoot in WAND's search for cheap and readily available fertilizer for local farmers.

The German Doctors for Developing Countries received funding from the German Federal Ministry of Economic Cooperation and Development (BMZ) via Referat 112 (chapter 2302, title 687 06) – this is a pot of money for private implementing organisations („private Träger"). The reference number for the entire project is 112 – T 7360 – PHL 43. The total budget for this project, which is carried out by two implementing organisations is € 584,480; the BMZ part is € 438,360. The project period is from 2006 to 2009. See also www.bengo.de for further information on the application procedure.

Technical knowledge about ecosan was acquired from the Periurban Vegetable Project of Xavier University College of Agriculture (see Section 6). Participation in ecosan training sessions enhanced further the knowledge of the users, i.e. the members of the local communities, on the ecosan concept.

The construction of the **23 UDD toilets** began in March 2007 and was completed by August 2007 (for details see Table 1 and 2). The toilets have now been used for 1.5 years. These 23 toilets, built at 14 different locations, of which 7 are schools, are frequented by approx. **1,000 people** overall (about 60 people per toilet for the school toilets and 22 people per toilet for the community toilets).

WAND's present practice is to promote ecosan UDD toilets at the community level (community toilets at barrio centres[4] or at primary schools) since the cost of building these toilets is too high for the low-income households in these areas.

5 Technologies applied

Double-vault urine diverting dehydration toilets (UDDTs) are used: Urine and faeces are collected separately, and without water, in these toilets. People who use water for anal cleaning ensure that this water is collected in a separate container (this water is directly used for plants and gardens). Very few people in this area practise anal cleansing with water (about 5% of the population is Muslim, the rest Christians).

The sites where the ecosan UDD toilets are built are selected during a 2-stage process whereby local officials or school officials submit a letter of interest to the WAND Foundation, and then WAND's field staff conducts a local assessment.

[3] The under-five mortality rate is the probability (expressed as a rate per 1,000 live births) of a child born in a specified year dying before reaching the age of five if subject to current age-specific mortality rates.

[4] A barrio centre is a place where the barrio office, a meeting hall and the health centre are located. A barrio is much smaller than a town. A town consists of 15 to 30 barrios.

Table 1: Eight Locations of 10 community ecosan UDD toilets implemented by WAND foundation in province Misamis Oriental, (all are now in operation and are being monitored) – about 22 people use each community toilet, located near barrio centres.

Municipality	Location	Number
Initao	Apas	1
Libertad	Gimaylan	1
Initao	Initao Poblacion (1 in Purok 3, 1 in Purok 5)	2
Libertad	Lubluban (WAND Office and Demo Farm)	1
Initao	Tagpaco	2
Initao	Tubigan: Tubigan Barrio Center	1
Initao	Sinalac: Sinalac Barrio Center	1
Manticao	Mahayahay	1

Table 2: Seven locations of 13 school UDD toilets implemented by WAND foundation in province Misamis Oriental (all are now in operation and are being monitored) – frequented by approx. 60 people per school toilet)[5].

Municipality	Location	Number
Initao	Casilihon Elementary School	1
Initao	Initao Central Elementary School	2
Libertad	Lubluban Elementary School	2
Initao	Sinalac Elementary School	2
Initao	Calacapan Elementary School	2
Initao	Oguis Elementary School	2
Manticao	Digkilaan Elementary School	2

6 Design information

The double-vault UDDT design was adopted from ecosan projects of the allotment gardens in Cagayan de Oro City (see separate case study for further details and/or the website of the "Peri-urban vegetable project" at Xavier University: http://puvep.xu.edu.ph). One toilet is to be shared by 10 to 200 people depending on the location (e.g. the estimate used in Section 4 is that 22 people share a community toilet and 60 people share a school toilet).

The concrete urine-diversion pedestals were manufactured by the WAND Foundation. WAND copied the mould from a commercial unit bought from a supplier in Manila c/o the Center for Advanced Philippine Studies (CAPS: www.ecosan.ph). The pedestal (or bowl) is made of cement, iron wires for strength and special paint. At present WAND has manufactured a total of 120 UD pedestals and will use the remaining 97 pedestals for the expansion of WAND's ecosan activities.

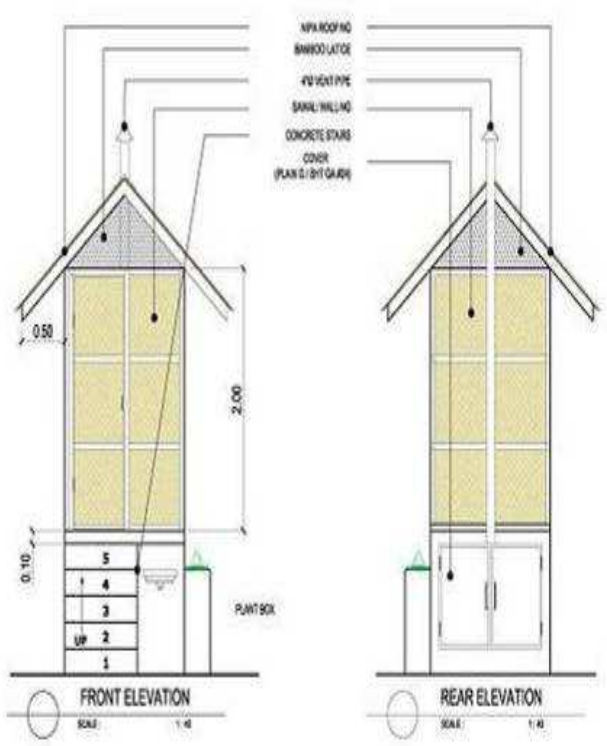

Fig. 5: Design drawings for double-vault UDD toilets – Part 1 of 2 (design drawings provided by Dr. Holmer from PuVep, see http://puvep.xu.edu.ph)

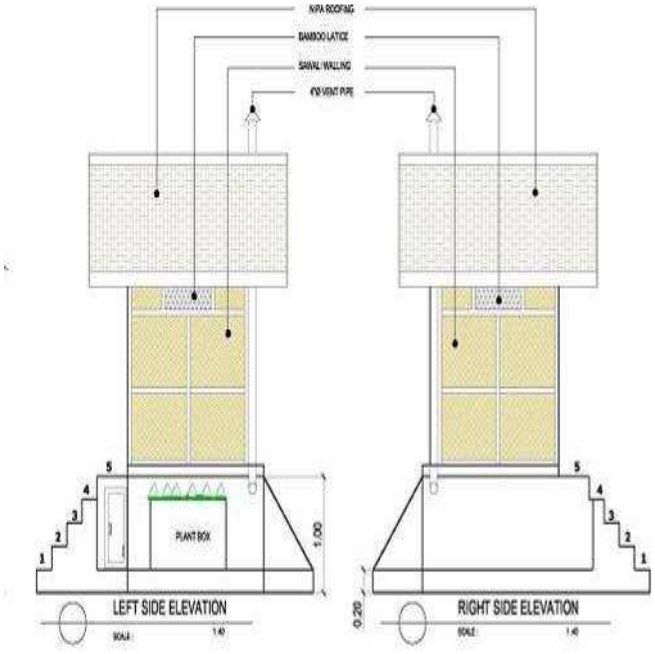

Fig. 6: Design drawings for double-vault UDD toilets – Part 2 of 2 (design drawings provided by Dr. Holmer from PuVep, see http://puvep.xu.edu.ph)

[5] Most of the schools currently have 2 conventional toilets, 1 for male, 1 for female. The toilets are pour flush with a septic tank or pit.

Rural community and school UDD toilets in Misamis Oriental, Libertad, Initao and Manticao, Philippines

Fig. 7: Elmer Sayre with 2 visitors inspecting construction of a UDD toilet and a garden for product reuse at Libertad Municipality (photo: WAND, Feb 2007)

Technical details for the UDD toilets:

- Floor area: 2.00 m x 1.50 m
- Floor Elevation: 0.9 m
- Ventilation pipe: diameter 2 inch, PVC
- Urinal pipe: diameter 1 inch
- 16 L plastic container and 200 L plastic drums for collection and storage of urine
- Roof: thatched roof (made of nipa leaves) or corrugated sheet roof
- For the faeces vault door, galvanized steel is used painted in black to increase the absorption of heat from the sunlight. The faeces vault is about 1 m x 1.5 m in floor area and 1 m high (1.5 m^3 volume[6]).
- Four 4-inch coconut wood for the posts in the 4 corners of the toilets.
- Faeces covering material is either ash or, if that is not available, soft limestone which is available throughout the region.

7 Type of reuse

Urine is diluted with water (1:15 dilution) and is used as fertilizer in household vegetable gardens, fruit orchards, and seedling nurseries where the seedlings are raised. The seedlings are Gmelina arborea, mahogany, ipil-ipil, mango, lanzones and other fruit trees. Urine is stored for 2-3 days, then diluted with water (1:10) before being directly worked in the soil to fertilize the plants (in the case of fruit and timber tree seedlings, the farmers use the urine immediately; in the case of vegetables, they store the urine in 200-liter plastic drums for at least one month).

When both faeces vaults are full (approx 1 year for each vault, so 2 years in total), the faeces will be further decomposed in a vermi-composting process before being used as soil conditioner. The vermi-composting units are simple boxes made of bamboo and sticks and filled with the dried faeces, animal manure and other organic waste. This is simple to operate and local community members know how to operate this already.

Users of some UDD toilets have already switched from vault 1 to vault 2, others are still using vault 1 only. It is expected that in Feb. 2009, the first vault needs to be emptied for some toilets – after 1.5 years of UDD toilet operation.

Fig. 8: Use of diluted urine in a seedling nursery at Initao Municipality (photo: E. Sayre, May 2006)

Fig. 9: Peter Wychodil of the "German Doctors for Developing Countries" inspecting a vermi-composting unit at Dipolog City (photo: E. Sayre, November 2008)

8 Further project components

This project is part of WAND's water, agroforestry and nutrition initiative funded by the Federal Ministry of Economic Cooperation and Development (BMZ) via the German Doctors for Developing Countries, who engaged WAND for this project (as explained in Section 4).

Further project components include:

- Promotion of small, sustainable farming systems including local livelihood projects, helping farmers to have an increased income.
- Reforestation of at least 300 hectares watershed areas.

[6] This is quite a large volume compared to other UDD toilets (adding to cost of construction).

- Planting of fruits such as lanzones, durian, noni, rambutan and pomelo.
- Training and developing the capabilities of local people in terms of organizational development and technical skills like agro-forestry and animal breeding.
- A part of the WAND project is a package of assistance to small-scale farmers consisting of support to their water demand, soil conservation and vegetable gardening. Vegetable seeds are provided to small-scale farmers on a credit basis.

9 Costs and economics

The total cost of building the 23 double-vault UDD toilets was pesos 600,000 or roughly € 9,000 Euro, which includes costs for monitoring, training and general management (equivalent to € 390 per UDD toilet, including "software").

The "hardware" costs of establishing one outdoor double-vault UDDT is **€ 300**. The cost is relatively high, and one option for cost reduction would be to use bamboo for the wall and roofing materials. Another option is to use single-vault UDD toilets with movable containers instead of double-vault toilets (see also case study description about UDD toilets in Bayawan, Philippines).

The total cost of € 300 consists of:

- concrete hollow blocks: € 30
- cement: € 46
- steel bars: € 42
- painted concrete UD pedestal: € 25
- wood, wall and roofing materials: € 66
- sand and gravel: € 24
- nails, reducer and tiles for flooring: € 43
- galvanized iron: € 24

Labor such as constructing the vaults, plumbing, building the walls and roof is provided at no cost by the local counterpart.

In the Philippines, user fees at public toilets are fairly common. An "ecosan user fee" could be implemented in order to recover costs for construction, operation and maintenance of the community UDD toilets. This idea has been tried already with an NGO in the nearby province of Zamboanga del Norte where users are asked to pay per use of the ecosan UDD toilet constructed near a market place.

Some of the urine fertilizer and compost could also be sold to seedling nurseries and gardeners.

10 Operation and maintenance

The community members are in charge of operation and maintenance of the UDDTs since these are community toilets. A local committee is in charge of the maintenance and mainly the women do the cleaning. In the case of UDD toilets in schools (see Table 2), the school headmaster takes over responsibility of the operation and maintenance of the system.

The reported experience so far is that all toilet users are using the toilets without problems, and the separation of urine and faeces works well. One factor which may have contributed to this success is WAND's close monitoring and the involvement of the school headmasters and local barrio (or barangay) officials at the start of the project.

Fig. 10: Inside view of a faeces vault (with faeces and ash) of a double-vault UDD toilet at Initao Municipality. Note how dry the vault content looks – excellent operational result (photo: E. Sayre, Feb. 2008)

11 Practical experience and lessons learnt

A guideline produced by the GTZ-Philippines detailed the steps on how to start an ecosan initiative (see Section 13). These steps were helpful even though it turned out that the steps, consisting of awareness raising, launching, baseline study, social preparation, decision making and implementation, do not take place in a chronological order but as an iterative process.

Promotion and implementation of ecosan UDD toilets have met the following difficulties from which lessons could be learned:

- Some people did not participate, distrusted or even opposed the ecosan project because it aimed at changing existing sanitation norms and practices such as open defecation.
- It became clear that social acceptance cannot be reached by a one-time activity, since it may be very difficult to change long-held religious beliefs and cultural practices. One belief is that faeces are associated with dirt and are "yucky" therefore it is not appropriate to use them as fertilizer. It is important to involve the community from the planning phase to the implementation and to provide a proactive, consistent, clear and reliable communication with all concerned stakeholders in order to gain trust.
- The lack of political will among the local government units for providing improved sanitation constituted a major obstacle.

Some of the factors the project succeeded in are described below:

- Identification and mobilization of local promoters: An evaluation carried out by the municipality found that approx. 70% of the people were neutral to the ecosan approach. Another 15% of early adopters actively supported the idea while the remaining 15% vehemently opposed it. For an effective promotion, the 15% of early adopters were encouraged with the aim to have them persuade the 70% of neutralists. This was done by concentrating on innovative

local farmers who had leadership capacity and stamina to promote ecosan to their neighbours.
- Implementation of incentives: As an incentive, farmer participants were provided with vegetable seeds on a credit basis.
- Use of multiple teaching and learning techniques: Some of the early ecosan initiatives lacked continuous training (one example is the experiment done in Bohol Province by a group based in Thailand). In the present case, multiple teaching methods were used like lectures, posters and simple illustrated manuals in the local dialect as well as on-site demonstrations. The GTZ Philippines office supported WAND by training 3 of their community trainers on ecosan in Dumaguete City in 2007. This has ensured that the ecosan concept slowly became part of the people's routine actions.
- In order to be credible, own practice should precede any promotion. In this spirit, an ecosan UDD toilet was built in the WAND main office in Libertad which is used by WAND staff and by farmers coming to the office to attend training sessions.

12 Sustainability assessment and long-term impact

A basic assessment (Table 3) was carried out to indicate in which of the five sustainability criteria for sanitation (according to the SuSanA Vision Document 1) this project has its strengths and which aspects were not emphasised (weaknesses).

Table 3: Qualitative indication of sustainability of system components. A cross in the respective column shows assessment of the relative sustainability of project (+ means: strong point of project; o means: average strength for this aspect and – means: no emphasis on this aspect for this project).

	collection and transport			treatment[a]			transport and reuse[b]		
Sustainability criteria:	+	o	-	+	o	-	+	o	-
• health and hygiene	X			X				X	
• environmental and natural resources	X			X			X		
• technology and operation	X				X		X		
• finance and economics		X			X			X	
• sociocultural and institutional	X			X			X		

[a] Storage and drying of faeces and in future vermi-composting
[b] Reuse only for urine so far, not for faeces

Sustainability criteria for sanitation:

Health and hygiene include the risk of exposure to pathogens and hazardous substances and improvement of livelihood achieved by the application of a certain sanitation system.

Environment and natural resources involve the resources needed in the project as well as the degree of recycling and reuse practiced and the effects of these.

Technology and operation relate to the functionality and ease of constructing, operating and monitoring the entire system as well as its robustness and adaptability to existing systems.

Financial and economic issues include the capacity of households and communities to cover the costs for sanitation as well as the benefit, e.g. from fertilizer and the external impact on the economy.

Socio-cultural and institutional aspects refer to the socio-cultural acceptance and appropriateness of the system, perceptions, gender issues and compliance with legal and institutional frameworks.

For details on these criteria, please see the SuSanA Vision document "Towards more sustainable solutions" (www.susana.org).

With regards to long-term impacts of the project, the main expected impact of the project is improved health of villagers (e.g. less intestinal worms) and lower pollution of water bodies. A full assessment of the long-term impact of the ecosan project will be carried out in 2009.

It will be difficult to prove the health benefits from this project as there are many pathways for disease transmission. From this point of view, it would be better to equip an entire school with UDD toilets instead of many schools with just one. Then the pupils' health status could be compared from one school with UDD toilets to another school without. As the UDD toilets also produce valuable fertiliser, the pupils' nutritional status may also be increased if the fertiliser applications result in higher yields at the school gardens.

13 Available documents and references

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DILG-GTZ Water & Sanitation Program (2008) Guideline for planning and implementing ecosan projects in rural and peri-urban areas of the Philippines, Bianca Gallinat and Ulrike Lipkow, updated December 2008

14 Institutions, organisations and contact persons

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