

**034**

**Urine diversion dehydration toilets for households in rural areas**

**Bayawan City,  
Negros Oriental Province,  
Philippines**

ECOSAN SYSTEM	SOLID BIOWASTE	FAECES	URINE	GREYWATER	RAINWATER
APPLIED COMPONENTS					
COLLECTION		Urine Diversion Dehydration, double & single vaults			
TREATMENT		Dehydration through storage for 12 months	storage for 1 month in closed container		
UTILISATION		Soil conditioner in agriculture	Fertilizer in agriculture		

**1 General Data**

**Type of Project:**

Rural upgrading

**Project Period:**

start of planning: 06/2005,  
start of construction: 11/2005  
start of operation: 01/2006  
project is on-going

**Project Scale:**

End of 2007: 22 households, 1 rural health centre, 6 barangay agricultural development centres

**Address:**

Private households and public institutions in the rural areas of Bayawan City

**Planning Institution:**

City of Bayawan

**Executing Institution:**

City of Bayawan

**Supporting Agency:**

DILG-GTZ Water & Sanitation Program

activities such as farming, fishing or trading activities. In the rural areas the vast majority of the households live of farming, either as tenants of big land-owners or on their own small farms.



**Figure 1:** House of a family that has a UDDT (source: DILG-GTZ Program)

In the project area only 10% of the population are served with safe drinking water. The majority relies on dug wells and springs. Only 1% of the rural population has a household connection (water). 63% of the households have a toilet. These are mainly pour-flush or pit/VIP latrines.

hollow blocks with concrete floors and slabs. They are designed for a storage time of 12 months. The single-vault toilets have mobile collection containers. The toilet rooms (superstructure) are made of different materials, ranging from bamboo mats to split bamboo and ply wood.

The vast majority of rural households uses firewood for cooking. After defecation the faeces are covered with ash to enhance the treatment process and for optical reasons. In cases where no ash or not sufficient ash is available carbonized rice hull may be used.

All toilets have an anal cleansing area behind the toilet bowl. The water is drained into a gravel and soil filled plant box that is made of concrete and is attached to the collection chamber. The plant box functions as a planted soil filter. Since there are no household water connections, water is provided in a plastic container.

All toilets have a handwashing basin either inside or outside the building. The water is drained into the plant box as well.

The ecosan team of Bayawan City decided to focus on UDDT as technology option because of the comparably easy maintenance and the 'quick' benefit that is generated through the direct use of urine as a fertilizer. Furthermore a dry system is preferred because the majority of households has no piped water supply but has to get water from communal wells or faucets.

**2 Objective of the project**

- Provide new sanitation facilities for households and public institutions without facilities in the rural areas.
- Provide fertilizer for vegetable growing and small farms.

**3 Location and general conditions**

Bayawan City is located in the south-western portion of Negros Island, it encompasses a total land area of about 70,000 hectares and has a population of about 105,000. The project is located in the rural areas of Bayawan. 80% of the population live in the rural areas which cover 83% of the land area. Current employment is considered very poor since there are still very limited employment opportunities. Mostly, the people are engaged in self-employment

**4 Technologies applied**

Sanitation technologies applied are single- and double-vault urine diversion dehydration toilets (UDDT). The faeces and urine are received in a urine diversion toilet bowl made of ceramics. The urine is drained through a plastic pipe system and stored in 20-liter plastic containers. Most toilets have a separate urinal for men made of old 1-gallon plastic bottles. The collection chamber for the faeces is made of concrete

commissioned by

ecosan program  
recycling oriented  
wastewater management  
and sanitation systems

Federal Ministry  
for Economic Cooperation  
and Development



**Figure 2:** Single-vault UDDT (source: DILG-GTZ Program)

## 5 Type of reuse

The use of human faeces as a fertilizer has no tradition in Bayawan. However, some households practiced the use of urine as a fertilizer for ornamental plants.

At the beginning of the project the project team informed the households on the benefits of re-using urine and faeces for crop production. The majority of target households cannot afford buying commercial fertilizer and appreciated the idea of producing their own.



**Figure 3:** Mixing of urine with water (source: DILG-GTZ Program)

The information campaigns during project implementation included trainings on the safe re-use of faeces and urine. Households with a double-vault UDDT store the faeces in the vaults for 12 months and use it directly as soil conditioner in their gardens and fields. The faeces of the single-vault UDDTs are either stored for 12 months as well or are composted after 6 months in the composting facilities of the city (barangay agricultural development centre).



**Figure 4:** Vegetables fertilized with urine (source: DILG-GTZ Program)

The urine is either used directly or after a storage time of 1 month. The farmers dilute the urine with 3 to 5 parts of water and use it as fertilizer for rice, certain vegetables and ornamental plants as needed.

## 6 Further project components

The project put a strong focus on active household participation during the planning and implementation stages. It started with information campaigns on health, hygiene and sanitation, which included discussions of the existing situation.

The planning phase was composed of baseline surveys of the project area, a series of stakeholder workshops and household interviews to generate interest, confirm the commitment of the selected households and agree on design parameters.

The households were involved in the construction process by providing building material and assisting the construction workers in the construction of the toilets. Thus local people were trained in UDDT construction.

Trainings in maintaining the UDDT and in practices of safe re-use constituted other important aspects of the implementation phase. After turn-over, the project team conducted household visits to monitor the use of the toilet and the re-use practices.

Monitoring activities throughout the planning and implementation of the UDDTs are an integral part of the project cycle. They made it possible to improve the design, mitigate construction errors and to ensure that the households maintain their new toilet facilities properly and are encouraged to apply safe re-use practices.



**Figure 5:** Construction of a UDDT (source: DILG-GTZ Program)

The Periurban Vegetable Project (PU-VeP) of Xavier University in Cagayan de Oro, Mindanao, and a partner of the DILG-GTZ Program have carried out various research projects on treatment and reuse of faeces and urine. The results of the research have been shared with other ecosan projects, i.e. the project in Bayawan.

## 7 Project History

The concept of ecological sanitation was introduced to the Visayas and Mindanao Regions of the Philippines through the "1<sup>st</sup> International Symposium on Low Cost Technology Options for Water Supply and Sanitation" in September 2004 in Bohol. This conference was organized by the DILG-GTZ Water & Sanitation Program and the WSP (Water & Sanitation Program) of the World Bank. The City of Bayawan attended this symposium and a group of German and Philippino experts visited Bayawan City right after the conference to conduct a rapid assessment. Two waste water management and sanitation options were identified: a constructed wetland for domestic waste water of a peri-urban resettlement area and a dry sanitation concept for the sparsely populated rural areas.

In January 2005, an appraisal mission on the ecosan potential for Bayawan City was conducted by the DILG-GTZ Water & Sanitation Program.

In June 2005, Bayawan City and the DILG-GTZ Water & Sanitation Program signed a Memorandum of Agreement for the planning and Implementation of the ecological sanitation pilot project. An ecosan technical working group (TWG) was set up by Executive Order of the City Mayor.

In September 2005 members of the TWG attended the "First ecosan Training for Rural Areas in the Philippines, organized by the DILG-GTZ Water &

Sanitation Program. After the training the TWG started with the planning process. The project started with two pilot facilities, one single-vault and one double-vault UDDT in two different coastal barangays. Assisted by the Community Organizer and the Technical Adviser of the GTZ Program the TWG developed a work plan, conducted a series of stakeholder workshops and identified the two target households. Construction started in November 2005 and the facilities were turned over to the users in January and February 2006.

After a short trial period the next phase of the project began. It was decided to set up 1 to 2 pilot facilities in each of the 28 barangays of Bayawan City, consisting of 40 units in total.

The implementation is in progress and so far 29 facilities have been completed: for 22 private households, 1 unit in a barangay health centre and 6 units in barangay agricultural development centres (BADC).

## 8 Costs

The double-vault UDDTs costs between 300 and 340 US\$, depending on the material used for superstructure. This includes material and labour cost. The costs for a single-vault UDDT range between 220 and 250 US\$. It has been tried to reduce the costs through a modified design. However, especially for the double-vault UDDT the cost could only be reduced by about 12 % by choosing cheaper material for the superstructure.

The costs are so high that most target households cannot build UDDTs without external funding. Currently the City of Bayawan funds the substructure (collection chamber), the pipes and the toilet bowl. The households contribute by around 30% to the construction costs through material for the superstructure and unskilled labour.

Bayawan City allocated 10,000 US\$ for the second phase of the ecosan project. The budget included costs for the planning process, i.e. social preparation and construction costs for the substructures. The planning process consumed about 40% of this budget.

Costs for operation and maintenance have not been monitored but are estimated at 30 US\$ per year. This includes the cleaning of the toilet and treatment of faeces.

## 9 Operation and Maintenance

Operation and maintenance include keeping the toilets clean, covering the faeces after defecation and monitoring the urine and faeces levels in the collection containers and chambers. The faeces are spread from time to time to enhance the desiccation process. All these tasks are done by the households themselves. In the BADCs and the health centre the facilities are maintained by the staff.



Figure 6: Urine container (source: DILG-GTZ Program)

Monitoring visits have shown that most users are motivated and able to operate and maintain their UDDTs properly. However, in some cases additional instructions have been necessary. This was mainly the case with families that had undergone the training several weeks before the facilities were completed.

## 10 Design information and technical specifications

The double-vault UDDTs were designed for households with 5 to 6 members and a 12-month storage time for the faeces. Based on these design parameters each collection chamber has a storage capacity of 0.6 m<sup>3</sup>.

The single-vault toilets with mobile collection containers have a collection volume of about 1 m<sup>3</sup>. The collection containers consist of used plastic or steel drums equipped with bin liners. When the bags are full they are stored in the chamber next to the container or in another safe place if the vault is full.

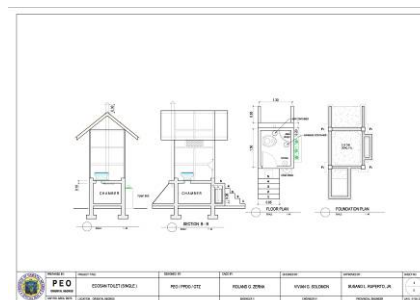


Figure 7: Single-vault UDDT (source: PEO Negros Oriental)

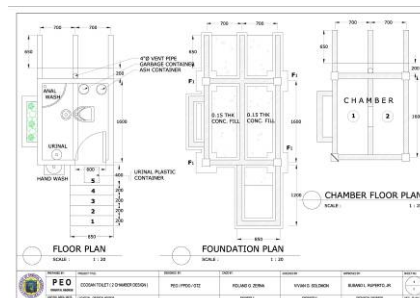


Figure 8: Double-vault UDDT (source: PEO Negros Oriental)

Both UDDT types have inclined doors that cover the back of the collection chambers and are made of black metal sheets to attract heat. The big doors make it easy to spread the faeces and empty the collection chambers. Ventilation is provided through ventilation pipes at the back of the building.

The collection chambers of both types are made of concrete hollow blocks with concrete floors and slabs. The storage space for the urine storage containers is under the stairs and easily accessible through a separate door.

The toilet bowls are made of sanitary ceramic which is easier to maintain than the original concrete bowls. The toilets are also equipped with waterless urinals for men because they prefer the urinals instead of the UDDT bowl for urinating. The urinals are made of old plastic bottles.



Figure 9: Inside a UDDT (source: DILG-GTZ Program)



The drainage pipes for the urine have a sufficient slope to drain completely. Thus urine odour can be kept at a minimum.

The superstructure is made of different materials. The material is chosen by the household and depends on availability and affordability. Thus the material ranges from split bamboo to plywood for the walls and galvanized steel sheets to palm leaves for the roof.

### 11 Practical experience and lessons learned, comments

Information and education campaigns on basic health, hygiene and sanitation paved the way for the ecosan project. Future users were informed about various technology options and learned to appreciate the advantages of UDDTs.

Intensive social preparation through stakeholder workshops and recurring household visits ensured that the future users participated right from the beginning in the planning and implementation.

Trainings on operation and maintenance as well as on safe re-use practices were part of the implementation process and prepared the households for the new concept.

All UDDTs have a poster with Do's and Don'ts in picture format. However, households needed re-fresher training in operation, maintenance and re-use when the time between training and completion of their facility was too long.

The planning and implementation process took much longer than originally planned because the project area covered all rural barangays of Bayawan City. Each pilot site covered only 1 - 2 families. This made especially the planning process with its numerous social preparation activities very time consuming and expensive for the City administration.

A number of completed facilities were only monitored several months after completion. Some of these UDDTs had not been used at all because the households didn't feel confident to handle them. Refresher trainings resolved the problem and all facilities are used and well maintained.

Monitoring visits ensure that the users can discuss issues and ideas with the members of the ecosan TWG. The ecosan TWG uses the information for the on-going ecosan activities.

The City of Bayawan plans an up-scaling of its ecosan program and allo-

cated a budget of 24,000 US\$. Based on the experience from the previous phase the up-scaling will focus on a limited number of barangays with a higher number of households in each location. Thus the planning and implementation process will be more effective. Currently the TWG explores possibilities on how to decentralize the whole process.

### 12 Available documents and references

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Provincial Engineering Office Negros Oriental, Technical Drawings for double and single vault UDDT, February 2006

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### 13 Institutions, organisations and contact persons:

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data sheets for ecosan projects

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