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'ONE DAVID, TWO GOLIATHS': MICROCREDIT AS A TOOL FOR SUSTAINABLE ECOLOGICAL SANITATION AND SMALLHOLDER AGRICULTURE IN GHANA

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ABSTRACT

This paper examines microcredit as a tool for ecological sanitation (EcoSan) and smallholder agriculture in Ghana. Employing a rapid review approach, and its associated review of existing literature, the paper argues that microcredit for sanitation has been proven to be an effective way ("David") of dealing with sanitation and agriculture challenges (two "Goliaths"), when directed to the provision of ecological sanitation (compost toilets). Such approach has multiple benefits such as improved sanitation, clean environment, improved crop yield, food security, good health and poverty alleviation. Thus, ecological sanitation is both an economically and environmentally sustainable sanitation option since it has the added benefits of paying for itself through the fertilizer generated as its by-product, thereby improving food security and alleviating poverty as well as protecting the environment in the long run. The paper therefore implores microcredit institutions to engage in diversified lending approach, which seeks to target smallholder agricultural development through ecological sanitation provision. Though attitudes and perceptions have been identified as a major challenge for the acceptance of EcoSan toilets, it is argued that beliefs can be altered or replaced through better community engagement and open discussions about the benefits of EcoSan toilets as well as the relevance of using microcredit as a tool to motivate this change process.

Key words

Microcredit, Ecological Sanitation, Toilets, Agriculture, Ghana

Introduction

Sanitation is a public health issue and that it should go beyond an individual household concern because even if only a few households do not practice safe sanitation, the whole community is at risk (Royal Government of Bhutan, 2012). Nonetheless, the need for improved sanitation around the world is becoming a crisis, particularly in developing countries. Thus, as at 2015, close to one-third of the world's population (2.4 billion people) lacked access to basic sanitation facilities, with almost one billion people (13%

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of the global population) practising open defecation (WHO, 2016). Sub-Saharan Africa still has the largest sanitation deficit: about 70% of the population in 2015 lacked access to improved sanitation facilities compared with 38% in developing regions as a whole and 32% globally (WHO, 2016). Subsequently, the Sustainable Development Goals (SDGs) calls for renewed commitment in improving access to improved sanitation. SDGs Target 6.2 states that *"By 2030, achieve access to adequate and equitable sanitation and hygiene for all, and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations"*.

Although Ghana attained a lower-middle income country status in 2010, her progress in relation to sanitation coverage broadly reflects that across sub-Saharan Africa. Only an estimated 15% of Ghanaians had access to improved sanitation by 2015, with almost a fifth (18.8%) practising open defecation (WHO/UNICEF, 2015). Meanwhile, inadequate sanitation, particularly open defecation, has been found to be the main culprit for millions of deaths among young children all over the world (Pruss et al, 2002; WHO, 2006; Overseas Development Institute (ODI), 2006). Inadequate sanitation is responsible for the transmission of many infectious diseases, including diarrhoea, cholera, typhoid, viral hepatitis, polio, schistosomiasis, and a variety of helminth infections, most of which occur in children living in poor environments (WHO, 2006; ODI, 2006).

While the dangers of inadequate sanitation have been widely recognized by governments, Non-Governmental Organisations, civil society, and most individuals, the right to adequate sanitation remains a promise unfulfilled for the world's poorest citizens (Hesselbarth, 2005). Several explanations have been espoused (from inadequate finance to poor attitudes), but the general set back in the development of sanitation in broader terms can partly be related to the dilemmas associated with the public good characteristic of sanitation which makes it an essentially un-commercial task (Bohman, 2010). Thus, the cost of providing household sanitation is borne by the individual while the public health benefits are less obvious to the individual but the health cost of poor sanitation affects the entire population. Therefore, in a short time perspective it is economically rational for an individual to avoid paying for sanitation services (Bohman, 2010). Hence, the demand for improved sanitation for most households in rural and peri-urban communities may not be high until other needs such as housing (shelter), water, farming, and schooling are met (Card and Sparkman, 2010). Therefore, to deal effectively with externalities from sanitation, Bohman (2010) suggests the need for 'collective action'.

To garner the required collective action to improve access to sanitation in Ghana, the Community Water and Sanitation Agency (CWSA) was created as an independent agency "to facilitate the provision of safe water and related sanitation services to rural communities and small towns" (CWSA ACT, 1998). However, sanitation planning and delivery under the CWSA is confined primarily to household latrine promotion and hygiene education. Subsequently, in 2010 the Ghana Government, with the ratification of the Environmental Sanitation Policy (Revised 2010), officially adopted the

Community-Led Total Sanitation (CLTS) approach to scale up rural sanitation.

After a national assessment of various pilot Community-led Total Sanitation (CLTS) projects in 2009, the Government of Ghana, represented by the Ministry of Local Government and Rural Development (MLGRD) developed and published the Rural Sanitation Model and Strategy (RSMS) between 2010 and 2012 through stakeholder consultations. CLTS approach is based on the premise that traditional sanitation programmes that focus on building latrines have proven both too expensive and ineffective in changing behaviour. Thus, CLTS approach focuses on achieving sustained sanitation demand and behaviour change, and therefore empower and motivate communities to take collective action on ending open defecation by building and using their own toilets (Kar & Pasteur, 2005).

However, it must be emphasised that willingness to build improved sanitation by community members does not automatically translate to ability to pay. For example, WaterAid (2011) found out that in Nigeria lack of credit for latrine construction by community members poses a big challenge though they are eager to have one for themselves. Therefore, there is the need to explore more innovative ways to improve people's ability to pay for the construction of their own toilets. Microcredit, which involves extending small loans to poor people to boost their income generating activities, has been proven as an alternative to conventional financial tools whose increasing role in development of the poor has been well documented (Bank of Ghana, 2007) and acclaimed by governments, international development organisations and Non-Governmental Organisations.

However, despite the significant interest and financial support microcredit has received, very few scholarly works have explored microcredit's role in improving ecological sanitation and smallholder agriculture. While most of the microcredit-for-sanitation projects and subsequent studies have focused on traditional sanitation facilities (Blackett, 1994; Varley, 1995; Saywell, 1999; Saywell & Fonseca, 2006; Mehta & Knapp, 2004; Mehta, 2008; Miller, 2013), to the best of my knowledge, there is dearth of literature on how microcredit can be harnessed for ecological sanitation and smallholder agriculture in Ghana, where the toilet facilities have the potential to at least pay for itself, indirectly through improved yields in crop produce. It is against this backdrop this paper seeks to examine the potentials of microcredit in achieving sustainable sanitation and smallholder agriculture. This is particularly important in Ghana, since both sanitation and agriculture are important for achieving the Sustainable Development Goals on universal health and food security.

Conceptual context

David and Goliath is a popular story in the Bible about how a young, smallish and inexperience fighter, David, defeated the famous, strongest and most fearful giant and fighter of the time, Goliath. What makes this story relevant for this study is the fact that most people doubted the potential of David, who was noted only for shepherding sheep, to skillfully defeat Goliath. In the same manner, microcredit, which is noted only for small and medium enterprise growth development,

is less acknowledged for its potential to improve sanitation and smallholder agriculture, which are serious development challenges in Ghana (Mariwah & Drangert, 2011; Mehta & Knapp, 2004). First, Ghana failed to achieve its target on improved sanitation, with only 15% of the population using improved sanitation by the close of MDGs in 2015 (WHO/UNICEF, 2015), with a substantial proportion still practicing open defecation, with its attendant health and environmental consequences (WHO, 2016).

Thus, sanitation has been a major public health challenge (or Goliath) that is threatening health and lives of millions of Ghanaians, especially those living in rural areas and low-income residential urban areas. Second, with climate change and climate variability on the rise, smallholder agriculture in Ghana, which is mainly rain-fed, will be severely affected, threatening the livelihoods of many people and rendering several others food insecure. Thus, with Ghanaian agriculture being overwhelmingly dominated by smallholders, constituting more than three-quarters of farms (Chamberlin 2007), any threat to smallholder agriculture is a threat to national food security, and therefore should be regarded as a serious challenge (or Goliath) that needs to be confronted head-on.

To do this, there is the need to engage both microcredit institutions and farmers so that they will realise the benefits for themselves, and the nation as a whole. Therefore, this study is situated within the rational choice theory, which attempts to explain human behavior as resulting from rational choices, particularly in an economic context (Hooker 2011; Ostrom, 1998). Thus, both farmers and microcredit institutions will make rational choices based on the benefits and cost of their decisions, and that both will make choices that will best serve their interests. Therefore, microcredit institutions will seek to ensure that loans disbursed are repaid with no or minimal defaults while farmers will seek to access loans that will help them expand their farms, improve yields and hence incomes. Both agents will act with the main motive of minimizing cost and maximizing benefits. Thus, all things being equal, it is expected that any microcredit facility that seeks to maximize farmers' yield and income is more likely to be accepted while microcredit institution will be more willing to disburse loans when there is greater assurance backed by substantial evidence of repayment. This is in view of the fact that Jensen et al. (2005) attest that households engaged in agriculture would probably accept sanitation technologies that could be accommodated within their agricultural production system in the form of offering economic benefits such as fertilizers.

Microcredit schemes in perspective

Generally, microfinance is seen to encompass the provision of a broad financial services that include insurance, savings, small loans, transfer services and other financial products and services that are targeted at low income clients (United Nations, 2005). Microcredit, a subset of microfinance, has been defined as "the principle of giving small loans to the very poor to help them generate an income of their own" (Wheat, 1997:4). Microcredit is a relatively-recently coined term that is applied to a subset of microfinance engaged in diverse range of credit activities and types

of institutions.

However, there are many antecedents to microcredit, such as locally managed credit arrangements which have existed for hundreds of years, including rotating savings and credit associations (ROSCAS) and savings and credit cooperatives (SACCOs), both of which are very widespread in most communities around the world (Food and Agriculture Organisation (FAO), 2000), and have demonstrated their effectiveness as a means of economic empowerment for most poor people in both urban and rural areas (Valrey, 1995). Since the 1990s the field of microcredit operations have expanded enormously, resulting from increased outreach and repayment rates, and which have been driven largely by the perceived demand for credit (Buckley, 1997). In 1996, Microcredit Summit was organised with the resultant target of reaching 100 million of the world's poorest people, particularly women, with credit for income-generating activities and other financial and business services by the year 2005 (Microcredit Database, 1999).

In Ghana, microcredit activities date as far back as the 1950s, and over the years, the sector has been vibrant due to the formulation of various financial sector policies and programmes such as the liberalization of the financial sector, establishment of rural and community banks (RCBs), the provision of subsidized credits to the poor, and the promulgation of PNDC Law 328 of 1991, that allowed the establishment of different types of non-bank financial institutions, including savings and loans companies, and credit unions (Bank of Ghana, 2007). According to Otero (1999) when credit facilities are made available to the poor in society, it strengthens their dignity and self-actualization, thus creating an enabling environment to help empower them to participate in economic and social activities. However, the banks require collateral security before loans are offered to ensure a reliable loan and credit recovery. Littlefield and Rosenberg (2004) argued that such a system tends to exclude the poor from accessing financial services since they do not have the collateral security required by the banks.

The Bank of Ghana (2007), identifies three broad types of microfinance institutions operating in Ghana, targeting different activities and individuals. These institutions include: Formal suppliers of microfinance such as rural and community banks, savings and loans companies, commercial banks; semi-formal suppliers of microfinance including credit unions, financial nongovernmental organizations (FNGOs); and cooperative societies; Informal suppliers of microfinance such as "susu" collectors and clubs, rotating and accumulating savings and credit associations (ROSCAs and ASCAs), and moneylenders. As a panacea to mitigate the exclusion of the poor from access to financial services, microfinance targets people with low incomes and supports a number of informal activities. Recognising the urgent need of credit for poverty alleviation, Government of Ghana (GoG) established the Microfinance and Small Loans Centre (MASLOC) in 2006, to be responsible for implementing the government's microfinance programmes targeted at reducing poverty, creating jobs and wealth.

Despite its popularity, microcredit's contribution to income and poverty reduction has been mixed. On the positive side, several

researchers have highlighted the role of microcredit schemes in improving the income and livelihoods of beneficiaries and hence reducing poverty (Dzisi & Obeng, 2013; Karnani, 2007; Gupta & Aubuchon, 2008). However, some researchers have argued that most microcredit institutions tend to serve the moderately poor and not the poorest of the poor (extremely poor) (Montgomery and Weiss, 2005; Hashemi and Rosenberg, 2006). In fact, a study of microfinance borrowers in Ghana by Shicks (2011) found that more than one-third of the borrowers had great challenges in repaying their loans. As a result, some researchers have concluded that microcredit's role in improving income and alleviating poverty is more of a fantasy than reality (Bateman, 2010) and that microcredit activities did nothing to alleviate poverty but rather worsened it (Bateman, 2007). In this paper, it is surmised that microcredit will lead to improved income and hence poverty alleviation because, with proper training and community engagement, the funds could be invested in sanitation facilities that will yield fertilizers needed for smallholder agriculture, hence improved crop yields and household income.

Methods

The main thrust of this paper is to examine the potentials of microcredit in improving sustainable sanitation and smallholder agriculture. Subsequently, the paper employed a rapid review of the existing literature (both peer-reviewed and grey literature). According to Khangura, Konnyu, Cushman, Grimshaw, & Moher (2012 cited in Tricco, Antony, Zarin, Strifler, Ghassemi, Ivory, Perrier, Hutton, Moher & Straus, 2015:2) 'a rapid review is a type of knowledge synthesis in which components of the systematic review process are simplified or omitted to produce information in a short period of time'. This approach has been regarded as a common way of obtaining synthetic, rigorous but relatively quick knowledge and evidence on specific fields of inquiry (Khangura et al. 2012; Tricco et al. 2015). The rapid review was carried out by collating both academic databases and grey literature sources, such as international and national reports and policy documents on sanitation, microcredit and smallholder agriculture. Research articles, papers, books, and reports were reviewed if they evaluated, compared, used or described (Tricco et al. 2015) microcredit/microfinance, sanitation, ecological sanitation or smallholder agriculture. This approach provided the opportunity to examine the successes, failures, challenges and prospects of using microcredit for sanitation provision and smallholder agriculture in Ghana.

Microcredit for sustainable ecological sanitation

Microcredit for sanitation incorporates the application of microcredit to provide small loans to poor households in order to increase their access to improved sanitation. This loan falls under the "channelled credit" category that encompasses loans provided with the aim of achieving specific goals, such as for increasing access to improved sanitation through the purchase of raw materials, or the cost of building a pit latrine or septic tank (Varley, 1995). The idea is based on the premise that current investment levels in

sanitation infrastructure, mostly financed by the public sector and donor agencies, are not sufficient to achieve universal access, and that microcredit should be used as a complementary approach to allow poor people to gain access to improved sanitation (Mehta & Knapp, 2004). Like all microfinance tools, microcredit is based on the ability of the credit to yield returns and hence has the potential to enhance the ability of the debtors to repay. Therefore, without proper stakeholder engagement, it will be very difficult to convince microcredit institutions to redirect attention to extending credit to households for the purpose of providing for sanitation.

However, it is argued in this paper that microcredit should not just be for any form of sanitation but rather sanitation alternatives (Ecological Sanitation) that have the potential to yield returns as fertilizer and hence improve the ability to pay back the loan. This is because one of the major challenges of smallholder agriculture in Ghana is with access to credit (Evans, Mariwah & Antwi, 2014; ActionAid, 2012; Bugri, 2008; FAO, 2000) which in most cases has to do with purchasing agriculture inputs, particularly fertilizer, due to declining access to land per capita (Bugri, 2008; Asare, Kranjac-Berisavljevic & Cofie, 2003), reduced soil fertility (Bugri, 2008; Asare et al., 2003) and increased variability in rainfall and temperature patterns, partly resulting from climate change (Bugri, 2008). For example, in 2005, a total of about 31,500 tonnes of NPK fertilizer were used in Ghana, of which 15,900 tonnes were nitrogen, 6000 tonnes phosphorus and 9,600 tonnes potassium; figures that reflect substantially lower actual fertilizer use than the natural fertilizer demand of the crops in Ghana (Stoll, 2008).

Meanwhile, conventional chemical fertilizers are becoming more expensive (Cordell et al., 2009) and they have the potential to pollute both surface and ground water and cause accumulation of heavy metals in the soil (Mariwah & Drangert, 2011). Yanggen et al. (1998) observe growing evidence from intensive agricultural production systems that the overuse of chemical fertilizers can cause environmental damage. As a result, there have been calls by experts in environment to look for alternative fertilizers that can increase food production while at the same time reducing environmental damage (Mariwah & Drangert, 2011). Therefore, agricultural engineers and scientists, who have concerns for the safety of the environment, as well as environmental NGOs and civil society organizations, have advocated the use of organic manure (from both human and animal sources) as complementary or alternative means of improving soil fertility rather than over-reliance on chemical fertilizers. However, whereas animal manure can be obtained from the fields and farms, human excreta is an integral part of the total household waste, and hence needs to be collected and sanitized before use in agriculture (Mariwah and Drangert, 2011).

The investment in collection and treatment of human excreta is worthwhile because human excreta contain enormous agricultural benefits. For example, in spite of its small volume, mostly estimated as only about 1.5 litre per person per day (Hellstrom and Karrman, 1996), human urine has the highest of the nutrients found in household wastewater; including 80% of the nitrogen,

55% of the phosphorus and 60% of the potassium (Jonsson et al., 2000; SEPA, 1995). In terms of the nutrient loads used in Swedish crop production, Vinneras et al. (2008) found that "human urine could replace 19%, 20% and 29%, respectively, of the N, P and K applied in the form of artificial chemical fertiliser. The second most nutrient- rich fraction is the faecal matter" (Vinneras, 2002). If these nutrients are reclaimed through collection and treatment of excreta, they can become important local resources in the form of fertilizer for sustainable smallholder agriculture. The most cost effective way to extract human excreta and compost it for agricultural use is through the construction and operation of ecological sanitation (EcoSan) toilets.

The term "ecological sanitation" or "EcoSan" was coined by Swedish scientist, Uno Winblad and was first mentioned in his book "Sanitation Without Water" published in the early 1970s. Winblad & Simpson-Hebert (2004) defined ecological sanitation as an approach where human excreta are treated and utilised as a resource for agriculture, and not as waste to be disposed off. The most important features of the approach include prevention of human excreta related pollution and diseases, recognition of human excreta as a resource rather than as waste, and recovery and recycling of the nutrients contained in human excreta (Winblad & Simpson-Hébert 2004). The ecological sanitation approach, also known as sanitised and reuse model, applies the principles of "don't mix", "don't flush" and "don't waste" to the treatment of human excreta (Winblad, 1998). Thus, when urine and faeces are separated and treated, the nutrients are recovered through composting. According to Langergraber and Muellegger (2005), the system is based on an ecosystem approach that is designed to reduce health risk, prevent pollution of surface and groundwater and optimise management of nutrients and water resources. The ecological sanitation model has therefore been promoted as an alternative approach to conventional sanitation methods (Werner, Avendano, Demsat, Eicher, Hernandez, Jung, Kraus, Lacayo, Neupane, Rabiega, Wafler, 2003).

More importantly, the EcoSan toilets, which are frequently referred to as compost toilets, are classified as improved toilet facility by the Joint Monitoring Programme (JMP) of UNICEF and WHO, and have subsequently been adopted as improved sanitation in Demographic and Health Survey Reports and most national publications on sanitation. JMP refers to improved sanitation facility as one that hygienically separates human excreta from human contact, and excludes shared toilet facilities (WHO/ UNICEF, 2015). As mentioned earlier, in addition to serving the sanitation needs of residents, EcoSan toilets are a source of compost for agriculture. Therefore, this paper argues that microcredit for sanitation can perhaps be the "David" that can overcome two "Goliaths" (sanitation and agriculture challenges) when directed to the provision of compost toilets, which have multiple benefits such as improved sanitation, clean environment, food security, good health, etc. (See Figure 1). As indicated earlier, this is in view of the fact that Jensen et al. (2005) attest that households engaged in agriculture would probably accept sanitation technologies that could be accommodated within their agricultural production system in the form of offering economic benefits such as fertilizers.

The paper therefore suggests that the focus of sanitation programmes should be on the development of sanitation systems that have additional benefits by allowing the use of excreta as fertilizer. Thus, agricultural households may benefit more in their investments in improved sanitation if such investments offer tangible value to them such as those found in EcoSan toilets (e.g. reuse of excreta in farming). Apart from the use of excreta as fertilizer that can lead to improved crop yield, and hence improved income, Figure 1 shows that microcredit for ecological sanitation can lead to improved health, enabling farmers to work hard for improved crop yield and income, thereby facilitating credit repayment and further access to credit.

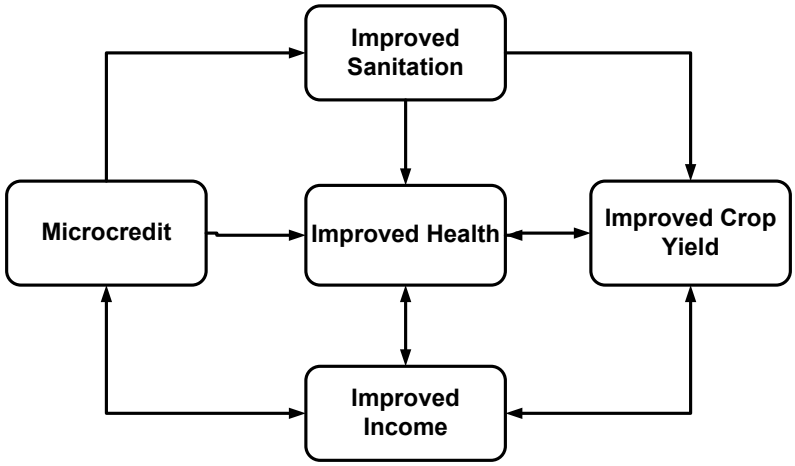

Figure 1: Framework for analysing the implications of microcredit for sanitation and agriculture

Source: Author's construct based on the literature review

Even on its own, substantial evidence exists to show that ordinary sanitation has benefitted from microcredit all over the world. Studies in Vietnam have found that provision of microcredit with flexible payment schemes can help reduce difficulties related to the high initial cost of sanitation installation which most poor people cannot afford (Frais & Muhkerjee, 2005). Saywell and Fonseca (1999), while admitting that use of microcredit for sanitation provision remains a fairly new idea, also posits that supplying the credit needed to provide sanitation services seems to be a promising approach to improving service coverage in low-income urban, peri-urban and rural agricultural communities. In an updated WELLfactsheet titled "Microcredit for sanitation", Saywell and Fonseca (2006) examined the progress being made to develop micro-credit mech anisms to support sanitation initiatives and identify the key factors for the success of these initiatives using case studies from around the developing world, including Lesotho, Honduras, Indonesia, South Africa, India, Pakistan and Ghana. Table 1, Box 1 and Box 2 present some of the microcredit for sanitation initiatives and their outcomes.

Table 1: Micro-credit for sanitation-Case studies

Project	Reference	Sanitation strategy used	Finance strategy used	Results	Key points
Low cost sanitation, Lesotho	Blackett, 1994	Promotion of VIP latrines	Credit funds provided by government administered by Lesotho Bank	1000 VIP latrines built: 80% by private investment, 20%by credit programme	Good sanitation is a product; need to develop market
Co-operative Housing Foundation, Honduras	Co-operative Housing Foundation, 1993	Variety of sanitation options to suit customer	CHF provide funding to local NGO's for on-lending to low-income borrowers	US$350,000 distributed in 1300 small loans, repayment rates of 95%	Flexible choice of sanitation options and loan terms Technical advice and help with contracts
Self-help Provision of Family Toilets, Yogyakarta, Indonesia	Schubeler, 1995	Construction of private toilets and privately managed public toilets	Type I administered by NGO YDD with direct government involvement; Type II administered by NGO YDD with no government involvement	Type I: 123 loans since December 1992; recovery rate of 65%; Type II: 153 loans since August 1993; recovery rate of 100%	Government agencies are not effective at debt collection
Strategic Sanitation Programme, Kumasi, Ghana	Whittington, 1994; Saidi-Sharouze, 1994	Shared sets of latrines for tenanted households	World Bank funds disbursed to petty cash accounts at a commercial bank. Loan collection by project staff and community steering committee	40% of 224 loans in arrears, May, 1993	Loan administration should be as simple as possible; Clear lines of responsibility are required; Difficult to run credit scheme in unstable financial environment

Mvula Trust, South Africa	Hartvelt et al, 1997; WRC, 1995	Promotion of latrine construction and sanitation upgrading	Mvula Trust runs a social investment fund and provide technical support and training to community representatives	192 projects implemented by Dec. 1995	
SULABH International, India	Varley, 1995	Marketing low-cost twin pit latrines in urban slum areas	Formal and informal mechanisms i.e. agents who market loans and collect on flexible terms	500,000 gained access to credit	Informal system based on price discrimination and minimal book-keeping. Very flexible

Source: Saywell (1999) and Saywell and Fonseca (2006)

BOX 1

Vietnam: Sanitation Revolving Fund

"In 1999, the World Bank, in cooperation with the governments of Australia, Finland and Denmark, supported the creation of a Sanitation Revolving Fund in Vietnam with an initial working capital of USD 3 million. The project was carried out in three cities, namely Danang, Haiphong and Quang Ninh. The main goal was to provide small loans (about USD 145) to low-income and poor households for targeted sanitation investments such as septic tanks, urine diverting/composting latrines or sewer connections. Households willing to participate needed to join a savings and credit group of between 12 and 20 people. Members of those groups were required to live near to each other to ensure community control. The loans covered approximately two thirds of the investment costs in the house sanitation infrastructure. This approach was strictly demand driven and thus required the Sanitation Revolving Fund to develop awareness raising campaigns for sanitation. Managed by the microfinance-experienced Women's Union of Vietnam, the Sanitation Revolving Fund gave 200,000 households the opportunity to finance and build sanitation facilities over a period of seven years. With a leverage effect of up to 25 times the amount of public spending on household investment and repayment rates of almost 100 percent, the fund is seen as a best practice example by its financiers and thus considered to be scaled up with further support of the World Bank and the Vietnam Bank for Social Policies" (Source: Miller (2013).

BOX 2

Low cost urban sanitation solutions through micro-savings-The Clean Team experience in Kumasi

Clean Team Ghana Limited was incorporated in 2012 as a company in Ghana that provides the urban poor in Kumasi with access to adequate and safe household toilets at an affordable rate. During a field trip undertaken in August, 2013 to Clean Team in Kumasi, we observed that the company rented households a branded portable toilet and collected the faecal matter 2-3 times per week into their central processing facility. The faecal matter was then transported to the municipal treatment site, with the future plans to convert the waste into energy and organic fertiliser to sell to commercial farmers in the region. Clients did not pay for the toilet facility but only paid for the collection and cleaning services. Service associates visited clients twice a week to collect money and feedback. Clients paid a minimum of GHS 2 ($ 0.8) per visit and were supposed to pay between GHS 25 ($ 10) and GHS 35 ($ 14) per month depending on the number of collection. In the absence of a service associates, users were encouraged to use money box and deposit the amount they would have paid if they visited a public toilet. This worked in the form of informal micro-savings for the purpose of paying for the collection and cleaning services. Even if the amount was the same as visiting the public toilet, there was an added benefit of safety, convenience, privacy etc. At the time of the visit, Clean Team had about 430 toilets and 3000 users, removed 161 tonnes sludge, and created 26 jobs in Kumasi (Yeboah, 2014).

Extending microcredit to the poor for the purpose of sanitation provision should not be seen as favour by the microcredit institution to the poor because the initiative tends to have mutually reinforcing benefits for both sectors. According to Varley (1995), good credit has the potential to create value for both the borrower and the lender: thus when the loan is properly utilised lenders cover their costs, and borrowers are able to realise the incremental benefits made available by the loan. Broadly, Mehta (2008:6) asserts that "the use of microcredit for sanitation provision helps to realize and further improve household benefits from improved sanitation; while engaging in the sanitation sector can help microcredit institutions to improve their outreach efforts, and their financial and social performance".

In term of repayment, it must be emphasized that all microcredit institutions seek zero default rate and for that matter are very much concerned about the people to whom they give loans. This is the main reason why screening of applicants is important and group formation is imperative. However, Varley (1995) is of the view that the willingness and enthusiasm for microcredit lending to the poor stems from the abundant evidence that there exists a number of resourceful people among the poor and that poor people are not a bad credit risk as had been wrongfully assumed. He argues that when high default rates do occur among the poor, they are often

a result of badly designed programmes and products (Varley, 1995). This is because there is substantial evidence to support the fact that microcredit for sanitation yields higher repayment rates. For example, the sanitation microfinance pilot projects with the NGOs in Tamil Nadu in India reached repayment rates greater than 90% for VIP and cluster latrines in rural areas and urban slums (WPI, 2005) while the Sanitation Revolving Fund in Vietnam had a repayment rate of 100% (see Table 1)

Ecological sanitation and smallholder agriculture: Closing the nutrients loop

From when the taming of livestock and cultivation of crops enabled larger human populations to settle in fixed locations for longer periods, human societies have always been confronted with the issue of excreta disposal. Subsequently, different sanitation technologies and approaches have been developed over the history of humankind. From dug-and-bury containment of excreta in the prehistoric era to the first latrines and sewers of ancient Rome built between 800 and 735 BC, and to flush toilets of the Indus Valley Civilization in 35th-12th century BC, and the modern centralized wastewater treatment systems, sanitation has adequately reflected the different phases of the development of human civilization (Luthi et al, 2011).

Many traditional agricultural societies approached the sanitation problem in different ways: while some societies saw human excreta as waste that needs to be disposed-of away-from human settlements, others recognised the value of human excreta for soil fertility and practised the collection and reuse of excreta. Though several ancient Arab, Greek, Roman and Spanish authors demonstrated the benefits of human manure as a fertilizer (Thurston, 1992) through collection and treatment of excreta, the most renowned example of the organised collection and use of human excreta to support food production is that of China (Brown, 2003). According to Luthi et al (2011), the use of human excreta in crop production by the Chinese dates as far back as 2500 years ago, hence enabling them to engage in intensive agriculture to sustain more people on a smaller piece of agricultural land. As recently as the 1950s, around 90% of China's human waste was put on agricultural fields, making up a third of the total fertilizer used (Hart-Davis, 2008).

Toilet facilities that are specifically designed to serve the all-important need of fertilizer for agriculture are broadly referred to as ecological sanitation. The emphasis of the ecological sanitation approach is on closing the nutrient loop, which follows the nature's way of recycling nutrients. The difference with the conventional approach lies in the fact that ecological sanitation approach utilises the nutrients in human waste as fertilizer for agriculture whereas conventional approaches to sanitation destroy these nutrients and break the cycle (Winblad & Simpson-Hébert 2004). As alluded to earlier, the recycling of the nutrients has several benefits such as reducing the need for chemical fertilizer, preventing the pollution of the waters, improving the soil structure and enhancing the productivity of agriculture (Esrey et al., 1998). The UNDP (2008) proposes that food security and agricultural sufficiency can be realized by utilising the valuable nutrients in human excreta'. Thus, the fertilizers derived

from human excreta can remarkably improve food security, as it is claimed that the relatively inexpensive phosphorus we use today will likely cease to exist within 50 years (EcoSanRes, 2008). The process through which ecological sanitation closes the nutrient loop is presented in Figure 2

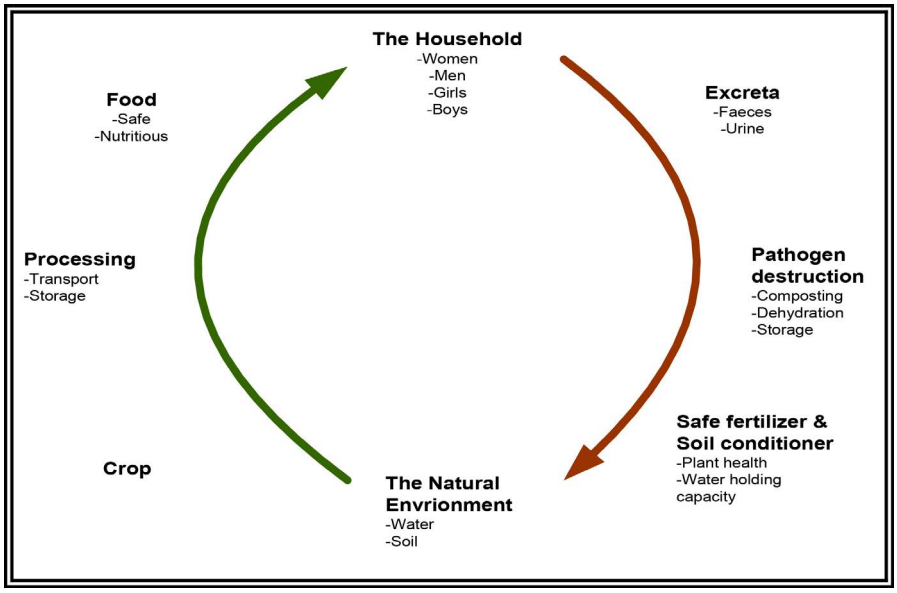

Figure 2: Closing the nutrient loop.
Source: Esrey and Andersson, (2000b)

In this regard, several studies have provided substantial evidence to support the fact that crop yields resulting from the use of human manure are very large (see Vinneras et al., 2006; Jonsson et al., 2004; Esrey et al, 2001; Esrey et al. 1998). Human excreta, like animal manure, are a renewable source of plant nutrients, such as nitrogen, phosphorus and potassium (Drangert, 1998).

In Africa, although the use of human excreta is not widespread, some studies in the continent have attested to the economic and environmental importance of the organic matter for agricultural purpose. In Uganda, for example, co-compost from faeces is used as fertilizer for various types of crops like bananas, pineapples, maize, cassava, sorghum, jackfruits and passion fruits (Mullegger & Freiberger, 2010). In a study of the Bwaba ethnic group in Burkina Faso, WaterAid (2009:7) found a popular belief that "if someone gives you food, you are expected to defecate in his field (and fertilise the crops), as the act of giving entitles the giver to receive something in return". In Ghana, human excreta compost has been tested for its impact on the germination capacity and early growth of vegetables commonly grown in the urban and peri-urban areas (Cofie & Kone, 2009). Farmers in Ghana have also attested to the agronomic benefits of excreta, and users of excreta make more net income than non-users (Cofie et al., 2005). For example, Mariwah and Drangert (2011) have shown that in a peri-urban community in the Cape Coast Metropolis in Ghana, about six out of ten respondents

acknowledge that human excreta is a good resource for soil fertility.

The analysis of the Ghanaian agricultural and fertilizer market by Stoll (2008) revealed that there was a strong nutrient demand from the ecological point of view. Stoll is of the view that generally, the agricultural situation in Ghana favours the introduction of a urine-based fertilizer, because it can help stop the soil degradation in the country. Secondly, for macroeconomic purposes, Stoll stated that the urine-based fertilizer offers a good opportunity to escape the dependence on food and/or fertilizer imports. Thus, as the fertilizer is produced inland, the macroeconomic factors that limit fertilizer use in Ghana (particularly exchange rate fluctuations) will no longer affect fertilizer consumption.

However, while the potential for ecological sanitation to improve smallholder agriculture, reduce environmental pollution and hence improve health has been widely endorsed by both researchers and policy makers, it remains to be fully realized within the context of developing countries like Ghana. It is worthy of note that, from the perspectives of both theory and practice, there is a general consensus that adoption of new technologies in any society is generally driven by practice rather than top-down planning (Horst & Miller, 2006; Jeffrey & Doron, 2013). Thus, most sanitation technologies come with spill-over benefits beyond conveniently, and sometimes hygienically, separating human excreta from human contact, and that with time the technology becomes appropriated, co-opted and used in ways that can improve incomes and wellbeing of users or others through the successful application of the by-product (faecal sludge). Moreover, Horst and Miller (2006) have argued that appropriation of technologies for extended benefits are deeply embedded within existing social and cultural forms. Therefore, seeking to move beyond rather sterile debates that set in binary opposition between technological versus social determinism, Horst and Miller (2006) have argued persuasively that society and technology are dialectically related: that each becomes altered in interaction with the other. These insights are important for understanding how the use of microcredit for ecological sanitation technologies might improve smallholder agriculture in both rural and urban areas.

Cost-effectiveness of ecological sanitation

Whenever sanitation schemes are planned and choices have to be made between improved sanitation technologies, cost always plays a crucial role. Thus, economic and financial considerations are crucial for encouraging the construction of EcoSan toilets as well as the safe use of excreta (WHO, 2006). However, it is important to distinguish between financial and economic costs. According to WHO (2006), financial cost refers to costs borne by the individual for the construction and operation of toilet facilities, whereas economic cost refers to the overall costs and benefits of toilet facilities that are borne by the society as a whole.

Financial costs of both conventional sanitation and EcoSan options vary widely by continent and by country, and even within countries because variations in local conditions such as topography, climate, socio-economic status, legislation etc. can significantly influence costs of sanitation (WHO, 2006). However, as long as we remain consistent in

the cost calculations across different sanitation technologies, it does not matter whether we include economic costs or use only financial costs. Therefore, the long term benefits of ecological sanitation should be assessed based on the cost of construction as well as operation and maintenance, and such an assessment should be done comparatively with the dominant sanitation technologies used in Ghana.

Several studies have indicated that EcoSan toilets are more cost-effective than any other sanitation option. For example, Jarvela (2012) simulated a five-year comparative financial cost analysis for EcoSan toilets, and two dominant sanitation technologies in Ghana; Kumasi ventilated improved Pit (KVIP) toilets and water closet (WC) toilet in the Ho Municipality of Ghana. The results showed that while the initial cost of construction was a little higher than KVIP but far lower than WC, EcoSan toilets have extra cumulative benefits that made them the most economical facility already during the first year and most financially sustainable over the years. This is because the value of the fertilizer derived from the EcoSan toilets was able to compensate for the marginally higher construction cost and in about five years the EcoSan facility was able pay for itself. Jarvela (2012) therefore concluded, based on other aspects of the facility, that EcoSan toilets are the most economically and environmentally sustainable sanitation option for the Municipality, and when comprehensive user education is included at the early stage in the introduction of the facility, EcoSan will be the most socio-culturally suitable model.

In similar studies, Mullegger and Lechner (2005) undertook a pre-investment cost comparison of construction and operation and maintenance (O&M) cost for school sanitation in Uganda with conventional flush toilets and sewerage and wastewater treatment versus urine diversion toilets and wastewater treatment. They found that the EcoSan option was 70% lower both in investment and in O&M costs than the other sanitation options. Similar research findings were observed in some developed countries. For instance, in a study by the Swedish EPA (2004), it was found that urine-diverting toilet with dry collection of faeces was the cheapest alternative in terms of the yearly combined construction and O&M cost when compared to other several conventional on-site household sanitation systems (Kvarnstrom et al, 2006). Also in a study in Denmark, Magid et al. (2005) compared the construction and O&M cost of different options of households and found that the on-site EcoSan system was slightly (3%) cheaper in capital and significantly cost less (13%) in operation and management.

Attitudes and perceptions towards ecological sanitation and related agricultural products

While there is adequate technological development for the appropriate ecological sanitation options, human behaviour patterns are a key factor in the acceptance of innovation and technology. Thus, no matter how well projects are technically planned and implemented, they can fail if socio-cultural beliefs of the beneficiaries and public perceptions about the project were not well conceived and adequately accounted for (WHO, 2006). Bieberstein (2012, citing Frewer & Miles,

2001; Knox, 2000) reports that people's perceptions of health-related risks such as those associated with human excreta reuse in agriculture are important determinants of food choices, their attitudes toward technologies used in the food and agricultural sector, as well as behaviour related to safety practices during food production. As observed by Wortman et al (1992), it is assumed that knowledge about the importance of human excreta can help provide a better understanding and promote behaviour that is consistent with beliefs and feelings of both residents and farmers.

Admittedly, negative attitudes and perceptions were an earlier challenge of the adoption and scale-up of EcoSan projects, particularly in most developing countries. For example, Drangert (2004:11) reports that some people in Manyatta, Kenya feared that *"tomatoes [may] smell like faeces and taste like urine"* if fertilized with excreta. Similarly, on a field to Kpong, in the Greater Accra Region of Ghana, we had a report that a headmistress of a local basic school refused to be connected with a small biogas facility built to provide household energy to her apartment, on the premise that the gas generated from a toilet facility may pollute her food.

Though attitudes and perceptions have been identified as a major challenge for the acceptance of EcoSan toilets, these cultural attributes can be adequately dealt with using appropriate communication tools. Thus, culture involves a constant building of meaning through the "processes of repetition - the reproduction of the ways of doing things and behaving which have been acquired; and renewal - the incorporation of new elements that add to or replace what has been acquired" (WaterAid, 2009). Therefore, societal attitudes are changeable and that through the process of renewal, people's or even communities' older beliefs can be altered or replaced with new ones that are more receptive to scientifically backed evidence. While this process might take some time to commence or complete, it can be facilitated through better community engagement and open discussions about the benefits of EcoSan toilets as well as the relevance of using microcredit as a tool to motivate this change process.

Conclusion

Sanitation has been shown to be a major contributing factor to many diarrhoea and diarrhoea-related diseases, which are the most frequent causes of death among children under five years of age worldwide. However, sanitation was the most neglected of all the MDG targets, and that a search for viable options in improving sanitation coverage is imperative in achieving the SDGs. Meanwhile, the inter-linkages of sanitation with many other development issues such as health, education, agriculture and poverty alleviation have been acknowledged widely in recent years. This paper has demonstrated the feasibility of microcredit as a viable tool to improve sanitation coverage in Ghana while at the same timeimproving agricultural productivity in the country, through EcoSan options. Although EcoSan is a relatively recent development, research and demonstration projects have shown promising economic gains, particularly the application of EcoSan products in agriculture. The paper therefore highlights the need to take seriously the sanitation problem in Ghana, and entreats

microcredit institutions to engage in diversified lending approach which seeks to target smallholder agricultural development through ecological sanitation provision. Since most urban and peri-urban dwellers who currently use septic tanks or the sewerage system are already used to it, the focus of microcredit for EcoSan toilets should be on new entrants who are willing to acquire private sanitation for their households. This emphasis on new entrants would have mutually reinforcing benefits for the microcredit institutions with an opportunity to broaden their client base and expand operation and hence medium to long term profit.

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