

# Evaluation of social and cultural acceptance of the biotoilet system

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## Abstract

Development of holistic sustainable systems has become a reality through the implementation of two pilot systems in both rural and urban areas of Central Mexico. Such pilot systems involved the design and installation of rainwater systems, installation of biotoilets, and the design and construction of controlled soil natural treatment systems. Social and cultural acceptance of the biotoilet system is crucial for the successful implementation of ecosan technologies. In this study, a simple methodology (application of interviews, questionnaires and physical inspection) was implemented to assess the sociocultural acceptance of the biotoilet system in comparison with the conventional dry toilets and septic tanks with conventional WC. The main result shows that acceptance of the biotoilet is better than that of dry toilets and similar to that of conventional WC with septic tank. Comfortability of the biotoilet when it is used and efficacy to treat the wastes makes this technology competitive and reliable for rural and urban zones of water scarce regions.

**Keywords:** biotoilet, dry toilet, septic tank, sociocultural acceptance.

## Introduction

There has been massive investment in water supply since 1980, but the health benefits have been limited by poor progress in other areas, especially in the management of human excreta. The lack of good excreta management is a cause of sickness and disease, a major environmental threat to global water resources, and a fundamental stumbling block in the advancement of human dignity (WHO, 2000).

The water supply and sanitation sector will face enormous challenges over the coming decades. The urban populations of Africa, Asia, and Latin America and the Caribbean are expected to increase dramatically. The African urban population is expected to more than double over the next 25 years, while that of Asia will almost double. The urban population of Latin America and the Caribbean is expected to increase by almost 50% over the same period (WHO, 2000).

On the other hand, centralized water-borne sewage systems leading to multistage sewage treatment plants seem to be unsuitable as a blanket solution for developing countries, particularly in arid zones, due to their enormous investment, operating and maintenance costs, their high water consumption and other drawbacks. These centralized systems are also running into criticism in developed countries because of economic and ecological issues. However, conventional individual disposal systems also make poor alternatives, especially in view of increasing population densities and the substantial groundwater contamination they cause (Werner, 2000).

Under these considerations, in 2002, Lopez Zavala et al. introduced the Onsite Wastewater Differentiable Treatment System (OWDTS) based on a differentiable management and treatment of household wastewater effluents. In this system, the fractioning of household wastewater into three types was considered; reduced-volume blackwater, higher-load and lower-load graywater were

concepts introduced in that model. The treatment of blackwater conceived a change in the traditional way of using the toilet; the use of water in the toilet was thought just to clean the toilet, not to transport the toilet wastes; this was a very important change that it was possible by using the biotoilet. Several benefits are derived from the implementation of the OWDTs, which can be found in Lopez Zavala et al. (2002).

After the introduction of the OWDTs concept, intensive research was conducted to support scientifically the system. This goal was achieved successfully during the subsequent years, but the implementation in practice of the system was an aim moving forward.

Development of holistic sustainable systems based on the OWDTs concept has been achieved on the practice through the implementation of two pilot systems in both rural and urban areas of Central Mexico, State of Guanajuato (Fig. 1). Such pilot systems involved the design and installation of rainwater systems, installation of biotoilets, and the design and construction of controlled soil natural treatment systems (Fig. 2). Social and cultural acceptance of the biotoilet system was a crucial and sensitive factor for the successful implementation of the OWDTs.

Unfortunately, on literature there was not available a systematic methodology to assess the social and cultural acceptance of the biotoilet or similar system. The German International Cooperation Agency (GTZ) has presented reports in different congresses where the sociocultural acceptance of ecosan technologies has been evaluated; however, details of the methodology implemented are not deeply described (Werner et al., 2003). In Mexico, there are not reports where similar evaluation has been conducted during introduction of new technologies. Thus, in this study, a simple methodology was implemented to assess the sociocultural acceptance of the biotoilet system.

## **Methods**

The first questions that arose during this study were “what kind of technology will be compared with the biotoilet and how the acceptance will be assessed”. Trying to answer these questions the procedure adopted was as follows:

1. Selection of sanitation technologies against the biotoilet acceptance was compared.

Based on official governmental reports at municipal, state and federal level, the most common technologies promoted and used for onsite sanitation in the state of Guanajuato, Mexico were identified. These technologies were selected to assess their acceptance in comparison with that of the biotoilet.

2. Preparation of a reliable survey format to assess the sociocultural acceptance of the biotoilet. This step consisted in:
  - a. Preparation of the survey format, contents and interviews to users.

- b. Pilot survey to assess the reliability of the contents, interviews and answers of users based on our expectations.
- c. Enrichment of contents, survey format and procedure to focus properly the interviews to the users.

### 3. Selection of the communities where the survey was conducted.

With the help of officers from the Social Development Department (SDD) of Dolores Hidalgo Municipality, communities using onsite sanitation systems were first identified. Then, in agreement with officers, the communities subjected to be surveyed were selected randomly from those already identified. Thus, users from these communities and biotoilet users were visited and interviewed in their homes.

### 4. Interviews and physical inspection of sanitation systems.

Members of different households with onsite sanitation systems were invited to attend the interviews. Then, the interviews were conducted by master students and professional staff of the SDD of the Municipality. Household members of different ages and gender were selected.

After interviews, users of the different sanitation technologies were asked to show their systems to conduct the physical inspection and take photographs as a proof of the conditions under which the systems were operating. This step was remarkably important to ensure that the information provided during the interviews corresponded to that of physical inspections and consequently to obtain reliable data.

### 5. Synthesis and analysis of data collected during the survey.

All survey formats used during the interviews and the photographs and comments generated by the interviewers were concentrated. Answers of users were analyzed statistically and results were contrasted with the physical inspection results.

## **2. Results and discussion**

### 1. Selection of sanitation technologies against the biotoilet acceptance was compared.

In the last decades, the Government of the State of Guanajuato has promoted among rural and suburban communities the massive utilization of septic tanks with conventional WC as a

sanitation alternative. More recently, its promotion has moved towards the installation of dry toilets. Two types of dry toilets are mainly found, prefabricated made of glass fiber and constructed on site made of masonry (Fig. 3). These technologies are onsite sanitation solutions; therefore, the biotoilet acceptance was compared with that of such alternatives.

2. Preparation of a reliable survey format to assess the sociocultural acceptance of the biotoilet.

Complete survey format is not included in this paper because of its extension. However, Table 1 summarizes the survey format contents. As seen, the survey was divided into 9 sections and the number of questions per each section is indicated in the right column of the table.

3. Selection of the communities where the survey was conducted.

According to the National Institute of Statistics, Geography and Informatics (INEGI, initials in Spanish, 2006), in the Municipality of Dolores Hidalgo 7,081 households (26.4% of the total, 37,195 inhabitants) did not have access to conventional WC connected to the sewage or septic tank. 6,719 households are located in rural areas. In some of these households dry toilets are installed, but still 473 households concentrated in 49 communities don't have any sanitation system.

**Table 1.** Contents of the survey format.

<b>Section</b>	<b>Description</b>	<b>No. of questions</b>
I	General data of the user	8
II	Type of sanitation system/use intensity	4
III	Level of acceptance	7
IV	Compost management	6
V	Users' preferences	5
VI	Environmental benefits and public health awareness	3
VII	Toilet cost/how much users are willing to pay	2
VIII	Summary question	1
IX	Physical inspection of the sanitation system	5
	<b>Total number of questions</b>	<b>41</b>

Figure 4 shows the map of the Municipality of Dolores Hidalgo. In this, the names and the location of six communities where the survey was conducted are indicated. Additional survey was conducted in the City of Salamanca where a pilot OWDTs was installed. The sanitation systems were distributed as follows:

- a. Communities with prefabricated glass fiber dry toilet. From selected communities, only in Ojo de Agua de Tepextle this type of dry toilet was found. They had been “using” the dry toilets per two years. The investment was covered mainly by the government.
- b. Communities with masonry dry toilets. La Trinidad and Los Claveles were the two communities where this type of dry toilet had been used per one year. The investment was covered mainly by the government.
- c. Communities with conventional WC and septic tank. Two communities with this sanitation system, El Coecillo and La Cantera. The period of use of the systems was ranging from three to five years. The investment was covered mainly by the government.
- d. Communities with biotoilet. As mentioned above, one biotoilet was installed in the community of Las Palomas, Dolores Hidalgo, and another in the City of Salamanca at the Regional Center for Environmental Training (CERCAS, initials in Spanish).

#### 4. Interviews and physical inspection of sanitation systems.

Table 2 summarizes some details of the survey application. As seen, some persons provided false information during the interview. This was realized after the physical inspection of installations. People lie to avoid the cancellation of other economical supports from the government.

**Table 2.** Details of the survey application.

Community	No. of households	No. of interviews	Age and gender of participants			Interviews with false information	Physical inspection
			C	W	M		
Ojo de Agua de Tepextle	4	7	3	5	2	3	Yes
La Trinidad	3	7	0	5	2	5	Yes
Los Claveles	2	5	2	2	3	2	Yes
El Coecillo	11*	7	4	6	1	0	Yes
La Cantera	2*	6	4	2	4	0	Yes
Las Palomas	1	4	1	2	2	0	Yes
CERCAS	1**	4	0	2	2	0	Yes

C: Children; W: Women; M: Men.

\* Includes schools. \*\* It was a training center not a household.

#### 5. Synthesis and analysis of data collected during the survey.

Based on the statistical analysis of reliable data collected during the survey, the percentage of users satisfied with the sanitation system used in their houses was determined and plotted

in Fig.5. 92% of the users of the WC with septic tank are satisfied with system and similar percentage (86%) are satisfied with the biotoilet. Dry toilet systems showed the lower level of satisfaction with 67% and 57% for the masonry and the prefabricated glass fiber toilets, respectively.

Regarding the reliable information of interviews, confirmed by physical inspection, the percentage of interviewed people that use its sanitation system was obtained. It was found that the WC with septic tank was used by 100% of the participants on the survey; meanwhile, the biotoilet had been used by 88%; the masonry dry toilet by 60% and the prefabricated glass fiber dry toilets by only 17% of the interviewed people (Fig. 6). As seen, the tendency is similar to that of Fig. 5. This means, a person that is not satisfied with its sanitation system does not use it. These results can be interpreted as the social acceptance of the different sanitation alternatives. Thus, conventional WC with septic tank is the most socially accepted; biotoilet is very well accepted and the prefabricated glass fiber dry toilet showed lowest acceptability.

The main results derived from the application of interviews, questionnaires and physical inspection of the different sanitation systems are summarized as follows:

- a. Users dislike dry toilets because they are not visually attractive; don't offer privacy; generate nuisance problems (odor, insects); they resulted unpleasant to users because of the necessity of adding substances after their used and they are difficult to clean.
- b. Assessment of WC with septic tank. Advantages of the system: The custom of using the WC; water is used, for users water means hygiene; it is easy to use and operate ("flush" and "forget") and it is easy to clean. Weak points of the system: the septic tank has medium life-time and WC cannot be used in absent of water.
- c. Assessment of biotoilet system. Advantages of the system: more comfortability; air circulation through the toilet bowl creates a sensation of freshness. Weak points of the system: resistance to change; it is unpleasant to add sawdust and withdraw the compost; and sensation of lack of hygiene because water is not used.
- d. On the short term, users comfort prevails over the environmental and public health benefits.
- e. Considerations taking into account by users for selection of the sanitation system are, in priority order: low cost, lack of nuisance problems (odors and insects), easy to clean, proper size of toilet room, privacy, free of adding substances after using the toilet, comfort, and toilet bowl design.

### **3. Conclusion**

Simple methodology was implemented to assess the social and cultural acceptability of the biotoilet by people of Central Mexico. The methodology offers reliability to be applied in more ambitious surveys.

Results of the survey showed that people does not use the toilet when it does not satisfy its expectations. It was clear that biotoilet system is well socially accepted by users, its acceptance is better than that of dry toilets and similar to that of conventional WC with septic tank. Comfortability of the biotoilet when it is used and efficacy to treat the wastes makes this technology competitive and reliable for rural and urban zones of water scarce regions.

The simplest “flush the WC and forget” is an extremely powerful attitude among people that constitutes an enormous obstacle to the success of alternative sanitation systems. Therefore, well focus educational programs are needed to change the way of thinking and doing of people of this region of Mexico.

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