

Economic Assessment of Greywater Reclamation in a single Household in Small and Isolated Communities

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INTRODUCTION

The growing demand for high quality freshwater along with the continuous reduction in availability and quality deterioration forces to find and implement alternative solutions. One of the strategic assets to close to gap between supply and demand for water and meeting as well economic considerations, primarily in small and isolated communities is to reuse the treated domestic greywater generated in almost every dwelling. Greywater reuse adjacent to the household for irrigation (under specific conditions even for food production) or toilet flushing has economic advantages of relying and water transportation from remote regions.

The greywater composes about 60% of total wastes of every household. The amount of greywater generated per each family of say 5 persons is in the range of 400 l/d to 500 l/d with a mean BOD₅ content is ranging from 50 mg/l to around 500 mg/l depending on the household source), TSS can as well go up to 500 mg/l and fecal coliforms is commonly above 10⁴ CFU/100ml (Eriksson et al., 2002). Adequate treatment adjacent to point of the greywater generation (living location of the residents) allows reusing the effluent for diverse purposes.

In light of the increasing cost of tap water supply it is frequently asked at what cost is it economically reasonable to have a private greater reclamation small facility. Certainly it depends on the purpose of use. One can assume that the post treated water will be reused for irrigation. The assumption is that without disinfection the treated greywater is used for irrigation under subsurface drip irrigation (SDI). The SDI is implemented since under adequate operating conditions (at least three times irrigation per week) it commonly guaranties no contact between the water and all on-surface activities.

METHODS

Treatment of the greywater in small and isolated communities can be based on a series of methods. These include for example soil treatment (simulating granular filtration), small facilities of constructed wetlands (Ran et al., 2004) and Membrane BioReactors (MBR). Constructed wetlands methods have the advantage of producing valuable food crops rich with nutritious proteins. The effluent of the MBR does not contain pathogens and can be reused for diverse possibilities, including for toilet flush. The almost perpetual question always raised – at what cost and under what conditions the greywater can be reclaimed.

RESULTS

In the economic assessment it assumed a water demand of about 160 l/ca/d, generating about 100 l/ca/d. For a national mean number of 3.7 persons per family it means generating around 0.37 m³/d per family, and around 135 m³ per year. At a cost of US \$ 2.9 per m³ of tap water supply it means an annual value of around US \$ 390 per family. The related expenses of a small private treatment systems id given in Table 1. Greywater can for example reused for garden irrigation. The dependence of resources saving due to greywater reuse for garden irrigation, depending on water prices is exemplified in Figure 1 (Dixon et al., 1999).

Table 1. Approximate expenses for a private greywater treatment system (all cost are in US Dollars)

<i>Component</i>	<i>Cost, \$/component</i>	<i>Comments</i>
Treatment system	1,325	
Pumps	325	
Container	135	
Pipes and accessories	400	
Miscellaneous, Operation	225	Considered as fixed cost
Subtotal	2,410	
Capital Recovery factor	0.106	4% interest at 12 years life span
Annual expenses per family	255	2410x0.106=255

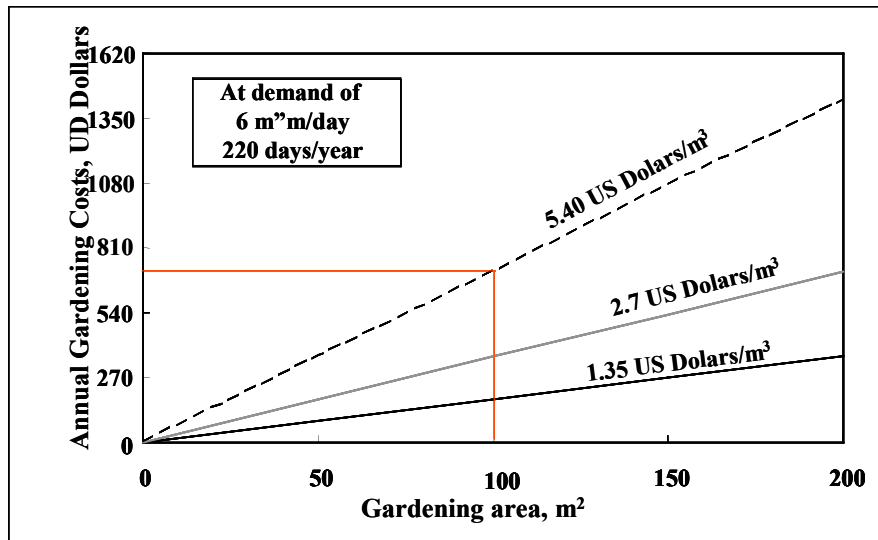


Figure 1. Cost of garden Irrigation which can be saved by greywater reuse

CONCLUSIONS

The provided data shows that greywater reuse has economic benefits. Probably additional considerations such as better environmental control and the options of food production provide additional advantages that are extra economic benefits. The reuse options are however, subject to the greywater quality and purposes of utilization (Australia, 2002; WHO, 2006).

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