Compost Latrines in Rural Panama: Design, Construction and Evaluation of Pathogen Removal

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Access to proper sanitation is a basic step towards sustainable development, and crucial to the health of any community. 2.6 billion people in the world lack access to any excreta disposal facility (UNICEF, 2005), with only 49% of the rural population of Latin America and the Caribbean having sanitation coverage (WHO/UNICEF, 2000). As a Peace Corps volunteer living in the rural Ngobe-Bugle Indigenous Territory (Comarca Ngobe-Bugle) of Panama, the author of this report assisted in the implementation of several compost latrine projects.

Due to the high water table and copious amount of rainfall found in many coastal areas, standard pit latrines may not be a feasible technology for sanitation problems in the developing world. Because the compost latrine described in this report is constructed above ground with a concrete base, it is feasible for any waterlogged or high-water-table area. This report provides the development worker, who believes compost latrines can be a solution to sanitation problems, with knowledge to successfully implement a compost latrine project. Detailed instruction on the design and construction of a family-sized compost latrine is provided, the various mechanisms responsible for pathogen removal are described in detail, and these mechanisms are incorporated into recommended operational procedures that can then effectively reduce the concentration of fecal pathogens in composted human manure, while producing a nutrient-rich fertilizer.

Thousands of compost latrines have been built worldwide, with the intent of destroying enteric parasites with the high temperatures achieved during thermophilic aerobic decomposition. Though the exposure of compost to temperatures above 45oC for one month has been found to inactivate all gastrointestinal pathogens, studies have shown that few compost latrines implemented in the developing world achieve high enough temperatures to significantly accelerate the destruction of enteric pathogens. Daily addition of local dry organic materials (e.g., rice husks, sawdust) not only provide a source of carbon for carbon-limited fecal material, but also increases the porosity of the compost pile which can accelerate decomposition and subsequently raise the temperature in the compost heap.

In this study, only 30% of the 97 compost latrines evaluated in Panama measured temperatures above ambient conditions (approximately 28oC). These measurements suggest that accelerated aerobic decomposition is not occurring and significant pathogen destruction may not be occurring over the six-month storage timeframe that is recommended to users before the compost material is removed. Nevertheless, there may be other processes taking place inside the compost latrine that effectively destroy pathogens. Daily addition of wood ash can result in pH up to 12.5, and pH levels greater than 9 have been shown to accelerate the destruction of various pathogens. Desiccation (through the addition of wood ash, rice husks, or sawdust) has also been attributed to the removal of fecal coliform bacteria in compost to levels safe enough that the material may be applied on edible food crops. In addition,

subsequent sun-drying of the compost has been found to decrease the necessary containment time by 60%. Because studies have shown that a moderate increase in temperature can also shorten the storage period necessary to produce pathogen-free compost, aerobic decomposition is still an important factor, and a synergy of mechanisms (i.e., increased porosity, aerobic decomposition, increased pH, and desiccation) are likely to contribute to pathogen removal.