

AN ANALYSIS OF A PERI-URBAN SANITATION MARKET AND FARMERS' PERCEPTION ON EXCRETA REUSE IN AGRICULTURE IN DANGME WEST DISTRICT, GHANA

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DECLARATION

I, Fred Nimoh, hereby declare that this submission is my own work towards the PhD and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

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DEDICATION

This thesis is dedicated to my family: Awo, Paa K, Awurama and Junior, for their encouragement and support throughout this work.

God Bless You.



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ABSTRACT

This study sought to analyse a peri-urban sanitation market and farmers' perception on excreta reuse for agricultural purpose in Dangme West District of Ghana. Specifically, the study examined the constraints, motivations and strategies to the operation of sanitation business; analysed financing mechanisms and willingness-to-pay (WTP) for improved household latrines; investigated farmers' perceptions toward excreta reuse for agricultural purpose; and reviewed literature on regulatory policies for sustainable sanitation. Data were collected using observations, interview guide and survey questionnaire. Descriptive and inferential statistics were used for data analysis and reporting. The motivations and constraints to sanitation business were examined using case sanitation service providers (SSPs). Budgetary estimates and the logit/logistic model were employed to analyse households' latrine financing decisions, and their WTP for improved household latrines, using the contingent valuation method (CVM). Farmers' perception on excreta reuse as fertilizer was analysed with a Likert-type scale and the ordered probit model. Results of the study showed that there exist various sanitation-related businesses such as latrine builders/masons, hardware suppliers and pitemptiers, who operate as sole proprietors in a market characterized as monopolistic competition in the study area. Sanitation business in the study area was found to be profitable, despite the financial, institutional and social challenges to the SSPs' business. The study found that a majority of the households practise open defecation (ODF), though they prefer improved latrines, particularly the flush latrine and ventilated improved pit (VIP) latrine. Lack of space and funds, availability of alternative option (beach) and no economic value for excreta were mentioned by the households as key considerations to owning a household latrine. A comparison of the households' income and expenditure showed that the households have sufficient income to finance the construction and management of their latrines, contrary to the claim that they do not have funds to build a household latrine. A majority of households were willing to pay for improved latrines via savings rather than the use of credit, although the financial institutions in the study area are interested to offer loans for household latrines. Empirical results from the logistic model showed that there exists some relationship between households' latrine financing decisions and their socioeconomic and community characteristics such as gender, education, household composition, income, tenancy, defecation practice and location of community. It was also found that a majority of farmers 'disagree' that excreta are a waste and they would use excreta as fertilizer if sterilised; as they 'agree' that excreta could pose health risks. Empirical results showed that a farmer's decision to use excreta as fertilizer is more related to the perception on excreta as a resource, experience in community, household size, income, and land tenure system. Regulatory options identified for sustainable sanitation include the use of community-based organizations, the professional and trade associations, and consumers as 'watch groups'. Based on the findings of the study, the following recommendations, among others, have been made to help improve the Ghanaian peri-urban sanitation: there is the need to address the constraints to sanitation business for effective service delivery. Households should be encouraged to consider the 'cheaper' and more feasible latrine technologies, and also adopt joint-resource mobilization strategies for their latrines. Programmes aimed at promoting improved sanitation, in a sustainable manner, should consider the heterogeneous needs and location of households as well as the reuse potential of excreta in agriculture. The choice of regulatory options for sustainable sanitation should be based on a

comparative assessment of the trade-offs between effectiveness, ease of implementation and costs and benefits.

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List of Abbreviations/Acronyms

ALA	-	Accra Learning Alliance
BOO	-	Build-Operate-Own
BOT	-	Build-Operate-Transfer
CANR	-	College of Agriculture and Natural Resources
CASS	-	College of Arts and Social Sciences
CDR	-	Committees for the Defense of the Revolution
CHPS	-	Community Health and Planning Services
CLTS	-	Community-Led Total Sanitation
CWSA	-	Community Water and Sanitation Agency
DAEAE	-	Department of Agricultural Economics, Agribusiness and Extension
DHDSS	-	Dodowa Health and Demographic Surveillance System
EHSD	-	Environmental Health and Sanitation Directorate
FGD	-	Focus Group Discussion
GNCCI	-	Ghana National Chamber of Commerce and Industry
HH	-	Household
ILO	-	International Labour Organisation
JMP	-	Joint Monitoring Project
KNUST	-	Kwame Nkrumah University of Science and Technology
MDGs	-	Millennium Development Goals
MFIs	-	Microfinance Institutions
MLGRD	-	Ministry of Local Government and Rural Development
NBSSI	-	National Board for Small Scale Industries
NGO	-	Non-Governmental Organisation
NI	-	Net Income
ODF	-	Open Defecation
PATH	-	Program for Appropriate Technology in Health
PM	-	Profit Margin
SCP	-	Structure, Conduct, Performance
SSPs	-	Sanitation Service Providers
SUSA	-	Sustainable Sanitation
TC	-	Total Cost
TR	-	Total Revenue
UNICEF	-	United Nations Children's Fund
VIP/ KVIP	-	Ventilated Improved Pit
WFP	-	Water for People
WHO	-	World Health Organization
WSMP	-	Water and Sanitation Monitoring Platform
WSP	-	Water and Sanitation Program

CHAPTER ONE

INTRODUCTION

1.1 Background

Proper sanitation¹ is a basic human need and it is crucial for life and health (WSP, 2004; Jaehyang, 2008). Nevertheless, 2.5 billion people worldwide and more than half of the population in the developing world, particularly the poor and disadvantaged in peri-urban communities, do not have access to improved sanitation facilities² (WHO/UNICEF, 2014). Poor sanitation poses serious health risks with negative implications on the socioeconomic development of nations (Choudhury and Hassain, 2006; WHO, 2008). To halve the proportion of people without access to proper sanitation is a Millennium Development Goal (MDG 7c). However, it is unlikely the world's MDG target for improved sanitation (i.e. 75% by 2015) may be achieved until 2026, as unfortunately, the developing world such as Southern Asia and sub-Saharan Africa (including Ghana) are still struggling with low coverage of 42% and 30% respectively (WHO/UNICEF, 2014).

Since the inception of the MDGs' target for sanitation, Ghana has recorded some improvements in access to improved sanitation, though the rate of improvement is low relative to water (Fig. 1.1) (WHO/UNICEF, 2012). Currently, Ghana's coverage of improved sanitation is 14% of the 54% target (WHO/UNICEF, 2014), despite widespread efforts in nation's sanitation policy since the colonial times (Thrift, 2007). Lessons from the historical

¹ The WHO (2004) defines 'proper' sanitation as involving better access and safer disposal of excreta. ² Improved sanitation facilities include: flush/pour-flush to piped sewer system, septic tank and pit latrine; ventilated improved pit latrine (VIP); and composting toilet. Unimproved facilities include: flush/pour-flush to elsewhere, pit latrine without slab or open pit, bucket, hanging toilet or hanging latrine, and no facilities or bush or field (open defecation-ODF) (JMP - WHO/UNICEF, WSMP, 2009).

shortcomings of Ghana’s sanitation policy now call for public-private partnership in the management of sanitation in Ghana (MLGRD, 2010), albeit the opposing interest by users, particularly people in peri-urban communities, due to the ‘full price effect’. Moreover, Nyangena (2008) argues that privatization of sanitation services is the key to the needed expansion and a more cost-effective and better service delivery approach in the sanitation market.

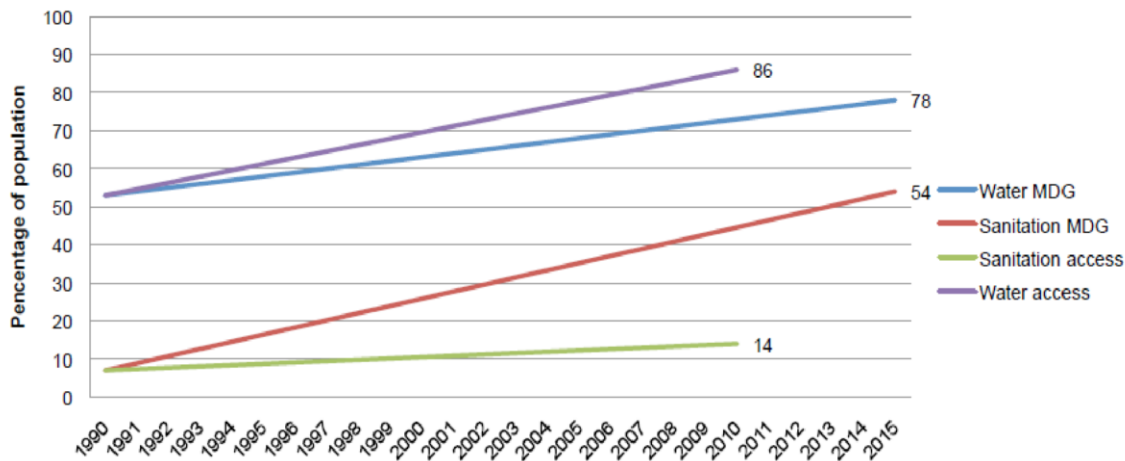


Fig. 1.1: Ghana’s Progress towards the MDG Targets on Safe Drinking Water and Basic Sanitation. *Source: JMP (UNICEF/WHO), 2012*

Unfortunately, notwithstanding the importance of proper sanitation, some households in periurban communities seem to be satisfied with their current open defecation (ODF) practice. For that reason, the perceived household demand for improved sanitation may not be high until other needs such as housing, water, farming, and schooling are met (Card and Sparkman, 2010). Moreover, sanitation business in low income countries (like Ghana) is characterized as: (i) slow moving; (ii) having relatively low priority need by households; (iii) having limited use of technology and fragmented supply chain; (iv) having donor distortions and subsidies; and (v) is perceived as having a poor social context (WFP, 2011; Card and Sparkman, 2010). In

such a situation, a new private sector enterprise would therefore have minimal interest in pursuing a profitable sanitation business, particularly in poor peri-urban communities where there are *cheaper* and/or *cost-free* alternatives such as ODF in the bush and beach.

Similarly, the introduction of free or subsidised sanitation facilities (thus, latrines) by governments and NGOs is also considered a cause of market distortion, which tends to discourage entrepreneurship in the sanitation market. In addition, limited information on the profitability of sanitation business could also dissuade entrepreneurs' interest in sanitation business. Notwithstanding the possible challenges to the private sector in the sanitation market, studies have shown that sanitation business is profitable (UN-Water, 2013 in Guy and Haller, 2004), and to the private sector, the untapped market for sanitation services is considered as one of the world's great business opportunities (Tully, 2000).

The focus of this study is to analyse the peri-urban sanitation market in order to understand the operations of sanitation-related businesses, households' response to the paradigm shift on use of improved sanitation (latrines), and farmers' perception on excreta reuse for agricultural purpose in peri-urban communities in Ghana. This study is a part of the Sustainable Sanitation Ghana (SUSA-Ghana) project with a broad objective to expand access to improved sanitation facilities among peri-urban residents in Dangme West District, Ghana

(see: <http://susaghana.com>). The SUSA-Ghana project has five main 'work packages' involving PhD and MSc studies. The specific studies of the SUSA project are: socio-cultural study on the preferences and practices in peri-urban sanitation; assessment of the technical and urban planning barriers to improved sanitation; investigation into risks and hazards in peri-

urban sanitation provision, analysis of sanitation business systems in peri-urban sanitation; and monitoring and evaluation in the sanitation sector. This study is part of the ‘sanitation business systems’ work package.

1.1.1 Sanitation: Meaning and Diversity

The WHO (2012) defines sanitation as the provision of facilities and services for the safe disposal of human urine and faeces. It can be also defined as the maintenance of hygienic conditions, through services such as garbage collection and wastewater disposal. Sanitation also refers to interventions, usually construction of facilities such as latrines that improve the management of excreta.

According to WHO (2008), most professionals also consider the term ‘sanitation’ as a ‘big idea’ which comprises: safe collection, storage, treatment and disposal/reuse/recycling of human excreta (faeces and urine); management/reuse/recycling of solid wastes (trash and rubbish); drainage and disposal/reuse/recycling of household wastewater (often referred to as sullage or grey water); drainage of storm water; treatment and disposal/reuse/recycling of sewage effluents; collection and management of industrial waste products; and management of hazardous wastes (including hospital wastes and chemical/radioactive and other dangerous substances).

Depending on the region and/or level of economic development, different approaches are employed by governments to address a country’s specific sanitation problem. Some countries in the developed world have focused on a more complete approach involving the use of specific

inter-linkages between the elements of sanitation, that is, from the management of human excreta to solid wastes and storm water management. In developing countries, like Ghana, the focus has been on the management of excreta, as it is the biggest challenge at the household level and also considered to have the biggest health implications in the short term (WHO, 2012). In that sense, this study focused on the ‘professional idea’ that defines ‘sanitation’ as the safe collection, storage, treatment and disposal/reuse/recycling of faeces (human excreta), and associated sanitation businesses and farmers’ perception on human excreta for agricultural purpose.

1.1.2 Costs and Benefits of Sanitation

A number of studies have reported on the importance of proper sanitation on health and socio-economic development, worldwide (WHO, 2004). The importance of the available evidence emphasises the consideration in the MDG on water and sanitation, which states the need to ‘halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation’. Improving access to sanitation services may be considered to be a disease preventive intervention, where the main outcome is the reduction in the number of episodes of diarrhoea, and consequently a proportionate reduction in the number of deaths. It is estimated that achieving the MDG water and sanitation targets would yield economic benefits of between US\$3 and US\$34 per US\$1.00 invested (depending on the region), and the benefits would include an average global reduction of diarrhoeal episode by 10% and a total annual economic benefit of US\$84 billion (WHO, 2004). It is also estimated that a 10-year increase in average life expectancy at birth, with the increase associated with access to

proper sanitation, can translate into a rise of 0.3-0.4% in economic growth per year (WHO, 2008).

There are other socio-economic benefits of proper sanitation which range from the easily identifiable and quantifiable benefits (e.g. cost avoided and time saved) to the more intangible and difficult-to-measure benefits (e.g. convenience and well-being). The costs avoided/time saved benefits include: less illness; reduced number of treatments of diarrhoeal cases; reduction on patients' expenditures on cares, drugs and transport and opportunity costs of time spent on seeking care; avoided days lost to both formal and informal employment and other productive activities in the household or school attendance; and time saving related with closer location of sanitation facilities and consequent more leisure time. Other benefits of access to proper sanitation include: convenience and comfort, privacy and safety, avoidance of sexual harassment and assault (particularly for women and girls), less embarrassment with visitors, and dignity and social status (WSP, 2004).

Conversely, the costs (health and socioeconomics) associated with poor sanitation are enormous. According to the WHO (2008), the most prominent of the health-related problems associated with poor sanitation is the episodes of diarrhoeal cases and risks of other infectious diseases which normally lead to deaths of millions, particularly the vulnerable groups such as children under five and the elderly in the developing countries. Moreover, the impact of poor sanitation can lead to a number of financial and economic costs such as: increased households' direct medical costs associated with treating sanitation-related diseases; lost income through reduced or lost productivity; increased social costs of providing health services; time and effort

losses due to distant or inadequate sanitation facilities; and reduced income from tourism and clean up costs. Furthermore, the daily exposure to an unpleasant environment as a result of the poorly controlled waste does not only pose human risk, but also affects other species which threaten the ecological balance of the environment.

1.1.3 Historic Shortcomings of Ghana's Sanitation Policy

According to Thrift (2007), since the colonial times till the 1980s, sanitation in urban Ghana was run by the municipal government. The municipal built, operated and maintained sanitation facilities such as public toilets, and charged no user fees in the process. This lasted till the *revolution* of the early 1980s, where several bottlenecks were identified, including failure to extend services to all communities, failure to consider people's ability/willingness to pay for the use of facilities, and poor maintenance of facilities.

As part of the *revolution* in 1981, local collectives called *Committees for the Defense of the Revolution* (CDRs) were formed to take charge of public toilets. This came with the construction of new toilet facilities and a change of controllers of existing facilities, and introduction of user fees for maintenance of the facilities. The use of the mobilized resources to other uses led to a short-lived success in the maintenance of those facilities. This led to the reclamation of control by the national government via the Metropolitan Assemblies in the late 1980s which then managed the toilet facilities.

Following the numerous setbacks, public-private partnerships for public toilets and treatment sites were then initiated and extended to all districts in Ghana with greater successes in

management than the prior model during the 1990s. Currently, the participation of the private sector in sanitation market has been low in Ghana, due to some challenges affecting the desires and efforts of the private sector.

1.1.4 The Policy Direction towards Improved Sanitation in Ghana

Among the strategies of Ghana's current sanitation policy is the privatization of environmental sanitation services. Ghana's revised sanitation policy (*in 2010*) supports building partnership with the private sector within an expanded network of actors through effective public sector facilitation and coordination (EHSD-MLGRD, 2010). The current emphasis is to ensure systematic collection of data to support relevant research needs as well as the development of solutions to sanitation challenges associated with the growing economy and rapidly changing lifestyles.

The policy direction of improving sanitation in Ghana is in accord with neoclassical theories which represent a radical shift away from 'International Dependence Theories'². These theories argue that governments should not intervene in the economy, emphasizing that an unobstructed free market is the best means of inducing rapid and successful development (Todaro and Stephen, 2006). Moreover, proponents of neoclassical theories argue that competitive free markets unrestrained by excessive government regulation are seen as being able to naturally ensure that the allocation of resources occurs with the greatest efficiency possible for increased and stabilized economic growth. This supports the call for the

² Theories of international dependence gained prominence in the 1970s. They have their origins in developing countries and view obstacles to development as being primarily external in nature, rather than internal (Todaro and Stephen, 2006). These theories view developing countries as being economically and politically dependent on more powerful, developed countries which have an interest in maintaining their dominant position.

publicprivate partnership (PPP) approach to providing proper sanitation services, as endorsed by

Ghana's current sanitation policy.

In Greater Accra Region, the study area, the vision of authorities as defined by the Accra Learning Alliance (ALA) is to ensure that at least 80% of the region's citizens have access to an acceptable level of an improved sanitation facility such as the flush latrine, KVIP/VIP or good public toilets by 2030. It is proposed that pan and bucket latrines should be phased out and there should be *zero* ODF (Adank *et al.*, 2011).

1.1.5 Failures of Simple Hardware Provision over Time

Improving sanitation has a high input and social costs, hence achieving the MDGs' target for improved sanitation in the developing economies, like Ghana, depends on the availability of funds to cover the capital costs of new infrastructure, for example in the sewer systems. Moreover, there is the need for investments in demand creation, feasibility studies, operations and maintenance, and general capacity building in the sanitation sector. The costs associated with the building and maintenance of improved latrines may undermine the aim of achieving full sanitation coverage (Evans *et al*, 2009), therefore necessitating the need for a sustainable financing strategy for the uptake of improved sanitation.

One area of sanitation financing in developing countries that attracts strong debate is the use of public money to finance households' sanitation, usually referred to as '*hardware subsidies*'.

There have been arguments about the '*hardware subsidy*' approach. Evans *et al*.

(2010) provide an overview of some of the arguments: as being economically justified; not cost prohibitive; and as a way of helping to promote equity and protection of the most vulnerable social populations. Moreover, it is also argued that governments have a moral duty to ensure that everyone has the potential to live in a clean, healthy and dignified environment, and that subsidy for sanitation facilities are an obligation of governments.

Even though the '*hardware subsidies*' approach is proposed to be one of the surest ways of providing improved sanitation to poor households, there have been some misinterpretations of its failure. Evans *et al.* (2009), in a review of literature, conclude that public subsidy does not fail *per se*, but fails when it is closely associated with a supply-driven approach that does not take into consideration households' preferences, their behaviour, and access to capital. Again, there is the assertion that many private organisations and government departments have focused on providing toilets with the aim of achieving a high coverage rather than motivating their use and maintenance (WSP, 2007). Hence, the failure of the '*hardware subsidies*' are also attributed to: lack of motivation for use and sustainability (Cairncross, 2004; Robinson, 2005); problem with targeting the poorest or the most disadvantaged households (Jenkins and Sugden, 2006); lack of financial resources to support a subsidised programme; and activities that undermine the business potential and/or may trigger market distortion (Mehta and Knapp, 2004).

1.1.6 Challenges to Expanding Sanitation Uptake and the Role of the Private Sector

There are challenges to expanding the uptake of improved sanitation, globally. The form or origin of the challenges may be political, economic, poor stakeholder participation, technical

and monitoring barriers (Danida, 2010). In Ghana, the low uptake of proper sanitation is attributed to political, technical and monitoring barriers (Thrift, 2007). The experience from the solitary operation of the sanitation sector by the municipal government in the colonial days to the CDR controls of the early 1980s now supports the call for public-private partnership in the provision and management of proper sanitation in Ghana.

Evidently, there is better performance in private utilities compared to state-owned utilities (Nyangena, 2008; Kirkpatrick *et al.*, 2004). Public sector utilities in developing countries have often not been efficient in providing access to reliable sanitation services, and countries across the world are increasingly looking to the private sector for assistance in the provision of the needed sanitation services. Towards this end, privatisation of sanitation services is viewed to be a cost-effective approach to service delivery that can also enhance quality and performance (Nyangena, 2008).

Governments' failure to bridge the demand-supply sanitation gap then provides an opportunity for the private sector to thrive in the sanitation market. Studies have also shown that households are willing and able to own proper sanitation facilities (Whittington *et al.*, 1993; Tiltnes, 1998; Harapap and Hartono, 2007). To the private sector, the untapped market for sanitation services is considered as "one of the world's great business opportunities" (Tully, 2000). The survival and sustainability of the private sector may however require recognition of the different household characteristics which will necessitate the creation of distinct homogenous categories of service users/households separated by how they respond to (sanitation) market interventions.

1.2 Problem Statement

Poor sanitation affects billions of people globally, particularly the poor and disadvantaged in developing countries like Ghana, where there is high population density and lack improved sanitation facilities (latrines). It is estimated that by 2015 there will be 2.7 billion people without access to basic sanitation (WHO, 2012). Ghana's coverage of improved sanitation is far below expectation; it is currently at 14% of the country's MDG target of 53% (WHO/UNICEF, 2014). In Ghana, most households do not have access to improved sanitation (latrines) and therefore practise open defecation (ODF); poor sanitation remain a serious health challenges to the country. Official statistics by the Ghana Health Service indicate that about 80% of all OPD cases are sanitation and water related (WSMP, 2008). It is also estimated that poor sanitation costs Ghana US\$290 million per annum (representing about 1.6% of the country's GDP) and open defecation costs Ghana US\$79 million per annum (EHSD-MLGRD, 2012; GSS, 2013).

In the study area, Dangme West district (now Shai Osudoku and Ningo-Prampram districts), it is estimated that most households (over 70%) practise open defecation (ODF) (SUSA Baseline Report, 2011). Household latrines are inadequate, and the available few public latrines are over-utilised and poorly managed, resulting in low patronage of the public latrines. There are also ineffective regulatory policies for the uptake of improved sanitation. The prevailing situations in the study area could result in health problems and social costs that can be huge and devastating.

A current approach aimed at improving the sanitation landscape in Ghana is to use business and marketing strategies to promote investment in household latrines; each household to install an improved to help improve the overall health situation (Furlan, 2013). Based on the MDGs' on environmental sustainability³, attempts are being made by the government of Ghana and other stakeholders to increase households' access to private latrines via the private sector. This is supported by Ghana's current sanitation policy which specifies the need for a public-private partnership (PPP) approach to address the poor households' sanitation problem (EHSD-MLGRD, 2010). The government and other stakeholders such as the Municipal and District Assemblies and NGOs have indicated that there is lack of funds to promote sanitation for the heterogeneous and growing peri-urban population. In fact in recent years, actual expenditures on sanitation had on average been lower than planned expenditures; Ghana is heavily depending on donor funding (for both water and sanitation) with an average proportion of about 12:1 donor to government contribution (WaterAid/DFI, 2012). In addition, financial support via credit unions and microfinance schemes for household latrines are non-existing or unknown in Ghana.

The new sanitation policy has created alarming situations, as there have been notices with deadlines to households to construct private latrine facilities, else they risk legal sanctions. Such measures also risk the construction of inappropriate latrine technologies (Furlan, 2013), in the fear and haste to obey the laws. The current sanitation policy seems to create some discomfort to households, particularly those in poor peri-urban communities, due to the 'full

³ MDG 7c: To halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation.

price effect' or cost to the household. The acquisition of an improved sanitation (household latrine) may therefore lead to a change (rise) in the household expenditure which may not commensurate to the fixed household budget. A relatively high cost of an improved sanitation facility can therefore discourage the peri-urban poor from accepting improved sanitation. To the service user/household, the ability to pay for improved sanitation even when preferences are made is a major determinant of demand. Lack of demand, is in fact, the largest threat to any potential or current sanitation business (Card and Sparkman, 2010).

Unfortunately, notwithstanding the importance of proper sanitation, some households seem to be with their current ODF practice. For that reason, the perceived demand for improved sanitation may not be high until other households' needs such as housing, water, farming, and schooling are met (Card and Sparkman, 2010). Similarly, the introduction of free or subsidized sanitation facilities (latrines) by governments and NGOs normally creates unrealistic expectations among households. In that sense, it becomes difficult to market the concept of 'selling' toilet services as opposed to giving them away for free. This situation causes market distortion which tends to discourage entrepreneurship in the sanitation market. Moreover, sanitation business in low income countries (like Ghana) is characterized as: (i) being slow moving; (ii) having relatively low priority need by households; (iii) having limited use of technology and fragmented supply chain; (iv) having donor distortions and subsidies; and (v) having a poor social context (WFP, 2011; Card and Sparkman, 2010). In such a situation, a new private sector enterprise would therefore have minimal interest in pursuing a profitable sanitation business, particularly in poor peri-urban communities like the study area where there are *cheaper* and/or *cost-free* alternatives such as ODF in the bush and beach.

Another challenge has been the escalating costs associated with the management of sanitation. Invariably, governments' expenditures on sanitation have been substantially high. It is reported that municipal authorities spend huge sums (50–75% of municipal budget) to dispose the ever increasing amounts of waste, including wastewater and solid waste (Cofie *et al.*, 2005). It is estimated that Ghana spends about US\$290 million (1.6% GDP) per annum on the management of sanitation, and ODF costs the country US\$79 million per annum (EHSD-MLGRD Statistics, 2012). It is estimated that about 60% of the District's budget is allocated to sanitation (communication with District Assembly Officers, 2011).

In addition, access to improved latrines has associated cost with respect to cost of effluent (excreta) discharge. In the study area, access to disposal sites for human excreta (faecal sludge) is also problematic due to lack of space and competition with operations of local authorities, among others. Service providers (faecal truck operators) travel long distances to dispose of human excreta. This situation tends to increase the operational costs to the service providers, which is transferred to the household and thus, creates a further disincentive for owning a household latrine. However, there is evidence that households may benefit more in their investments in improved sanitation if such investments offer tangible value to them such as the reuse of excreta in agriculture. Jensen *et al.* (2005) point out that farming households would probably accept improved sanitation technologies and hygiene promotional activities if those technologies/activities could be accommodated with the agricultural production system and be seen as offering an economic benefit. In that sense, the idea of excreta reuse for agricultural purpose, which tends to vertically integrate with the sanitation business system, could provide an avenue for balancing food security and environmental health in peri-urban communities.

On the contrary, some households have biased attitudes toward human excreta reuse in agriculture, as they perceive excreta as a waste rather than as a resource by traditional sanitation (Gjefle, 2011). Moreover, some people are turned off immediately by the term ‘faecal sludge’ as it is usually considered as dirty, smelly and harmful substance (Douglas, 1966; IWMI, 2013). Jensen *et al.* (2005) also argue that the use of excreta can have severe negative health consequences. In Ghana, while this essential organic manure is considered as waste, the government spends scarce foreign exchange to import chemical fertilizers which are becoming more expensive (Cordell *et al.*, 2009), due to the increasing demand for their use in agriculture (Asare *et al.*, 2003). Moreover, chemical fertilizers have the potential to pollute both surface and ground water and can cause accumulation of harmful heavy metals in the soil (Mariwa and Drangert, 2011). To minimise the possible health hazards with chemical fertilizers use in agriculture therefore necessitates a consideration of ecological sanitation, which is a new paradigm in sanitation that recognizes human excreta as a resource that can be recovered, treated where necessary, and safely used again (WHO, 2006; Gjefle, 2011).

Research Questions

On the basis of the aforementioned issues, this study sought to address the following specific questions:

- i. What are the constraints to and motivations for sanitation business development in the study area?
- ii. What strategies are employed by sanitation service providers (SSPs) for the survival of their businesses?

- iii. What are households' latrine preferences and financing mechanisms for improved household latrines in the study area?
- iv. Are households in the study area willing to pay for improved household latrines?
- v. Are households aware on the use of human excreta for agricultural purpose, and are they interested to use excreta as fertilizer on their crops?
- vi. What are crop farming households' attitudes and perceptions toward excreta reuse as fertilizer in agriculture in the study area?
- vii. What regulatory options could be considered for sustainable sanitation?

1.3 Objectives of the Study

The main objective of the study is to analyse the sanitation market in peri-urban communities in Dangme West District, with particular focus in Prampram in Ghana. The specific objectives of the study are:

1. To assess the nature of local sanitation businesses in Prampram and its environs,
2. To examine the constraints, motivations and strategies to the operation of sanitation business in the study area,
3. To assess households' preference for improved latrines, their financing mechanisms, and estimate their willingness-to-pay for improved household latrines,
4. To investigate crop farming households' attitudes and perceptions toward human excreta reuse for agricultural purpose in the study area, and
5. To review literature on regulatory policies for sustainable sanitation.

1.4 Hypotheses

Hypothesis	Source
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<p>□ Sanitation (latrine) business in poor peri-urban communities in southern Ghana is profitable.</p>	<p>WHO, 2008; UN-Water, 2013 in Guy and Haller, 2004</p>
<ul style="list-style-type: none"> • Household and community factors such as: <i>age, education, household composition-with children, income, tenancy-house ownership, use of public latrines, improved latrine preference, type of community and supply conditions - residents far from the sea and access to water and latrine complementary products</i> - have positive and significant influence on a household's latrine financing decision and willingness-to-pay for improved latrines. • Household factors such as: <i>gender-male and household size</i> have negative and significant influence on latrine financing decision and willingness-to-pay for improved latrines. 	<p>Weinberger and Jütting, 2000; Whittington et al., 1993; Tiltnes, 1998; Harapap and Hartono, 2007</p>
<ul style="list-style-type: none"> • Personal and farm characteristics such as: <i>gender-male, age, education level, experience in community, income, farm size, land tenure - own land, and knowledge and perception on excreta – as a resource</i>, have positive and significant influence on a farming household's attitude and perception toward human excreta reuse for agricultural purpose. • The <i>type of crop cultivated - vegetables</i> - has a negative and significant influence on a farming household's attitude and perception toward excreta reuse in agriculture. 	<p>Asare et al., 2003; Cofie et al., 2004; Robinson, 2005; Cofie et al., 2010; Mariwah and Drangert, 2011</p>

1.5 Relevance of the Study

Access to proper sanitation has important implications for the social and economic development of nations, worldwide. The presence of decent latrines at home also helps to reduce time spent on queuing at public latrines, reduces the risk and shame of open defecation, and increases social dignity. Conversely, poor sanitation is a major cause of diseases which affects billions of people world-wide, particularly the poor in urban and periurban communities in developing countries.

In Ghana, most households in poor peri-urban communities lack improved sanitation. The rapid population growth in urban and peri-urban communities in Ghana, caused mainly by migration and with the consequent high population density, has outpaced the ability of the government and local authorities to provide better public services such as improved sanitation (improved latrine) to a greater proportion of the population in those communities. Most households in poor peri-urban communities practice open defecation, and there is low demand for improved sanitation. On the basis of these challenges, it is envisioned that a study on the analysis of the sanitation market would help to provide valuable information for policy makers and other stakeholders in their quest for solutions for sustainable sanitation in Ghana.

In Ghana, the sanitation sector is less developed as a business, particularly in poor peri-urban communities where the demand for improved sanitation is low. There is lack of effective regulatory policies and incentives to make the sanitation sector attractive. Moreover, there are limited entrepreneurial capacities (financing, technical and marketing skills) by the available private service providers. In addition, limited information on the profitability of sanitation business could also dissuade entrepreneurs' interest in sanitation business. In this regard, an assessment of the constraints and motivations to sanitation business development, as well as on the strategies employed by existing sanitation businesses would help to provide useful information for the improvement of the sector.

Information on the demand for improved sanitation is an important social and behavioural process with implications for public health, sanitation policy and planning, and sanitation design and technology development. However, information on peri-urban households' latrine

preference and the demand (WTP) for improved latrines are rarely available in Ghana. In view of this, the identification of households' latrine preference and the factors that influence their financing decisions for improved latrines would provide valuable information for the formulation of short- and long-term sanitation marketing programmes. Moreover, information on households' WTP for improved latrines is also crucial for the design and execution of appropriate programme(s) for the uptake of improved sanitation in the study area and other communities in Ghana.

Excreta reuse for agricultural purpose in Ghana is low, although some farmers are aware of the potential benefits of excreta as fertilizer. Few studies have assessed the use of excreta in agriculture (Asare *et al.*, 2003; Cofie *et al.*, 2010; Mariwah and Drangert, 2011). In addition, sanitation practice is to a large extent considered a social phenomenon, and as such people's attitude and perceptions would have influence on excreta reuse. In that sense, information on households' attitude and perceptions toward excreta reuse for agricultural purpose is vital for effective planning, implementation and evaluation of sanitation promotional activities aimed at ensuring sustainable sanitation.

The output of this study is expected to provide input for the formulation of appropriate policies and strategies aimed at improving the sanitation sector for the benefit of households, particularly the poor in peri-urban communities, sanitation service providers/businesses, and the entire Ghanaian community.

1.6 Organisation of the Study

The study is organised into five chapters. Chapter one provides the background of the study, the problem statement, objectives and hypotheses, and relevance of the study. Chapter two presents the conceptual framework and a review of literature relevant to the study. Chapter three provides information on the study area and the methodology for the study. Chapter four presents the results and discussion of the key findings of the study. Last but not the least, chapter five presents the summary, conclusion and recommendations based on the key findings of the study.

CHAPTER TWO

CONCEPTUAL AND THEORETICAL FRAMEWORK

2.1 Conceptual Framework

Improved sanitation facility (latrine) is perceived by some households, particularly those in poor peri-urban communities, as a ‘merit good’⁴. In view of this, there are debates that the effective demand (based on *willingness* and *ability* of pay) for proper sanitation need not necessarily include an *ability to pay*. In such a situation, the *willingness to pay* is sufficient to warrant the market and government (*through subsidy*) provision. Evidently, the perception of improved sanitation being a ‘merit good’ does not oppose its inclusion in the MDGs, calling

⁴ A merit good is one considered as so important for health and well being that more of it should be provided by government than what the market mechanism alone will allow. A merit good has positive externalities, but consumers do not realise the true benefits and so they are under consumed (http://en.wikipedia.org/wiki/Merit_good).

for the recognition of it as an ‘economic good’⁵. Invariably, there have been debates on the theoretical and operational implications, as well as the social and economic impact of the recognition of ‘improved sanitation as an economic good’ on the poor.

In reality, a change in the provision of a household’s sanitation status, that is from use of public latrine or ODF to improved household latrine, may lead to a ‘full price effect’, as the possible change in price may not commensurate to the fixed household budget. Nonetheless, a change in the household’s defecating practice with the use of an improved latrine instead of the public latrine or ODF is expected to result in optimum satisfaction that would lead to welfare maximisation. With the shift to the use of an improved latrine, the household’s utility can be maximised subject to its fixed budget. It is assumed that the household has an exogenous budget which is to be spent on alternative commodities which can be bought in non-negative quantities at given fixed, strictly positive prices. It is also assumed that the provision of improved sanitation (latrine), consistent with suppliers’ interest, will also lead to profit maximization to suppliers. Figure 2.1 provides the summary concept of the possible stakeholder interactions in the sanitation market, based on the perceived change to use of improved sanitation (latrine). This concept guided the formulation of the objectives for this study.

⁵ A good that is useful to people but scarce in relation to its demand, so that human effort is required to obtain it (<http://www.businessdictionary.com/definition/economic-goods.html>).

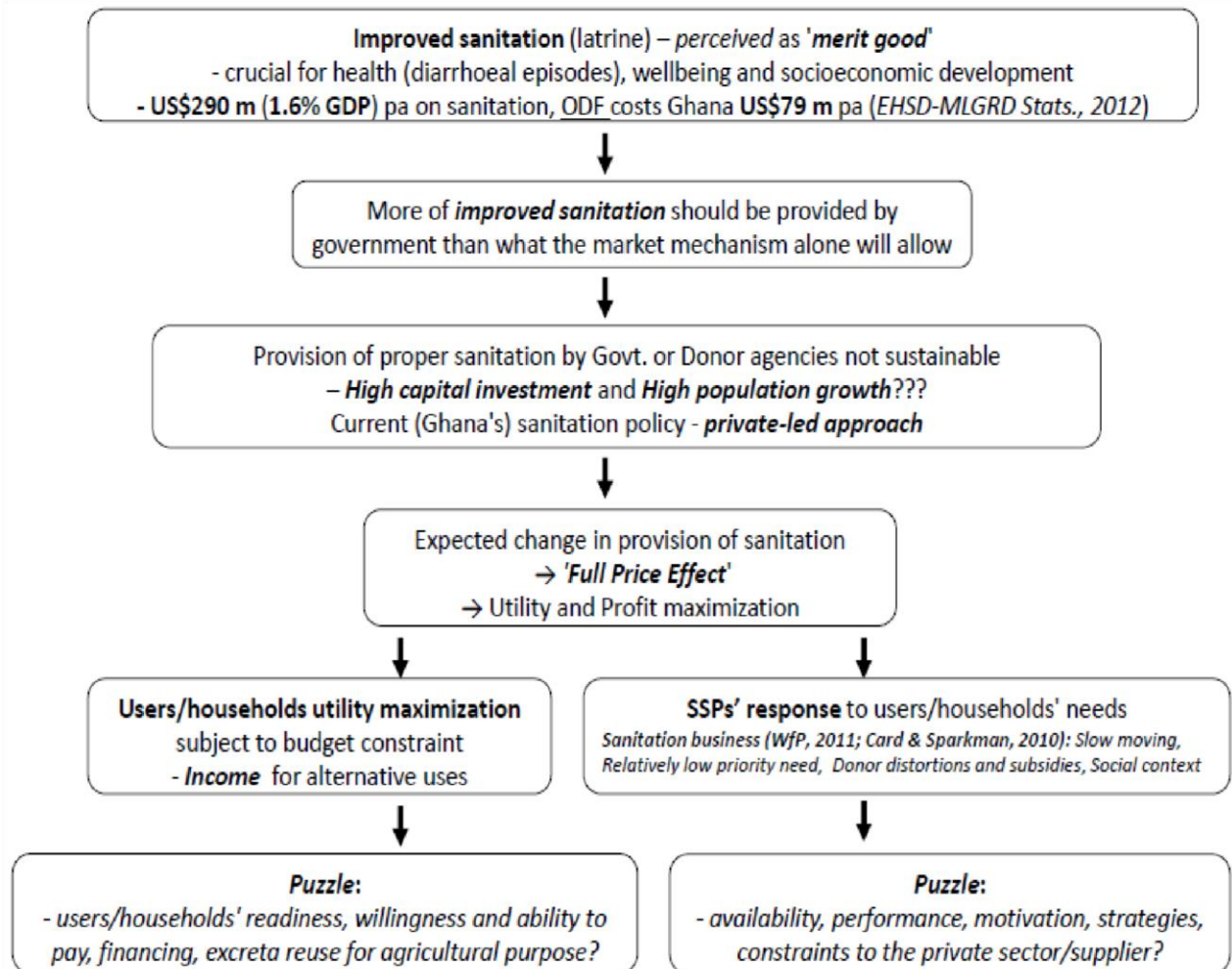


Fig. 2.1: Conceptual Framework – Demand-Supply Paradigm of Improved Sanitation.

Source: Author's construct, 2012

2.2 Literature Review/Theoretical Framework

This section presents literature review on the following: sanitation market and sanitation business models, latrine technologies, financing mechanisms for improved latrines, households' attitudes and perceptions on excreta reuse in agriculture, regulatory options for sustainable sanitation, and methodological review on the methods employed for data analysis for the study.

2.2.1 Sanitation - A Global and Local Perspective

Safe disposal of excreta and hygiene behaviours are crucial for the dignity, status and wellbeing of every person, be they rich or poor, and irrespective of whether they live in rural areas or urban centres. The primary direct negative impact of poor sanitation is on health, the most significant being diarrhoeal diseases, which also has a direct impact on the social and economic development of nations, particularly in developing countries.

According to the WHO/UNICEF (2014), since 1990, there have been some achievements in meeting the MDG target for sanitation as almost 2 billion people now have access to improved sanitation. However, it is also reported that even though progress towards the MDG target represents important gains, much remains to be done, as more than one third of the global population - about 2.5 billion people - do not use improved sanitation facility, and of these 1 billion people still practice open defecation.

2.2.1.1 Sanitation in Developing Countries

Global figures on the lack of water and sanitation services are alarming. It is estimated that more than a billion people do not have access to improved drinking-water suppliers, and lack of proper sanitation is even worse, with an estimated 2.6 billion individuals without improved sanitation services (Montgomery and Elimelech, 2007). The situation is most severe in developing countries, as in sub-Saharan Africa it is estimated that 64% of the population is without improved sanitation, and the deaths due to diarrhoeal diseases are greater than in any other region.

The recent records indicate that there have been some increases in sanitation coverage in the developing regions, although the coverage is low relative to the developed regions. It is estimated that 56% of people in developing regions now use an improved sanitation facility (WHO/UNICEF, 2014). Among the developing regions, the progress has been greatest in Eastern Asia, where coverage has increased by 40% since 1990, largely driven by China with 94% coverage. South-eastern Asia, Southern Asia and Northern Africa have also achieved a coverage increase higher than the average for the developing regions. Southern Asia and sub-Saharan Africa have the lowest level of coverage of 42% and 30%, respectively.

In sub-Saharan Africa, progress in sanitation coverage has been much slower, relative to the coverage in other developing regions. The WHO/UNICEF (2014) report on sanitation indicates that the improved sanitation coverage of 30% in sub-Saharan Africa reflects only a 5% increase since 1990, in contrast to Southern Asia's coverage increase of 19% since 1990, to reach 42% of the population in 2012. The low sanitation coverage in sub-Saharan Africa is due to the poor performance of some countries in the region. For example, it is estimated that Nigeria has recorded a decline in coverage of improved sanitation, from 37% in 1990 to 28% in 2012. Ghana's coverage of improved sanitation has doubled since 1990 (7%) to 2012 (14%), though the coverage is low. Of this progress, coverage in the rural area contributed the more, doubling from 4% (1990) to 8% (2012), whilst coverage in the urban area increased by about half (54%), from 13% (1990) to 20% (2012). This could be due to increasing population in the urban areas as a result of rural-urban migration.

2.2.1.2 Sanitation Ladder and Latrine Technologies

The United Nations has mandated UNICEF and the WHO to monitor progress on the MDGs on water and sanitation, globally (WSMP, 2008). These two agencies have created a Joint Monitoring Programme (JMP) to undertake this assignment. The goals of the JMP are to report on the global status of water and sanitation, and to support countries in their efforts to monitor these sectors. The strategic objectives of the JMP involves compilation, analysis and dissemination of high quality data, and serving as a platform for the development of indicators, procedures and methods for strengthening monitoring mechanisms to measure sustainable access to water and sanitation (JMP, 2010a, cited by Kvarnstrom *et al.*, 2011).

To facilitate international comparison, and hence to improve its assessment of progress towards the MDG sanitation targets, the JMP has distinguished between improved and unimproved sanitation technologies/facilities⁶. The JMP has developed a tool called the ‘sanitation ladder’ for monitoring progress towards the MDG sanitation targets (Kvarnstrom *et al.*, 2011). The ‘sanitation ladder’⁷ is a well-established concept within the water and sanitation sector and is extensively used to demonstrate how people can move from simpler sanitation solutions to more advanced technologies, as they move on the ladder (Wood *et al.*, 1998 and Lenton *et al.*, 2005, cited by Kvarnstrom *et al.*, 2011). It is used generally as a tool to choose latrine types in community-based sanitation projects. The first level of the sanitation ladder is usually characterised by a simple latrine, which can be constructed with local material by the user with

⁶ Improved sanitation facilities include: flush/pour-flush to piped sewer system, septic tank and pit latrine; ventilated improved pit latrine (VIP); and composting toilet. Unimproved facilities include: flush/pour-flush to elsewhere, pit latrine without slab or open pit, bucket, hanging toilet or hanging latrine, and no facilities or bush or field (open defecation-ODF) (JMP - WHO/UNICEF, WSMP, 2009).

⁷ See <http://www.wssinfo.org/definitions-methods/watsan-ladder/>

locally available assistance. Latrines in the first level, such as the pit latrine, are usually not considered sustainable over a longer period and needs to be replaced when the pit is full. The higher level latrines, for example ventilated improved pit latrine (VIP) and flush latrine, require skilled artisanship and technical equipment as well as funds for installation and maintenance of those facilities.

The use of the sanitation ladder as a monitoring tool for assessing progress of the MDG targets has been criticized based on the fact that it is technology-based and does not deal with issues such as quality, reliability and sustainability of sanitation (Kuznyetsov, 2007, cited by Kvarnstrom *et al.*, 2011). Moreover, it is argued that sanitation systems that are not used and maintained properly will not provide the intended health and environmental benefits. It is still argued that the sanitation ladder could be further improved by moving from the currently used ‘technology approach’ to a ‘function approach’ for monitoring, despite the recognition of the advantages of the more detailed monitoring achieved by the use of the sanitation ladder. By considering how different functions could be added along the sanitation ladder, the sanitation sector leaves room for new technologies and creativity in adapting services to meet the needs of the local context.

2.2.1.3 Sanitation Facilities in Ghana

In Ghana, individuals and households use different sanitation facilities (latrines), depending on the socioeconomic status of the individual or household and state of community development. Both improved and unimproved latrines are used by individuals and households

in Ghana, with the former being the ‘sewerage systems (flush latrines)’ and the latter being the ‘shared and public latrines’, ‘pan or bucket latrines’ and ‘open defecation’.

The JMP does not consider ‘shared or public latrines’ as improved, the reason being that those facilities are not hygienic enough compared to household latrines (WSMP, 2008).

Use of improved latrines in Ghana: Current statistics of the JMP show that Ghana is offtrack in meeting the MDG target on sanitation; only 14% of the population use improved latrines (UNICEF/WHO, 2014). The flush latrine (i.e. flush to septic tank) is the common improved latrine used in Ghana. Sewerage systems are virtually non-existent in Ghana; hence the sludge is normally removed from septic tanks or pits and disposed elsewhere.

Use of unimproved latrines in Ghana: The JMP’s statistics indicate that about 58% of the people of Ghana use ‘shared and public’ latrines, 19% practise open defecation, and 8% use other unimproved facilities such as ‘pan or bucket’ latrines and ‘pit latrine without slab’ or ‘open pit’ latrines (UNICEF/WHO, 2012). According to the Environmental Health and Sanitation Directorate (EHSD) of the Ministry of Local Government and Rural Development, ‘public latrines’ are mainly built for transient populations and areas of heavy public activity (WSMP, 2008). However, a number of community members in both rural and urban areas use public latrines as their main place of defecation due to absence of household toilets. Open defecation (bush and beach) is currently estimated at 24% (GSS, 2013), and increase of 5% (from 19% to 24% per the JMP’s report in 2012), and the practice is prevalent in all the ten regions of Ghana, but most widespread in the northern and coastal regions (WSMP, 2008).

2.2.2 Sanitation and the Private Sector

Sanitation programming has evolved dramatically over the years with a shift in focus towards engaging communities, creating demand for sanitation, and supporting the development of sustainable systems and appropriate technologies - all of which are rooted in catalyzing behaviour and social change in communities (Thomas *et al.*, 2010). At the core of the shift in the sanitation sector is a move from donor determined and supply-driven programming to community-led and demand-driven programming. For many years, the traditional approach was supply-driven, focused on building latrines and giving households subsidies to support construction projects. This approach viewed sanitation as a private household good with a public benefit, often assuming that communities were unwilling or unable to invest in sanitation. In reality, such an approach has not contributed much to the socio-economic development of communities.

Over the past, the global movement towards involvement of the private sector in the provision of sanitation services has been rapidly gaining momentum and so has the political opposition (Whittington *et al.*, 2002). In developing countries, a major aspect of the economic reforms over the last two decades was the increasing withdrawal of the public sector from the direct production of goods and services (Aryeetey and Ahene, 2005).

Today, countries across the world are increasingly looking to the private sector for help in the provision of needed services, including sanitation services. Towards this end, the privatisation of sanitation services is viewed to be a cost effective method for enhanced quality of service delivery (Nyangena, 2008). However, the privatisation of former publicly owned and managed

sectors always raises concerns. Privatising the sanitation sector normally raises fierce protests and sometimes even violent opposition (Quehenberger, 2008). In view of this, a better understanding of the (sanitation) market by all stakeholders in poor peri-urban fishing and farming communities is crucial for sustainable sanitation.

With a private-driven approach, the sanitation market is likely to better provide the needed products and services. In such a market, externalities are limited; there can be competition between multiple suppliers; and the product/service in question has private goods characteristics (i.e. has rivalries and excludable) (Rakodi, 2002). Market failure, however, is possible when the service is a natural monopoly; there are extensive positive and/or negative externalities; and the service in question has public and merit goods characteristics. In such circumstances, markets often become distorted despite best intentions to create viable private sector markets. This is because market interventions do not reflect demand, thereby restricting and discouraging the private sector.

2.2.2.1 Sanitation Marketing

Sanitation marketing is a sustainable approach to household sanitation promotion that aims to create a sustained and an effective sanitation by stimulating household demand for sanitation products and services (Devine and Kullmann, 2011). Sanitation marketing seeks to stimulate both the demand for and the supply of sanitation products and services through market forces, and by using techniques that focus on the *four Ps* of marketing - product, price, placement and promotion (Thomas *et al.*, 2010). By means of sanitation marketing, private sector provision of products and services is also developed and enhanced, with both the demand and supply activities acting together to result in the establishment of a sustainable sanitation industry.

In sanitation marketing, there is no subsidy for hardware (e.g. toilet bowls, slabs, cement), and it is an approach that builds upon strong understanding of consumer/user motivations and preferences as well as constraints to latrine adoption (Devine and Kullmann, 2011). Sanitation marketing ensures that people/households choose to receive what they want and are willing to pay for, and in reality, people pay for proper sanitation when (economic) conditions are favourable; they believe that a product or service they pay for is superior to anything they receive free (WSP, 2004). Moreover, sanitation marketing is important because it is cost effective, it ensures financial sustainability, and it can be taken to scale.

There is evidence that the development of the (sanitation) market is the only sustainable approach to meeting the need for sanitation in the developing world (WSP, 2004). According to Devine and Kullmann (2011), sanitation marketing has been successful in Vietnam where the elements of the approach were behaviour change communications, no hardware subsidy, and development of the small-scale private sector to supply household sanitation. Moreover, Benin is also noted to provide the first example of a fully developed and tested national rural sanitation programme that adapts sanitation marketing to the rural African development context. In Ghana, lessons from the historical shortcomings of the nation's sanitation policy now call for public-private partnership in the management (*based on sanitation marketing approach*) of sanitation in Ghana (Thrift, 2007; MLGRD, 2010).

2.2.2.2 Factors that Influence Sanitation Business Development

The success, in terms of performance, growth and sustainability of any business depends on several factors, some of which include: the business viability and benefits to the investors and consumers; market forces determined by demand and supply and behaviour of consumers and competitors; financing in terms of initial investment required and for maintenance; and general business constraints which may be economical, environmental, political, technological, socio-cultural and demographic, among others.

According to the UN-Water (2013, cited in Guy and Haller, 2004) report, sanitation business is considered an excellent economic investment that yields an average return of US\$5.50 for every dollar invested. Despite the profitability and potential of sanitation business, there are a number of factors that constrain the operations of service providers in the sanitation sector, particularly to small and medium size operators in poor urban and peri-urban communities in developing countries. Anecdotal evidence shows that the rate at which small (sanitation) businesses are established and 'die-out' is overwhelming.

Several factors affect the performance and development of small (sanitation) businesses, some of which include: limited capital and limited access to finance (Kappel, Lay, and Steiner 2004; Mugume and Obwona 2001); inadequate provision of public infrastructure and services that affect private investment (Svensson and Reinikka, 2001); and unfavourable taxation systems, heavy regulatory burden and administrative bureaucracy (Keefer, 2000). Other factors include: limited access to differentiated markets, which might be related to a lack of forward linkages (Kappel *et al.*, 2004), for example, the lack of knowledge and incentive for reuse of household

waste (excreta) for agricultural purpose; the concentration of small businesses in low-quality production (Sengendo *et al.*, 2001); high transport and transaction costs (Rudaheranwa, 2000, 2006); corruption (Svensson, 2002); low trust and minimalist entrepreneurial strategies (Kappel 2004; Sorensen 2001); education and poor managerial and skills competence (Nalumansi *et al.* 2002; Nel and Shapiro 2003); and a lack of competitiveness and an overall neglect of small businesses in developing countries.

Studies have reported that there is strong correlation between business constraints, investment and growth and development of an economy (Svensson and Reinikka, 2001; Kappel *et al.*, 2004). Reinikka and Svensson's (2001), indicate that the rate of economic growth is positively associated with the rate of investment. In that sense, factors in the business environment that constrain investment could in turn be the root cause of poor economic growth.

2.2.3 Business Models

A business model is important in determining a firm's performance and its sustainability. There is anecdotal evidence that ventures still fail, despite the presence of available market opportunities, novel business ideas and resources, and talented entrepreneurs; the possible cause of the failure is associated with the underlying model driving the business. Highly emphasised in entrepreneurial practice, business models have received limited attention from researchers, with the largest volume of research coming from electronic commerce (Mahadevan, 2000, Morris *et al.*, 2005).

2.2.3.1 Definition of “Business Model”

There is no consensus regarding the definition, nature, structure, and evolution of business models; yet, a business model is important as a unifying unit of analysis that can facilitate theory development in entrepreneurship (Morris *et al.*, 2005). Diversity in the available definitions of ‘business model’ poses substantive challenges, leading to confusion in terminology, as business model, strategy, business concept, revenue model and economic model are often used interchangeably. Moreover, a business model has been referred to as the architecture, design, pattern, plan, method, assumption, and statement of a business.

To streamline the various perspectives of business model, a content analysis of key words revealed 30 definitions of a business model, which Morris *et al.* (2005) grouped under three general categories based on the principal emphasis underlying the models. The categories were labelled as *economic*, *operational* and *strategic*, with each comprising a unique set of decision variables. These categories represent a hierarchy in that the perspective becomes more comprehensive as one progressively moves from the economic to - the operational to - the strategic level.

The three categories of business model are described as follows:

- ***Economic level model*** - is the most rudimentary level of business model definitions. The concern under this category is with the logic of profit generation, and relevant decision variables include: revenue sources, pricing methods, cost structures, margins, and expected volumes. This category is also defined by Stewart and Zhao (2000, in

Morris *et al.*, 2005) as ‘a statement of how a firm will make money and sustain its profit stream over time’.

- **Operational level model** - this represents an architectural configuration, focusing on the internal processes and design that enables the firm to create value. Decision variables of this category include: production or service delivery methods, administrative processes, resource flows, knowledge management, and logistical streams. This category is also defined by Mayo and Brown (1999, in Morris *et al.*, 2005) as ‘the design of key interdependent systems that create and sustain a competitive business’.
- **Strategic level model** – this considers the overall direction in the firm’s market positioning, interactions across organisational boundaries, and growth opportunities. This category emphasizes on the firm’s competitiveness and sustainability. Decision elements under this category include: stakeholder identification, value creation, differentiation, vision, values, and networks and alliances. Slywotzky (1996, in Morris *et al.*, 2005) also defines this category as ‘the totality of how a company selects its customers, defines and differentiate its offerings, defines the tasks it will perform itself and those it will outsource, configures its resources, goes to market, and creates utility for customers and captures profit’.

Following the above perspectives, Morris *et al.* (2005) propose an integrative definition of a business model as a concise representation of how an interrelated set of decision variables in the areas of venture strategy, architecture/operation, and economics are addressed to create sustainable competitive advantage in defined markets. In all the definitions of business models,

the most frequently cited components include firm's value offering, economic variables, customer interface/relationship, partner network/roles, internal infrastructure/connected activities, and target market.

2.2.3.2 Theories of Business Models

Issues of theory relating to business models have received scant attention (Morris *et al.* (2005). For the available theory on business models, Zott *et al.* (2011) argue for a crosstheoretical perspective that there is no single theory that can fully explain the value creation potential of a venture. It has been established that the business model construct builds upon central ideas in business strategy and its associated theoretical traditions; Porter (1985, 1996, in Morris *et al.*, 2005) states that the business model construct builds directly upon the *value chain concept* and the extended notions of value systems and strategic positioning. Other findings also provide the theoretical underpinning of business models based on the components of a particular business model.

Encompassing competitive advantage, business models also draw on *resource-based theory*, where the firm is viewed as a bundle of resources and capabilities (Barney *et al.*, 2001, in Morris *et al.*, 2005). In terms of the firm's fit within the larger value creation network, the model relates to *strategic network theory* (Jarillo, 1995, cited in Morris *et al.*, 2005) and *cooperative strategies* (Dyer and Singh, 1998, in Morris *et al.*, 2005). In addition, the business models involve choices (e.g. vertical integration, competitive strategy) about firms' boundaries (Barney, 1999, in Morris *et al.*, 2005) and relate to *transaction cost economics* (Williamson, 1981, in Morris *et al.*, 2005).

Other perspectives of business model include the firm's offerings and activities undertaken to produce them. It is therefore important that management/service providers consider the business' proposition, the activities it will undertake within the business, and determine how the business will fit into the larger value creation network. Schumpeter (1936, in Morris *et al.*, 2005) in his *theory of economic development* postulates that value is created from unique combinations of resources that produce innovations, while *transaction cost economics* identifies transaction efficiency and boundary decisions as value source. As part of a firm's positioning strategy, it is important that the firm establishes appropriate relationship with suppliers, partners and customers.

Consistent with the *resource-based theory* (Barney *et al.*, 2001, in Morris *et al.*, 2005), models implicitly or explicitly address the internal competencies that underlie a firm's competitive advantage. Competitive advantage can emerge from superior execution of activities within the firm's internal value chain, coordination among those activities, or superior management of the interface between the firm and its stakeholders. In such a situation where the model has proprietary innovative elements, *resource advantage theory* becomes relevant (Hunt, 2000, in Morris *et al.*, 2005).

Besides the external factors, the growth and profit aspirations of entrepreneurs, which reflect the firm's relationship to the entrepreneur's career and life, can influence the firm's objectives. Business models will then differ for ventures with more moderate versus more ambitious aspirations. Other theoretical traditions have implications for entrepreneurial intentions regarding the nature and scope of the venture. For example, *self-efficacy theory* emphasises on

the role of an entrepreneur's cognitive capabilities and skills assessment in determining outcomes. On the other hand, the *theory of effectuation* suggests that entrepreneurs make conjectures about the future, determine what can be done, and goals emerge over time (Wiltbank and Sarasvathy, 2002, in Morris *et al.*, 2005). In addition, another theoretical perspective, the *systems theory*, approaches the business model as interrelated components of a system that constitutes the firm's operational backbone (Petrovic *et al.*, 2001, in Morris *et al.*, 2005). With systems theory, the business is viewed as an open system with varying levels of combinatorial complexity among sub-systems and bounded by the environment and open information exchange.

2.2.3.3 Sanitation Business Models

There are various sanitation business models, worldwide. Some of the models, as identified by REES (2008), include the following:

- **Service contract** - single function contracts to perform a specific service for a fee.
- **Management contract** - short-term contracts, typically for five years, where a private firm is only responsible for operations and maintenance.
- **BOT (Build-Operate-Transfer)/BOO (Build-Operate-Own)** - contracts are issued for the construction of specific items/facilities/infrastructure (such as a bulk supply reservoir or treatment plant). Normally, the private sector is responsible for all capital investment and owns the assets until they are transferred to the public sector, but in BOO schemes, private ownership is retained.
- **Lease** - long-term contract, usually 10-20 years but can be longer, for which the private sector is responsible for operations and maintenance and sometimes for asset renewals.

- **Concession** - the local government lets a long-term contract, usually over 25 years, to a private company which is responsible for all capital investment, operations and maintenance.
- **Partial divestiture** - the local government sells a proportion of shares in a ‘corporatized’ enterprise or creates a new joint venture company with the private sector.
- **Full divestiture** - full transfer of assets to private sector through asset sales, share sales or management buyouts.

According to Budds (2000), models of private sector participation in sanitation services (such as from construction and maintenance of latrines to pit-emptying) can be divided into four categories: (1) Full privatization (divestiture); (2) Partial private-sector responsibility - shared responsibility through one of a variety of contracts including service or management contracts, lease contracts or a concession contract; (3) Co-operative model - government owned public limited company; and (4) Informal sector provision - involves small-scale operations, common in low and middle-income countries.

In Ghana, there are several business models, which include: design-build-operate, design-build-lease, build-operate-invest, build-operate, long term operation and maintenance, shortterm operation and management, build-operate-transfer, rehabilitate and operate, delegated management, and semi-direct municipal management (SUSA-Ghana Project document, 2010).

2.2.4 Financing Mechanisms for Sustainable Sanitation

For sustainability, the provision of sanitation facilities and services must be self-financing; providing liquid resources for the day-to-day running and long-term survival. An active

involvement of the user community in the planning and provision of services could contribute to greater equity and financial viability and would, in turn, attract greater private sector participation in the sector.

2.2.4.1 Acquisition, Operation and Maintenance of Sanitation Facilities

According to Rakodi (2002), attempts to involve users directly in the operation and maintenance of (sanitation) facilities may take different forms:

- ***Contribution of additional resources of cash or labour*** - for construction of facilities. The hope is that such contributions will (a) increase users' sense of ownership and responsibility for maintenance, (b) ensure effective use of public resources, and (c) result in less capital intensive and more appropriately designed facilities.
- ***Identification of workers from within user communities*** - who take responsibility for certain components of delivery, working unpaid, paid at less than regular rates, or reimbursed in kind by the community (e.g. voluntary community health workers).
- ***Establishment of user groups*** (e.g. Village Health/Sanitation Committees) to take responsibility for operating or guiding the operation of local facilities.

Although the involvement of users in the delivery, operational and maintenance arrangements may improve service levels, it is also important to note the following (Rakodi, 2002):

- the opportunity costs of free labour for poor residents, especially in urban areas;

- resent of requirements when higher income users do not face similar demands or when no improvements in service quality result;
- the operational and financial sustainability of community level services; and
- interests of all users so that others do not consider it as an opportunity to secure personal, rather than community benefits.

Moreover, for financial sustainability of facilities, cost recovery options for the key cost components - *investment/capital*, *operational* and *maintenance* may include:

- ***Immediate full cost recovery*** - This is applicable with creditworthy communities, and where organisations have proper management skills.
- ***Progressive full cost recovery*** – Involves either through phases or a continuous adjustment. Timing may be determined according to agreed steps in a process of increasing managerial responsibility and ownership.
- ***Recovery of operation and maintenance costs (O&M) only*** - In most cases, it is difficult for communities to recover all the costs, and there should be clarity about the reasons why part of the costs are not or cannot be covered by the communities.
- ***Recovery of O&M costs only, with initial use of subsidies*** - This involves subsidising costs at the beginning, and providing free technical support for some maintenance. Although this approach can be necessary for poor communities, it can send wrong signals to a market.

2.2.4.2 Agencies for Management of Sanitation Sector in Ghana

The management of sanitation (and water) is based on a hierarchy of institutions deriving their key roles from the Constitution of Ghana or Acts of Parliament. The Ministry of Local Government and Rural development (MLGRD) is the lead agency responsible for policy, planning, financing and monitoring of the sanitation sector in Ghana.

In Ghana, sanitation (and water) services are provided by both public and private organisations and individuals, and these include the following (WaterAid/DFI, 2012):

- **Community Water and Sanitation Agency (CWSA):** The agency provides safe water and related sanitation services to rural communities and small towns under community ownership and management. CWSA activities are funded by government with donor support.
- **Water and Sanitation Development Boards (WSDBs):** They manage and oversee water supply systems and sanitation services within small towns, with the responsibility for setting tariffs and collecting fees from water consumers.
- **Water and Sanitation Committees:** they plan, implement and oversee water and sanitation systems constructed for communities in the rural areas.
- **The Water and Sanitation monitoring Platform (WSMP):** This is an independent national water and sanitation monitoring platform that seeks to increase accessibility to relevant water, sanitation and hygiene sector information and analysis.

2.2.4.3 Financing the Sanitation Sub-sector in Ghana

The sanitation (and water) sector in Ghana is financed from domestic and external sources, but heavily dependent on donor funding with an average proportion of about 12:1 donor to government contribution (WaterAid/DFI, 2012). The domestic financing of the sector involves both discretionary from the central government budget and statutory from the District Assemblies Common Fund (DACF), whilst the external sources are discretionary from development partners.

In spite of efforts made by the central government and donor agencies toward improving access to proper sanitation (and water), much have not been realised; there are major challenges to the sector which include: population growth, rapid urbanisation and industrial pollution, particularly in urban and peri-urban communities. In nominal terms, total disbursements to the water and sanitation sector in Ghana have increased steadily since 2009, however, in real terms the benefit has been less positive (WaterAid/DFI, 2012). Moreover, as a proportion of GDP, the sector's expenditure represents only a 0.05% point increase since 2009, with almost 90% of the expenditure to urban areas in Ghana.

There seems to be no substitute for proper resourcing of the sanitation sector in order to achieve the necessary change. Financing, particularly sanitation and hygiene financing, is falling short of the required investment, despite the efforts made by the central government (i.e. commitment to fund the sub-sector at 0.5% of the nation's GDP and the pledge to allocate US\$400 million annually to the water and sanitation sector between 2011-2015) (WaterAid/DFI, 2012). There are constraints to the appropriate financing and delivery of

sanitation (and water) services is faced with several constraints which include: inadequate release of funds to the sector and the autonomy of District Assemblies which influences the use of the DACF for investment or development projects. As an alternative and a sustainable means to resourcing the sanitation sector, there have been calls for individual or household financing via the private sector (Tully, 2000; WSP, 2004; Nyangena, 2008; EHSD-MLGRD, 2010).

2.2.5 Households' Attitude, Perceptions and Preferences

This sub-section presents a review of terminologies such as attitude, behaviour, perception and preference, in their relation to sanitation (improved latrine) marketing and/or human excreta reuse for agricultural purpose.

2.2.5.1 Definitions: *attitude, behaviour, perception, preference, product/service*

Attitude: Attitude is willingness or disposition to show characteristic ways of behaviour about specific objects (Ziniel, 2013); the behaviour stems from direct and indirect experiences with the specific object and usually displays cognitive (opinions), emotional and connotation (disposition for a behaviour) aspects (Rosenstiel and Ewald, 1979 in Ziniel, 2013). Padberg *et al.* (2002) also define attitude as the willingness or predisposition of a consumer to react positively (or negatively) to a stimulus pattern of a product offer (e.g. improved latrines or excreta as fertilizer); thus explaining the consumer's evaluation or image of a product. Consumers' attitudes towards a product depend on their perception of the product (Alvensleben and Meier, 1990; Padberg *et al.*, 2002). It should be noted that attitudes cannot be observed, they are hypothetical constructs and their existence cannot be proven, but the

conjecture can be measured and justified when the forecast and the explanation of human behaviour succeed better with the help of the construct (Gierl, 1995 in Ziniel, 2013).

Perception: Perceptions influence behaviour, guide all behaviour, motivate (or de-motivate) all actions and determine the future success of technologies and/or products (Duncker *et al.*, 2007). Investigating households' perceptions and preferences toward improved latrine technologies and use of human excreta in agriculture is one of aims of this study.

Behaviour: The more favourable the attitude and norm, and the greater the perceived control, the stronger would be a person's intention to perform certain behaviour (Mariwah and Drangert, 2011). In this milieu, the more favourable the norm of ODF (beach or bush), the stronger would be people's intention to practise ODF, and vice versa.

Preference: In marketing science, 'preference' denotes the strength of a positive attitude (Gierl, 1995 in Ziniel, 2013), and thus the relationship between preference research and attitude becomes apparent (Ziniel, 2013). A number of studies have defined preference. GreenFacts (2013) reports that preferences are subjective values expressed in relative terms such that one thing (e.g. an improved latrine) is deemed to be more desirable or important than another (e.g. ODF). Gutsche (1995, cited by Ziniel, 2013) reported that preference can only develop when at least two alternatives are compared by means of relative criteria and/or attributes during decision situation; thus preference demands a relativisation through alternatives (Ziniel, 2013 in Bauer, 1989). Other authors define preference as a kind of relative profitability of

alternatives without the consideration of restrictive purchasing factors (Ziniel, 2013 in Srinivasan, 1982).

Preference can also be defined as an individual's one-dimensional indicator representing the amount of profitability to choose a product in a specified period of time (Ziniel, 2013 in Bocker 1986), or one-dimensional mental variable, representing the relative advantageousness or superiority of alternatives (Ziniel, 2013 in Backhaus, 2003). Other dimensions of preference include restrictions like price and time (i.e. constrained preference) where a value comparison is sometimes the determining factor. It should also be noted that preference and benefit are sometimes used synonymously in most literature (Ziniel, 2013 in Hausruckinger, 1993). Concerns about future benefits and environmental safety may therefore also create preferences that take into account environmental sustainability (i.e. Ecological sanitation - composting latrine). This study focuses more on 'constrained preference' and 'environmental sustainability', as the choice of a household latrine (improved latrine) has value comparison (i.e. price) and also has a 'technical feasibility constrained' factor (i.e. households' access to water and sewer system) as well as the perception of households on excreta reuse for agricultural purpose.

Product/Service Preference: To better understand the subjective evaluation of 'product preference' and also minimise its ambiguous definition within marketing discipline, Ziniel (2013) provides an outline of the manifold meanings of 'product/service' with regards to their use with 'preference'. The notion of product is into three categories as follows (Ziniel, 2013 in Gutsche 1995):

- **Substantial conception** – The view of product focuses on objectively verifiable and delimitable purchasing objects that can be described physically, chemically or technically (services are viewed as products under this category).
- **Extended conception** – This incorporates services, but only those services directly connected to a specific product. For example, household buying latrine hardware and the installation work by a specialist (e.g. artisan-plumber) of the seller or producer.
- **Generic conception** – This assumes that a product does not only produce core benefits but also an added value. For example, a flush toilet does not only provide a place for defecation, but also social (e.g. prestige) or aesthetical value. In this study, the generic view of product is considered to capture a holistic picture of preference.

2.2.5.2 Relationship between Attitude, Perception, Behaviour and Preference

Empirical evidence suggest a link between consumers' attitude, their perception, behaviour, and ultimately their preference for a product or service (Fig. 2.2). Studies have shown that consumers' attitude towards a product depends to a great extent on their perceptions on the product (Alvensleben and Meier, 1990; Padberg *et al.*, 2002). Ziniel (2013) explains that behaviour plays an essential role in product policy, as the position of a product must be seen relative to its competitors, which is based on subjective evaluations of a customer's attitude towards the product and not the objectively measurable properties of the product or service.

This implies that households' willingness (to pay) or disposition towards a latrine technology and their preferences can be influenced by their subjective evaluations based on their attitudes toward the latrine technology. Preference, as preceding action choice (or no-choice) should therefore be examined from the perspective of attitude research in marketing, as it is assumed that behaviour can be explained by perceptions and attitudes (Ziniel, 2013). The implication is

that the consumer preference or decision is influenced by his/her behaviour, and the behaviour is influenced by his/her perception and attitude.



Fig. 2.2: Relationship between Attitude, Perception, Behaviour, Preference and WTP.
Source: Author's construct, 2012

2.2.6 Regulatory Policies for Sustainable Sanitation

In poor peri-urban communities of developing countries, the rapid growth of population, caused mainly by migration, and hence the associated high population density has affected the ability of authorities to meet the demand for public services, including proper sanitation.

This is seen more as a result, rather than a cause, of low economic growth in those locations. For example, in countries like Cambodia, Indonesia, the Philippines and Vietnam, it is estimated that about US\$9 billion (approximately 2% of their combined GDP) is lost every year because of poor sanitation (WSP, 2008). In Ghana, poor sanitation costs the nation US\$290 million each year, representing 1.6 percent of National GDP (EHSD-MLGRD, 2012). In most cases, though sanitation policy may seem well developed on paper and many well organized actors are involved in the sector, sanitation coverage is woefully inadequate, more especially in peri-urban Ghana (Thrift, 2007). To meet the needs of the large un-served sanitation market, it has been proposed to increase the role of the private sector in the provision of sanitation services in poor peri-urban communities. Positive engagement between government agencies and non-state providers (NSPs) for sustainable sanitation however requires a consideration of some regulation policies in the sanitation market.

2.2.6.1 Effects of Change in Context – Public to Private Sanitation Service Delivery

Several factors account for the failure or success in the transmission from public to private sanitation service delivery. For example, the lack of formal recognition of non-state providers (NSPs) by governments and their agencies is a key limiting factor to more productive forms of engagement. If governments do not recognize and engage positively with NSPs, there is a clear risk of collusion between utility staff and informal NSPs, which can increase the cost of services to consumers (Sansom, 2006).

Another limiting factor is the failure of governments and service providers to involve users in decision making and implementation of community projects. An example is the poor periurban areas of the Dangme West District of Ghana, where public latrines are no longer promoted by government and most stakeholders. Households are informed to acquire their own latrines through private sourcing. This approach appears to create tension between the Assembly and the opposing interest of the people (SUSA Baseline, 2011). The inability of households to afford private sanitation facilities can be a major impediment to a smooth switch in the sanitation sector. The lack of demand for improved household latrines may therefore be a threat to any potential or current sanitation business (Card and Sparkman, 2010).

2.2.5.2 Forms and Extent of Private Sector Engagement in Sanitation Market

In terms of private sector engagement in public services, there are diverse forms, extent and terminologies. Government's engagement with non-state providers (NSPs) of sanitation can be grouped into five main categories: *recognition*, *dialogue*, *facilitation/collaboration*, *contracting* and *regulation* (Sansom, 2006). The services provided by the private sector tend

to be very different in service delivery and in the characteristics and philosophy of organizations. Models of private sector participation in water and sanitation services can be divided into four categories: (a) Full privatization (divestiture), uncommon model in developing countries; (b) Partial private-sector responsibility - shared responsibility through one of a variety of contracts including *service or management contracts*, *lease contracts* or a *concession contract*; (c) Co-operative model - government own public limited company; and d) Informal sector provision – involves small-scale operations, common in low and middleincome countries (Budds, 2000).

The services provided by NSPs can be divided into three broad types, reflecting the activity undertaken (Sansom, 2006): (a) *Informal private providers* - undertake activities such as: providing sanitary marts, latrine construction, public latrine operation, manual cleaning and emptying services; (b) *Civil society organizations supporting community-based management* - this is where community groups in rural and poor urban areas are mobilized to contribute to the decision-making and project costs; and (c) *Public private partnership contracts* - on short- or long-term basis.

In general, there are two forms of private sector participation: a *full privatization*, where assets are permanently sold to a private investor, and a *public-private partnership (PPP)*, where ownership of assets remains public and only certain functions are delegated to a private company for a specific period (http://en.wikipedia.org/wiki/Water_privatization, 2012). The most common forms of PPPs, in the order of increasing responsibilities for the private partner are: (a) *management contract*, under which the private operator is only responsible for running the system, in exchange for a fee that is to some extent performancerelated; (b) *lease contract*,

under which assets are leased to the private operator who receives a share of revenues; (c) a *mixed-ownership company* in which a private investor takes a minority share; and (d) *concession*, under which the private operator is responsible for running the entire system. Nevertheless, with the type of arrangement with the private sector, it is important for governments to create an environment that ensures stakeholder satisfaction. A number of actions required to enable better governments engagement with NSPs include: reconciling informality with conventional procedures, sharing the market, and changing attitudes (Sansom, 2006; Collignon and Plummer, 2005).

2.2.6.3 Regulatory Policies for Private Sector Participation in Sanitation Market

Regulation has been viewed as the top agenda in the reforms to improve sanitation (Trémolet and Binder, 2010). It may be defined as legal instruments by which governing institutions at all levels impose obligations or restrictions on private sector behaviour. It is also a rule, order or standard adopted by any state agency to implement and interpret the law administered by it or to govern its procedure. Regulatory policies may come in a combination of the following forms: economic, environmental and health regulation.

Regulation helps to control inefficiencies, especially with public ownership. Sheshinski and Lopez-Calva (1998), observed that public ownership could lead to substantial efficiency losses, if not regulated. Regulation helps to manage the risks associated with market failure and also helps to reduce risks to public health and safety. It protects investments, for example, investment in sanitation facilities that usually tend to be long-term. A good regulatory framework is therefore an important incentive and a source of guarantee for investors. A well-

established regulatory framework gives investors incentives to improve efficiency, which could have a key influence over the rest of the economy through improved production processes and reduced user costs (Berthelemy *et. al.*, 2004, cited in Aryeetey and Ahene, 2005).

Regulation of facilities can be of different forms or approaches such as government, private, and community-based. Participatory projects where community groups are mobilized to contribute to the decision-making and project costs are often initially effective (Sansom, 2006). There are normally concerns about the longer-term sustainable management, including operations, maintenance and cost recovery of community facilities, such as public latrines. There seems to be a lack of incentives for community groups to continue with activities, particularly where the community groups are reliant on voluntary inputs from its members. According to Schouten and Moriarty (2003), while there are still very good reasons for promoting community management, the reality remains that community management approaches have not been noticeably better at sustaining systems.

Invariably, many governments have declared policies which place a heavy reliance on community-based organisations, particularly for operation and management of sanitation facilities. However, there are risks of local political capture of the management of public latrines, as has happened in Accra and Kumasi in Ghana, where poor services have been the result (Ayee and Crook, 2003, cited in Thrift, 2007). This has occurred despite the contracting out of services and involvement of communities in management, and is attributable to the politics of patronage (Sansom, 2006). Furthermore, regulatory functions for longer-term

public-private partnership (PPP) contracts in sanitation are often split amongst a number of government agencies at different levels, leading to inconsistent decisions. Without the creation of capable independent regulators/agencies, problems with serving poor areas are likely to persist in PPP contracts.

In addition, the regulation of smaller Non-State Providers (NSPs), such as informal private providers and community groups, in the water sector, for example, presents challenges due to their small scale and informal characteristics. NSPs like water vendors often charge high water prices, so it is tempting for government agencies to try and regulate their prices (economic regulation) (Batley and Larbi, 2004). Like the 'Principal-Agent' theory which views an organizational relationships as a tension between the 'principal' who demands a service and an 'agent' who provides it, the likelihood of the principal (such as a government agency) effectively controlling an agent (such as an NSP) depends on: *'How much information the principal has about the performance of the agent; and How far the principal can structure the relationship so as to make the agent's interests or objectives correspond to the principal's.*

As an alternative to community-based management of public facilities and the operations of service providers, Sansom (2006) proposes the formation of professional and trade associations as an effective means of regulation. WUP-Africa (2003) added that such associations can help to improve professionalism and capacity building by: establishing common rules and procedures; recognizing and protecting private investments; and creating a forum for dialogue (and collaboration) between the authorities, the utilities and the alternative service providers who are too numerous to be handled on an individual basis. However, there is the caution that

associations can become cartels that seek to limit competition from new entrants. This therefore makes it important for the regulatory authority to promote competition and encourage new entrants to the market.

As another alternative, Gerlach and Franceys (2005) also report that consumers as 'watch groups' can play an effective role in regulation. However, the choice of regulatory instruments should be based on a comparative assessment of the trade-offs between effectiveness, ease of implementation and costs and benefits.

2.2.7 Methodological Review

This sub-section presents a review of literature on the analytical methods employed in the study as follows: analysis of the sanitation market; an assessment of sanitation business performance and estimation of market potential for sanitation-related businesses; analysis of households' latrine financing mechanisms and willingness to pay for improved latrines; and assessment of households' knowledge, attitudes and perceptions (KAPs) towards human excreta reuse for agricultural purpose.

2.2.7.1 Sanitation Market Analysis

Sanitation marketing seeks to stimulate both the *demand for* and the *supply of* sanitation products and services through market forces, and by using techniques that focus on the four Ps of marketing - *product, price, place* and *promotion* (Thomas *et al.*, 2010). For a successful sanitation business, it is important that the supplier recognizes the creation of consumer demand, which like in any business, is dependent on five key criteria: **Purpose** – product

achieves its intended purpose; **Price** – product is available at an acceptable price to the consumer; **Location** – product is available in adequate volumes in the required location; **Quality** – product is of an adequate quality for the consumer; and **Consumer knowledge** – information about where and how the product can be acquired.

For a better understanding of the sanitation market, it is also important to analyse the structure, conduct and performance (SCP) of the market. Empirical evidence suggest that the structure of a market influences the conduct, and hence the performance of the market (Marion, 1976; Edwards *et al.*, 2006). The basic principle of the SCP model is that, given certain basic conditions, the performance of a particular market depends on the conduct of its sellers and buyers, which is influenced by the structure of the relevant market. The SCP approach focuses on the conduct of groups rather than individual firms, and looks into the influence of the horizontal relationships among firms on market performance.

According to Marion (1976), the key components to consider when studying a market should include: the control of sub-sectors and performance, particularly the extent to which supply offerings match demand preferences; technical and operational efficiency of the entire subsector; equity of distribution of returns (i.e. analysis of margins), rights, risks, information and responsibilities; access to the sub-sector including conditions of entry; and the reliability and stability of the sub-sector performance. In this study, the structure of the sanitation market is analysed to help assess the conduct and performance of service providers in the sanitation market in the study area.

2.2.7.2 Assessment of Business Performance and Estimation of Market Potential

The performance of a business can be assessed based on the profitability or returns on investment. According to Ross *et al.* (1998), the profitability of a business can be determined using profit margin analysis. This compares the returns or net profit to total sales or revenue generated by the business in question. Besides the profit margin, entrepreneurs are also interested in the expected market size (i.e. market potential) of a business

An assessment of the market potential for a product or service is essential for making an investment decision. Market potential is the maximum reasonable sales/revenues attainable under a given set of conditions within a specified period of time (Lehmann and Winer, 2005). The market potential for a product/service determines whether the market is large enough to support the viability of the product/service (Wolfe, 2006). It is therefore important to determine the prospects and economic motive of a sanitation market via an assessment of the maximum total sales potential for sanitation service providers in that market.

2.2.7.3 Consumer Preference and Willingness-to-Pay

It is generally assumed that consumers maximize their utility subject to a budget constraint, and will therefore choose the option among a bundle of goods that gives them the highest utility. Consumers normally express their satisfaction from the consumption of a good by the amount they are 'willing to pay' in exchange for the good in question. In their desire to acquire a good, consumers may place a higher value, i.e. economic value, on the good than the market price. Harapap and Hartono (2007) define 'economic value' as the maximum units of goods or services that a consumer is willing to sacrifice in order to get other goods or services; a concept

formally known as the ‘willingness to pay (WTP)’ of a person towards the goods and services desired.

Most economic/environmental goods and services, such as wildlife population, healthy fish, clean air, water and sanitation (e.g. *improved latrines*) are not traded in markets, as such their economic value, i.e. how much people would be willing-to-pay (WTP) for them, is not revealed in market prices (GreenFacts, 2013). Such items are not bought or sold directly; they do not have observable monetary value, and are often not directly incorporated within the pricing system which is the hallmark of a marketed good (Scarpa and Alberini, 2005; GreenFacts, 2013). Although their value are not revealed in market prices, preferences for non-market goods and services can be revealed (i.e. in purchasing decision), expressed (via surveys) or imputed (e.g. cost of replacement) (Mishra, 2003; GreenFacts, 2013).

The WTP concept has been used in many studies, particularly in environmental and resource economics, for ecological valuation of ecosystems in economic terms through measuring the monetary value of goods and services. The WTP concept is also strongly related to the concept of ‘compensating variation (CV)⁸ and equivalent variation (EV)⁹’ in the theory of demand; thus WTP can be interpreted as the maximum amount that a person is willing to pay to prevent the deterioration of ‘something’ (Harapap and Hartono, 2007). In general, WTP is the maximum amount a consumer would be willing to pay, sacrifice or exchange in order to receive a good or to avoid something undesired, such as poor sanitation.

⁸ CV is a measure of utility change (John Hicks, 1939); refers to the amount of additional money an agent would need to reach its initial utility after a change in price, or a change in product quality, or the introduction of new products.

⁹ EV is a measure of how much more money a consumer would pay *before* a price increase to avert the price increase.

2.2.7.4 Methods of estimating WTP

A number of studies have reported a range of pecuniary techniques for valuing preferences for environmental goods/non-market goods (*see*: Mishra, 2003; Scarpa and Alberini, 2005; Breidert *et al.*, 2006). Mishra (2003) has provided a schematic presentation of the methods of pecuniary valuation of non-market or environmental goods and services (Fig. 2.3). There are pros and cons of the pecuniary valuation methods for non-market/environmental goods and services; as such caution should be taken with their use.

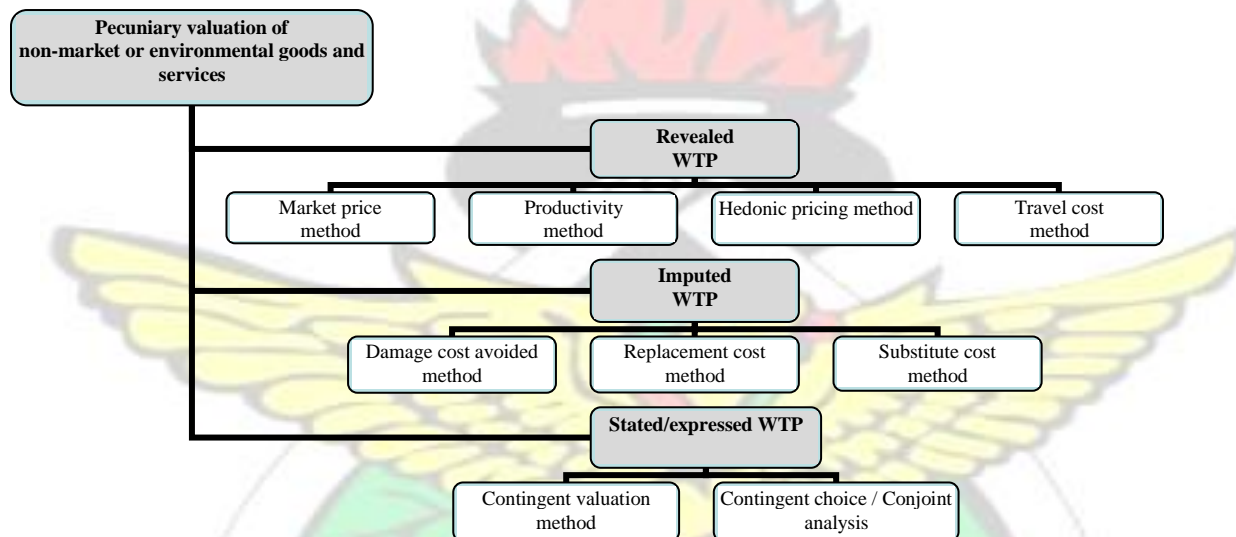


Fig. 2.3: Pecuniary Methods of Estimating WTP

Source: <https://www.msu.edu/user/schmid/mishra.htm> (Mishra, 2003)

Weaknesses of Pecuniary Methods for Estimating WTP

Mishra (2003), in a review of literature on pecuniary estimation of WTP reports that the measurement of the benefits of non-market goods and services in money terms (i.e. WTP) has a cultural bias which is often unnoticed or ignored. Moreover, the assumption of a constant ‘value’ of money over time, generations, locations, income groups and individuals creates a particular type of habit, inculcated by the neo-classical economists, with which people think and cannot understand anything that does not refer to money, which leads to deification of

money. Assigning immutability to value of money can then introduce a series of bias in valuation, especially when the experience suggest that value of money varies over time, among income groups and others.

Furthermore, it is argued that the valuation methods are not sensitive enough to discriminate the less beneficial from the more beneficial; as such their standard errors of estimate (usually interpreted slightly liberally) are so large as to make them insensitive measures of differential values. In addition, it is also argued that the valuation methods are 'indirect or proxy methods', and as such raises the concern of whether there exist a one-to-one linear relationship in the value of a 'proxy' variable and the 'object variable'. Moreover, the assumption in the identification of consumers 'desire' and what is 'desirable' is questionable. Mishra (2003) points out that WTP is that measure of the intensity of 'desire'¹⁰, but not of the status of 'desirability'¹¹.

Most desires are rooted in the culture in which one lives and is brought up (e.g. ODF at the beach and bush), and with the economic progress, larger parts of desire becomes culture bound with a leisure class culture characterized by high valuation of conspicuous consumption and conspicuous leisure. In such circumstance, wastage becomes culturally supported, and the desires of the people may suggest the value system that is characteristically wasteful and detrimental to the prudent allocation and use of scarce economic and environmental resources (Mishra, 2003).

¹⁰ 'Desire' refers to most wanted or preferred.

¹¹ 'Desirability' refers to wanted or pleasing.

Finally, the assumption on the measurement of expressed WTP that ‘what people say they would do or pay for’ is argued to be far from being realistic as investigations have shown a considerable inconsistency in hypothetical comparison of alternatives; as even inconsistencies creep in when people making choices are dealing with the real world situation. The weaknesses in the pecuniary valuation methods of non-market/environmental goods and services make it necessary to accept the validity of the methods only with a caution.

Strengths of Pecuniary Methods for Estimating WTP

Despite the weaknesses and criticisms of the valuation methods, the use of WTP in marketing and economics is vital for making informed management decisions, both at present and in the future. Breidert *et al.* (2006) report that knowledge about a product’s WTP on behalf of its (potential) customers plays a crucial role in many areas of marketing management, like pricing decisions or new product development.

A number of studies have used the different WTP methods, particularly the stated and revealed preference methods, to investigate households’ demand for non-market or environmental goods and services such as water and sanitation. The revealed preference methods make use of people’s behaviour in actual or stimulated markets to infer the value of environmental goods or services, whilst the stated preference methods elicit non-market values directly from respondents through surveys (Asafu-Adjaye, 2000).

i. Stated Preference versus Revealed Preference

Empirical evidence suggest that unlike the stated preference methods, the revealed preference methods have not been able to satisfy all the demands for non-market valuation, and that there is limited number of cases where non-market values exhibit quantifiable relationship with a market good; hence the preference for use of stated preference methods which deal with the estimation of ‘total economic value’ of environmental impact (Asafu-Adjaye, 2000; Bennet and Blamey, 2001). Moreover, the stated preference methods are relatively straightforward for eliciting people’s valuations on environmental goods and services, and require few theoretical assumptions compared to the revealed preference methods (AsafuAdjaye, 2000).

The stated preference methods have their strengths and weaknesses, despite their preference over the revealed preference methods. In conjoint analysis, the explicit trade-offs between product attributes helps to provide a more realistic approach, and the part-utilities produced provide a common scale to facilitate direct comparison, and it also helps to quantify and predict people’s overall judgement of a product based on its most important attributes (Steenkamp, 1987 in Monteiro *et al.*, 2001). However, its use has difficulty in making interpersonal comparisons of ranking/rating data; difficulty of respondents to rank large number of alternatives; and the fact of rating tasks in particular involve a departure from the context of choice actually faced by consumers (Morrison *et al.*, 1996 in Bennet and Blamey, 2001). Moreover, it does not provide an opportunity for respondents to say ‘no’ to the good in question, hence considered as being unconditional or a relative measure of WTP that could be understated (Asafu-Adjaye, 2000).

ii. Stated Preference Methods

The choice modelling, a stated preference method, is used to value multiple use alternatives and can provide conditional and absolute measures of WTP (Asafu-Adjaye, 2000), and it has the ability to allow a range of potential substitute goods within the alternatives from which respondents are asked to choose (Bennet and Blamey, 2001). However, the method requires complex survey designs, thus the number of choice sets can be large, and tends to affect the outcome (Asafu-Adjaye, 2000). Moreover, its use has difficulty in the selection of attributes to be used to describe the choice alternatives because of apparent contradictions between what policy makers regard as key factors and what really matters to respondents (Bennet and Blamey, 2001).

iii. Contingent Valuation Method (CVM)

The contingent valuation method (CVM), also a stated preference method, has the capacity to estimate non-use values. CVM is considered the most useful technique for estimating economic values for some non-market resources, and has the ability to estimate existence values which are theoretically meaningful aspect of value, and very useful in hypothetical market situations (Hanley and Spash, 1993). The CVM offers respondents one or sometimes two alternatives to evaluate, and therefore improves response rate (Asafu-Adjaye, 2000). The CVM is a more traditional method and has been extensively used in survey studies. Whittington *et al.* (1993) report that the direct survey approach to estimating household demand for a product or service is termed the 'contingent valuation method (CVM). The CVM is mostly used in environmental and resource economics to estimate the benefits of environmental improvements and other public goods (Whittington, 1993 in Cummings *et al.*,

1986a and Mitchell and Carson, 1989). A number of studies have used the CVM in water and sanitation studies (Carson and Mitchell, 1987; MacRea and Whittington, 1988; Whittington *et al.*, 1991; Bachrach and Vaughan, 1994; Whittington *et al.*, 2002).

According to Whittington *et al.* (1993), the CVM can be successfully employed in cities in developing countries for services such as sanitation, and that it is possible to obtain reasonably reliable information to assess households' demand for different sanitation technologies. However, the use of the CVM in estimating demand has two obvious drawbacks: either the respondent may not know how to respond to such a hypothetical choice, or s/he may know but not tell the truth (Whittington *et al.*, 1993). Empirical evidence however suggests that if the respondent is familiar with the good/service in question (i.e. aware of the product/service), then the threats to the 'reliability' and 'validity'¹² of CVM results are often not serious, and that CV surveys that are carefully designed and administered can yield accurate and useful information on households' preferences (Whittington, 1993 in Cummings *et al.*, 1986b and Dickie *et al.*, 1987). Other studies have provided guides to maximize the reliability of CV estimates (Arrow *et al.*, 1993). Based on the 'constrained' preference of households in the study area and the review of literature which guide the appropriateness of the valuation method, the CVM is employed to assess households' WTP for improved latrine technologies in the study area.

¹² 'Reliability' and 'validity' are defined by Whittington *et al.* (1993) as the extent of the variance of an observed variable (e.g. reported household WTP), due to random sources), and the degree to which a data collection method or instrument (e.g. a survey questionnaire) measures a given concept, respectively.

iv. Factors influencing Consumers' WTP for Sanitation Facilities/Services

The identification of the factors that influence consumers' WTP for a product/service is crucial for addressing the heterogeneous needs of the various segments in a (sanitation) market. These factors could be personal (intrinsic) or extrinsic (including the attributes of the product or service offering). Consumers demand is influenced by their behaviour, and behaviour is influenced by personal and environmental factors such as psychological factors (perception, motivation and attitude), lifestyle, demographic and economic factors (Lancaster and Lester, 2001).

Some of the variables that have been identified to explain variation in WTP bids for improved sanitation (improved latrines) include characteristics of the respondent (e.g. sex, age, education); socioeconomic characteristics of the household (e.g. household composition, income, household size); community characteristics and existing water and sanitation situation (Whittington *et al.*, 1993; Tiltnes, 1998; Harapap and Hartono, 2007).

Using a contingent valuation survey, Whittington *et al.* (1993) estimated households' willingness to pay for two types of improved sanitation services: improved ventilated pit latrines and water closets connected to a sewer system, in Kumasi, Ghana. The study found that most households were willing to pay more for improved sanitation service (particularly the VIP latrine) than they were paying for their existing sanitation system (mostly public and bucket latrines). Household characteristics and other factors such as tenancy/ownership of house, household income, education, knowledge of facility, access to water/private water connection were found to have positive influence on households' willingness to pay for

improved sanitation services, while occupation, household size and expenditure on sanitation had negative influence on willingness to pay for improved sanitation services. Based on several tests that were conducted to check the accuracy of respondents' answers to contingent valuation questions, the study reported that contingent valuation surveys could be successfully carried out in cities (urban and per-urban communities) in developing countries for public services such as sanitation and that reasonably reliable information can be obtained on household demand for different sanitation technologies.

Tiltnes (1998) assessed households' ability and willingness to pay for water and sewage services in Palestine using the contingent valuation method. The study found that a majority of households were willing to pay to get connected to sewage services. Socioeconomic and other factors that were considered to influence households' willingness to pay for sewage services included: household size and density; income and sources of income; water sources and stability of water supply, and water consumption and expenditure. Harapap and Hartono, (2007) also analysed households' willingness to pay and determinants for drinking water and sanitation in Indonesia using the hedonic price model and logistic model. The study found that the availability of toilet facilitated with septic tank influences rent price of houses, both in urban and rural areas, and that households' economic and social conditions such as age, household size, education of the household head, and expenditure per capita influence the availability of sanitation facilities in the form of toilet with septic tank.

2.2.7.5 Assessment of Creditworthiness for Household Latrine Loan

There are no ‘miraculous’ formulae for assessing the probability that a borrower will not pay. In general, the classic *five Cs of credit* are the basic factors for evaluating creditworthiness of borrowers, and these include: *capacity* - ability to meet credit obligations (out of operating cash flows); *capital* - financial reserves; *collateral* - asset pledged in the case of default; *conditions* - general economic conditions including interest rate, inflation and motives/demand for money; and *character* - borrower’s personal character (such as honesty, integrity, reliability) and willingness to meet credit obligations (Gustafson, 1989; Ross *et al.*, 1998). Traditionally, lenders have used the *five Cs* of credit to analysis creditworthiness of borrowers (Olagunju and Ajiboye, 2010).

Lenders use *credit scoring* - the process of quantifying the probability of default based on information on the *five Cs* - to assess whether credit should be granted or refused a borrower (Ross *et al.*, 1998). A credit score is calculated by totalling the ratings (of the *five Cs*), and based on experience or the policy of the lender, credit is granted (or denied) an applicant with a score above (or below) a limit set by the lender. Based on the results of the credit scoring, it is possible to determine the variables that best predict whether or not an applicant will pay. It helps to determine applicants that are not creditworthy; hence the lender/credit officer is also able to make informed decision regarding a customer’s application.

2.2.7.6 Knowledge, Attitudes and Perceptions toward Excreta Reuse in Agriculture

Information on people’s knowledge, attitudes and perceptions (KAP) toward an intervention or technology is important for effective planning, implementation and evaluation of that

intervention. The WHO (2008) reports that a KAP study can help identify knowledge gaps, cultural beliefs, or behavioural patterns that may facilitate understanding and action, or pose problems or create barriers for an intervention or adoption of a technology. Moreover, information that is commonly known and that are commonly held by study participants can also be identified using the KAP approach. In addition, KAP to some extent, can help identify factors that influence behaviour that are not known to most people, and the reasons for people's attitudes, and how and why people practise certain behaviours.

Perceptions, like behaviour, are influenced by people's knowledge, beliefs, values and norms (Mariwah and Drangert, 2011). For example, the more knowledgeable one is about human excreta, the clearer his/her opinion tends to be, and the stronger his/her (feelings) perception. Similarly, being informed about an issue is even more likely to influence behaviour, especially when knowledge is gained from first-hand experience (Fazio and Zama, 1981).

This study, which employs the KAP's approach in the assessment of households' attitudes and perceptions toward human excreta, is also corroborated by the ideas of Bieberstein (2012) who reports that people's perceptions of risk related to food products (e.g. *healthrelated risks of excreta reuse in agriculture*) are important determinants of food choice, attitude towards technologies used in the food and agricultural sector, as well as behaviour related to safety practices during food production. As Wortman *et al.* (1992) observed, it is assumed that knowledge about the importance of human excreta can help provide a better understanding and promotion behaviour consistent with beliefs and feelings of study participants like farmers.

CHAPTER THREE

STUDY AREA AND METHODOLOGY

3.1 Study Area

The study area, Dangme West District (now Shai Osudoku and Ningo-Prampram districts), is situated in the south-eastern part of Ghana, lying between latitude 5° 45' south and 6° 05' North and Longitude 0° 05' East and 0° 20' West. It is the largest district in Greater Accra region, with a total land area of 1,442 sq. km (41.5% of the regional land area). It shares boundaries with the Yilo Krobo District on the north-west, North-Tongu District on northeast, Akwapim-North District on west, Tema District on south-west and Dangme-East District on the east. It is divided into four administrative sub-districts: Dodowa (Shai), Prampram, Great Ningo (formerly Old Ningo), and Osudoku (Dangme West, 2006, <http://www.ghanadistricts.com/districts>).

The study area was chosen purposively because it is peri-urban and forms part of the study area of the Dodowa Health Research Centre (DHRC), a partner institution of the SUSAGhana Project with a broad objective to expand access to improved sanitation facilities among peri-urban residents in Dangme West District, Ghana (*see*: <http://susaghana.com>).

Dangme West District has gone through rapid urbanization, representing that of sub-Saharan Africa in general (Spencer, 2012). The study was primarily conducted in four peri-urban communities (*Upper-Prampram*: Kley and Olowey; *Lower-Prampram*: Lower East and Lower West) in Ningo-Prampram District (Fig. 3.1a), and some communities in the Shai-Osudoku district. The sanitation map of Prampram is presented in Fig. 3.1b.

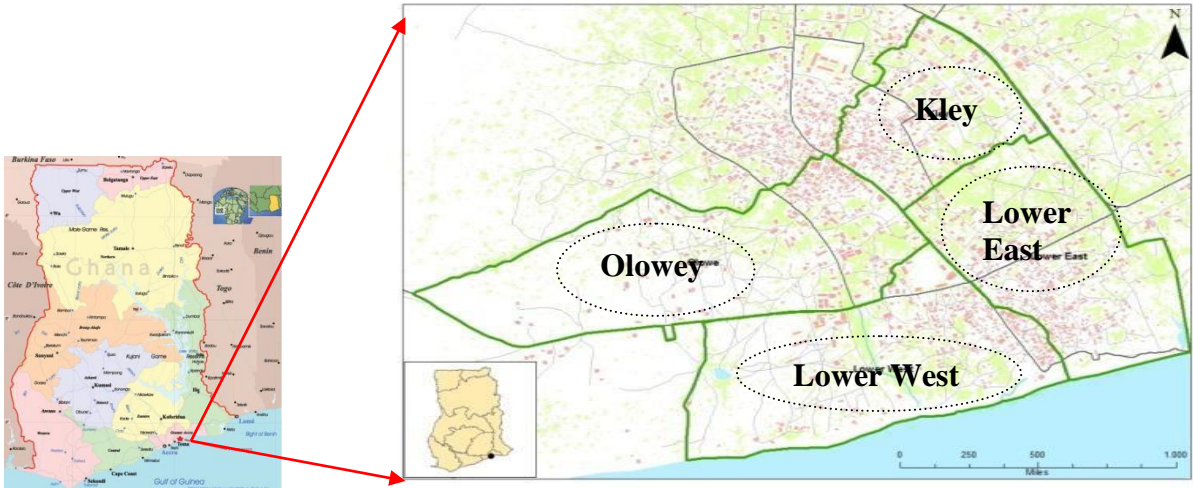


Fig. 3.1a: Selected Communities in Ningo-Prampram District. *Source: DHDSS, 2011*

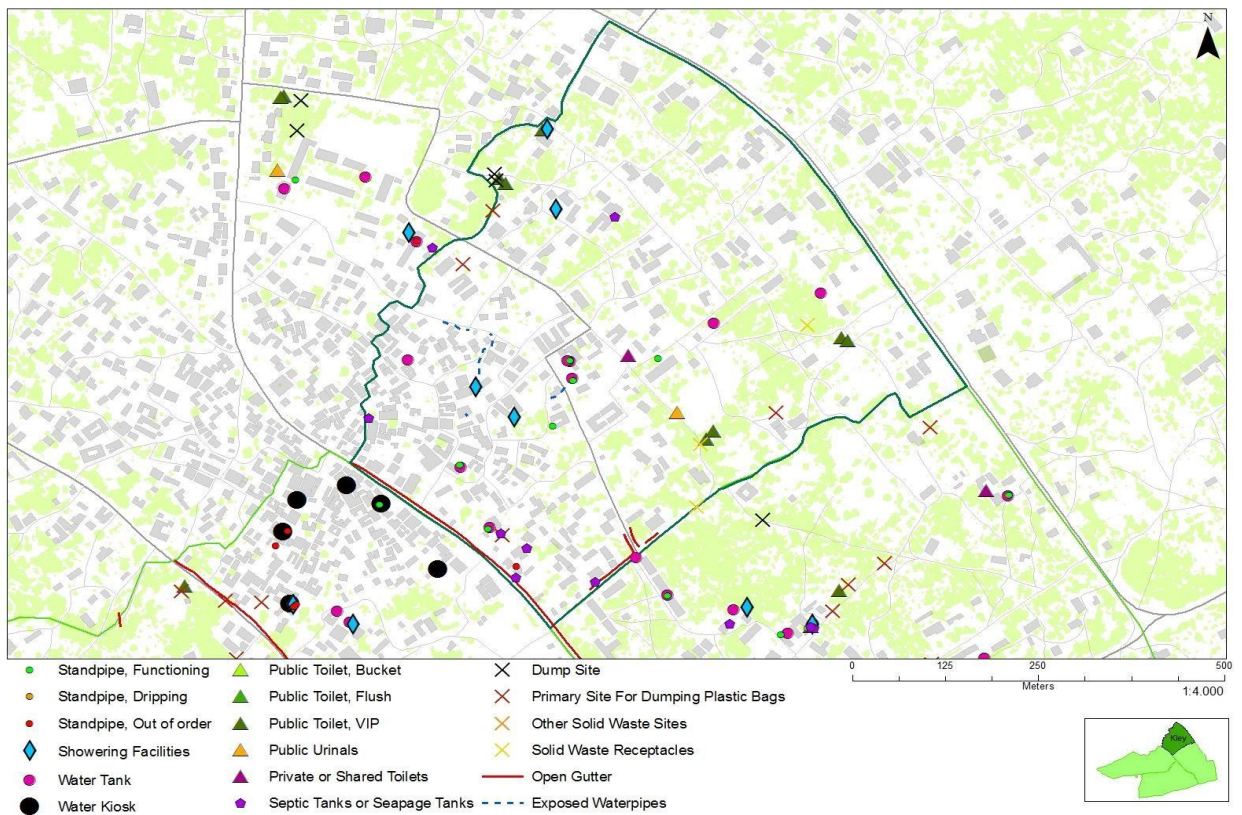


Fig. 3.1b: Sanitation Map of Prampram. *Source: DHDSS, 2011*

Socio-economic situation in study area

The total population of Dangme West is 122,836 persons (47.9% males and 52.1% females), representing about 0.50% of Ghana's total population and 3.06% of the Greater Accra region population (GSS, 2012). The average household size in the District is estimated at 5.2 persons. Agriculture, the dominant occupation, employs about 59% of the people, followed by trade (22.1%) and fishery (6.4%). Financial reports indicate that the highest contribution to internally generated revenue in the District comes from fees and fines, followed closely by business operating permits (<http://www.ghanadistricts.com/districts>).

Environmental, health and sanitation situation

The natural and physical activities (such as sand winning) have led to the situation where agricultural lands are seriously being threatened. Reclamation of land is not as aggressive as the degradation. Large pools of stagnant water and solid waste with the inevitable mosquitoes, malaria, and other related diseases is a major threat to the district. However, forest conservation measures are being practiced using the Taungya system. In terms of health, the Dodowa Health Research Centre (DHRC), established in 1990, is one of the health research centres of the Ghana Health Service that has had a close link with the Dangme West Health Administration for several years.

3.2 Population, Sampling and Data Collection

The study population comprised crop farming and fishing households and sanitation businesses/service providers in peri-urban communities in Dangme West District of Ghana. DHRC has established a numbering system for all households in its survey area to facilitate

sampling and record keeping. A household was defined as a building, as numbered by DHRC, with one or more families residing in it and every member eating from 'one pot'.

Both primary and secondary data were used for the study. The study used observations, interview guide (for focus group discussions (FGDs) and key-informant interviews), and survey questionnaire (structured and semi-structured) to collect primary data from the study participants (households, local government representatives and sanitation service providers (SSPs)). The SSPs comprised: latrine builders/masons, pit emptiers, sanitation hardware suppliers, solid waste collectors, and public latrine attendants/managers in the study area and its environs. Prior to the selection of participants for the study, an observational technique (transect walk) was used to get a general idea of the sanitation situation and the study environment (such as the topography and housing, presence and types of sanitation facilities and service providers, financial institutions and private and government institutions).

The study employed different sampling methods to help achieve the various specific objectives as follows:

- ***Objectives One and Two: Description of sanitation-related businesses and constraints, motivations and strategies to their operation.*** The study participants were selected using non-probability sampling techniques based on purpose, convenience and availability of participants. The participants comprised three masons/latrine builders, two sanitation hardware suppliers, a pit-emptier, six public toilet managers/attendants, local and government representatives (two chiefs/elders in the upper and lower Prampram communities), three assemblymen, four district assembly officers (the

Coordinating Director, Planning Officer, Internal Auditor, and Environmental/Sanitation Officers), and the local overseer for Zoomlion sanitation company.

Based on information gathered through the observations, interview guides and semistructured and structured questionnaires were used to conduct in-depth and keyinformant interviews and focus group discussions (FGDs) with the study participants. The key-informant interviews were conducted with local and government representatives while in-depth interviews were conducted with the SSPs. A total of six FGDs comprising two community member groups, two mason groups, and two sanitation workers' (Zoomlion, Zoil and ACI) groups were also conducted.

The specific data that were considered to help describe the sanitation market in the study area included community members' perception of the sanitation situation in the study area, the types of sanitation-related businesses; the size of the sanitation market and scope of operation; the performance of SSPs as perceived by the community members; personal and business characteristics of SSPs such as *age, education, business experience, business registration*, among others; business strategies/models used by the SSPs; motivations and constraints to business performance, and the market potential for sanitation business in the study area.

- ***Objective Three: Households' latrine financing mechanisms and willingness-to-pay for improved latrines.*** Using a household list from the Dodowa Health Research Centre

(DHRC), the study employed a cross-sectional data collected on 633 randomly selected households (Upper-Prampram: Kley and Olowey, 280; Lower-Prampram Lower East and Lower West, 353) without latrines. A study by Spencer (2012) in the study area which was sponsored by SUSA had investigated the latrine preference for households with and without latrines; hence it was necessary for this study to focus on the financing mechanisms and WTP for households' preferred latrines. The determination of the sample size was based on an estimated population of 32,000 households (DHRC's estimate), which falls within the estimated population of 10,000 to 100,000 as a guide with the use of the sample size chart (Bartlett *et al.*, 2001) and the formula: $N = (z/e)^2 \cdot p(1-p)$, where N is the required sample size, z is the confidence level at 95% (value of 1.96), p is the estimated number of households without latrines, and e is the margin of error at 5%. To improve the validity of the results, the sample size used for this study was more than that estimated by the sample size chart and the formula.

The household questionnaire comprised four main sections: section one elicited data on personal and household characteristics such as age, sex, educational level, income, expenditure, tenancy and household defecating practice, among others; section two captured data on households' latrine preference and cost estimates of those latrines; section three captured data on households' proposed financing mechanisms and factors that influence their latrine financing decisions as well as data on households' banking profile; and section four elicited data on the factors that influence households' WTP for improved latrines. In addition, the study used a lenders' questionnaire to

collect data on factors that lenders may consider in their interests (or not) to finance household latrines.

- ***Objective Four: Farmers' perception on excreta reuse for agricultural purpose.***

Using a household list from the District's Agriculture unit, the study employed a cross-sectional data collected on 400 respondents who were proportionately and randomly selected from purposively considered farming communities in the district: Dodowa (50), Henyum (21), Odumase (39), Adumanya (30), Ayikuma (100), Asebi (100), Abonya (30), Metase (10), Ziakpone (10) and Adumadzan (10). The communities were chosen on the basis of the major farming activities in those areas and also part of the research area of the DHRC, a partner institution of the SUSAGhana Project which provided funding for this study. The determination of the sample size was based on an estimated population of 10,000 farming households, guided by the sample size chart (Bartlett *et al.*, 2001) and the formula: $N = (z/e)^2 \cdot p (1-p)$. Again, the sample size used was more than that estimated by the sample size chart and the formula, to help improve the validity of the results.

The questionnaire comprised four main sections: section one elicited data on personal, household and farm characteristics such as age, sex, educational level, income, farm size, crops cultivated and land tenure system, among others; section two captured data on respondents' knowledge on human excreta; section three obtained data on respondents' attitudes and perceptions on excreta reuse for agricultural purpose and health-related risks of using excreta; and section four elicited data on the

constraints/barriers that influence farmers' decision to use excreta as fertilizer. In addition, two focus group discussions (FGDs) comprising male and female farmer groups were conducted to complement the responses from the interviews.

□ **Objective Five: review of literature on regulatory policies for sustainable sanitation:** the study primarily used current literature to discuss issues relating to the forms and extent of private sector involvement in sanitation service delivery in developing countries, especially in Ghana. Regulatory policies for sustainable sanitation generally available in literature, and those applicable to the Ghanaian situation were discussed.

Ethics

Clearance was obtained from the ethical review board (IRB) of the DHRC before the commencement of the study. Consent was also sought from the study participants before any discussions or interviews were conducted. In each selected household, the participant was the head of the household or any other adult member or representative of the household head.

3.3 Data Analysis

Both quantitative and qualitative analytical methods were employed for data analysis and reporting. Descriptive tools such as frequencies, percentages, bar charts and pie charts were used to summarize the socioeconomic characteristics of the respondents. Appropriate models of qualitative and quantitative components were also employed to help achieve the objectives of the study. SPSS and STATA software were used to analyse data for the study.

3.3.1 Description of Local Sanitation-related Businesses

The local sanitation-related businesses that were indentified in the study area were described using narrative texts and pictures. Based on a review of literature, business models that were employed by the sanitation service providers (SSPs) were also described using tables and narrative texts. The structure of the sanitation market in the study area was assessed based on the nature of competition among the SSPs in the sanitation market. The conventional structure-conduct-performance (SCP) theory of market analysis, that is the approach in assessing market structure by measuring the concentration/share ratio of actors and margins, was used as a guide to help understand the nature of competition, and hence the conduct and performance of the sanitation market in the study area (Marion, 1976; Ross *et al.*, 1998).

3.3.1.1 Assessment of the Sanitation Market Structure

Market concentration, as a measure of market structure, can be measured using three methods, namely: concentration/market share ratio, Herfindahl-Hirschman Index (HHI) and Gini coefficient; all three measures yield comparable results (Edwards *et al.*, 2006). Market concentration (CR) is defined as the number and size distribution of sellers (SSPs) and buyers (service users/households) in a (sanitation) market. The HHI is a measure of concentration based on the sum of squares of market shares of firms, expressed as proportions of total market sales. The Gini coefficient is a measure of inequality in the distribution of firms in an industry from a hypothetical distribution of equal size firms.

The concentration ratio is the most commonly used method of measuring industry concentration; the other two methods are very demanding in terms of data. The concentration

ratio is the percentage of market share owned by the largest m firms in the market, where m is a specified number of firms, often 4, but sometimes a larger or smaller number (Edwards *et al.*, 2006). In this study, the 2-firm and 3-firm concentration ratios were used for the sanitation hardware suppliers and latrine builders/masons, respectively.

The concentration ratio often is expressed as CR _{m} , e.g. CR₄, and it can be expressed as:

$$CR_m = \sum_{i=1}^m S_i$$

where, $S_i = V_i / \sum V_i$, S_i = market share of the i firm (SSP), V_i = amount of product/services or service users/households handled by an SSP, $\sum V_i$ = total products/services or service users/households handled by all SSPs in the (sanitation) market.

As a rule of thumb, a four enterprise concentration ratio of ≥ 50 percent is indicative of strongly oligopolistic market; 33-49 percent indicates a weak oligopoly; and < 33 percent is an un-concentrated market. The larger the degree of concentration, the greater would be the possibility of non-competitive behaviour, hence barrier to entry very high. Again, the more difficult it is for other firms/SSPs to enter a (sanitation) market, the more likely it is that existing firms can make relatively high profits and the high possibility of exploitation, hence an effect of the market performance.

3.3.1.2 Perceived Performance of Sanitation Service Providers

The performance of sanitation service providers (SSPs) in the study area, particularly solid waste collectors and public latrine managers, as perceived by the local authorities and community members/households was assessed using percentages and a 3-point rating scale (1 = good (>50%), 2 = fair (50%), and 3 = poor (<50%)). The ratings were done by the various study participants based on their opinion on the general sanitation situation in the study area, particularly the reliability and responsiveness of waste collectors and public latrine managers in the cleaning of the surroundings and public latrines. The participants included officers of the District Assembly, the local/traditional leaders, members of the Area Council (Assemblymen) and community members/households.

3.3.2 Factors influencing Sanitation Business Development

Using three sanitation service providers (*latrine builders/masons, pit-emptier, hardware suppliers*) as case studies, an empirical investigation was made into the internal and external factors (*business strategies, motivations and constraints*) that influence sanitation business development in the study area. To strengthen the possibility of scientific generalization, multiple cases involving two or three local SSPs, particularly the latrine builders/masons and hardware suppliers were used for the study (Yin, 1984; Susan, 1997; Zainal, 2007). The study employed both descriptive and explanatory case methods (Yin, 1984). Tables, narrative texts and quotations were used to present the findings of the study.

3.3.2.1 Assessment of Business Strategies /Models employed by SSPs

A marketing strategy/mix analysis was employed to help identify the marketing orientation of the SSPs. Following Hoffman (2006), a semi-structured questionnaire involving openended questions was used to collect data on the marketing strategies/mix (that is, the *four P's* - product, price, place and promotion) adopted by the local SSPs in their operations. An examination of the SSPs' market orientation was necessary to help provide information that could guide the development of appropriate sanitation marketing programme for an improved and sustainable sanitation market. The adoption of appropriate marketing strategies by the SSPs could also help increase the uptake of improved sanitation.

3.3.2.2 Assessment of Motivations and Performance of Sanitation Business

The motivations of the SSPs' businesses were examined using both pecuniary and nonpecuniary indicators. The study used profit margin estimates as a measure of the efficiency and performance of the sanitation market in the study area. An analysis of market efficiency is one of the approaches to assess market performance. Market efficiency measures the effect of the costs and methods of performing a service, which is an estimation of profit margin (Edwards *et al.*, 2006).

Following Ross *et al.* (1998), the SSPs' profit margins (*PM*) were estimated as:

$$PM = NI/TR$$

where, *NI* (Net Income) = *TR* (Total Revenue) minus *TC* (Total Cost), $TR = \sum_{i=1}^n P_i Q_i$, and

$$TC = \sum_{i=1}^n P_{xi} X_i, P_i = \text{price per quantity or service}, Q_i, \text{ quantity of products or services}$$

rendered, and P_{xi} = the price of the i th input (including labour; service costs incurred by masons such as transport fare to service site, medicine/*pain killers*, water/food and depreciation of tools - *trowel*), and X_i is the i th input. All other things being equal, a relatively high profit margin is desirable. This would imply a low expense is obviously desirable.

3.3.2.3 Assessment of Constraints to Sanitation Business Development

Using an interview guide, the general business constraints faced by the SSPs were identified and presented in narrative texts and pictures. The specific constraints to sanitation business development in the study area, particularly constraints to the latrine builders/ masons, pitemptier and hardware suppliers, were assessed by ranking the participants' responses according to the most important to the least important using numerals; 1,2,3,... N , where 1 = most important constraint and N = least important constraint.

3.3.2.4 Market Potential for Sanitation Business

Market potential, which is the maximum reasonable sales or revenues attainable under a given set of conditions within a specified period of time, is important in determining the economic feasibility of the products and services and the sales potential for the sanitation market (Lehmann and Winer, 2005). The market potential for a product/service determines whether the market is large enough to support the viability of the product/service (Wolfe, 2006). Following Wolfe (2006), the market potential for various sanitation businesses (*latrine builders/masons, pit-emptier, hardware supply and management of public latrine*) in the study area were estimated as:

$$MP_i \square N_i * P_i * Q_i$$

where, MP_i is market potential for the i th sanitation business, N_i is number of potential service users/households for the i th business in study area, P_i is average price of product/service of the i th business, and Q_i is the average annual quantity purchase by service users/households for the i th business.

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3.3.3 Financing Mechanisms and WTP for Household Latrines

3.3.3.1 Estimating Costs of Improved Latrines

The cost estimates for improved latrine technologies were determined using the budgetary method. The prices of inputs for the construction of an improved latrine were obtained from the study participants, particularly the latrine builders/masons and hardware suppliers. The estimates were compared and confirmed with those estimated by other studies sponsored by SUSA and masons/experts working with TREND-Sanimart Technology in Ghana.

3.3.3.2 Financing Mechanisms for Household Latrines - Resource Mobilisation Strategies

Descriptive statistics were used to summarise households' latrine preferences and proposed resource mobilisation/financing strategies (i.e. use of equity or non-equity funds and/or other resources in kind). The logistic regression, a probabilistic statistical classification and binary response model, was used to estimate the socioeconomic and community factors that influence households' latrine financing decisions.

The logistic model which is based on the cumulative logistic probability function (Pindyck and Rubinfeld, 1991) is specified as:

$$P_i = F(Z_i) = \frac{1}{1 + e^{-\beta X_i}} = \frac{1}{1 + e^{\beta X_i}} = \frac{e^{\beta X_i}}{1 + e^{\beta X_i}} \quad (1)$$

where, P_i is the probability that a household will make a certain latrine financing decision, given X_i predictor variables, and e is the base of natural logarithm.

The dependent variable which is a household's latrine financing decision (Z_i) is the logarithm of the odds that a rational choice would be made weighing the costs and consequences of a financing decision. In this study, since P_i is the probability of a household's latrine financing decision of use of own funds for building an improved latrine, $1 - P_i$ is the probability of use of non-equity funds. $P_i/(1 - P_i)$ is the odds ratio in favour of use of own funds. If P_i happens to equal either 0 or 1, then the odds $P_i/(1 - P_i)$ equal zero or infinity and the logarithm of the odds undefined, hence the application of the ordinary least-squares estimation, inappropriate.

It is assumed that Z_i depends on the characteristics of the household head (H) who makes a financing decision based on the household's current income (y), the characteristics of the household (W), other community characteristics (C), and the error term u (Weinberger and Jütting, 2000). The general model of a household's latrine financing decision was specified as:

$$Z_i = f(y_i, H_i, W_i, C_i) \quad (2)$$

In this study, the empirical logistic model for estimating the probability of a household's latrine financing decision was specified as:

$$DTF_OwnLat_i = \beta_0 + \beta_1 Age_1 + \beta_2 Gend_2 + \beta_3 Educ_3 + \beta_4 hhCmpCHILD_4 + \beta_5 INCOMpCAP_5 + \beta_6 Tenancy_6 + \beta_7 DfPRACTICE_7 + \beta_8 Cmmty_8 + u_i \quad (3)$$

where, $DTF\text{-}OwnLat_i (Y_i) = 1$, if $Y_i > 0$, meaning a household is interested in using its own funds to construct the household latrine, and $Y_i = 0$ otherwise. β_0 , is the intercept, β_i , is the coefficients of the predictor variables. The variables employed in the empirical logistic model are defined and presented in Table 3.1.

Table 3.1: Variables for Empirical Logistic Model for Households' Financing Decision

Variable	Variable definition	<i>a-priori</i> sign
DTF_OwnLat	Decision of household to finance own latrine	
Gend	Gender of respondent (1 if male, 0 otherwise)	-
Age	Age of respondent (years)	+/-
Educ	Education level of household head:	
	- 1 if highest education level is secondary/tertiary, 0 otherwise	+
	- 1 if highest education level is basic, 0 otherwise	+
hhCmpCHILD	Household composition (1 if there is a child (< 6 years), 0 otherwise)	+
INCOMpCAP	Average household monthly per capita income (in GH¢)	+
Tenancy	Tenancy status of household:	
	- 1 if respondent is a landlord, 0 otherwise	+
	- 1 if respondent resides in family house, 0 otherwise	-
DfPRACTICE	Defecating practice of household:	
	- 1 if household uses public latrine, 0 otherwise (ODF)	+
Cmmtty	Community in which the household resides:	
	- 1 if household resides in Upper Prampram, 0 otherwise	+
Pref_Lat	Household preference for improved latrine:	
	- 1 if household prefers VIP latrine, 0 otherwise	+

3.3.3.3 Consumer Utility and Willingness to Pay for Improved Latrine Technologies

Willingness to pay (WTP) can be analysed as a consumer choice decision making. In line with

economic theory, WTP is considered an appropriate measure of the value which a consumer derives from a particular good or service, corresponding to the appropriate monetary welfare measures, that is compensating and equivalent variations. This forces the consumer to take into account the fact that s/he is being asked to sacrifice some of his/her limited income to secure a good/service, and must thus weigh the value of what is being offered against the alternative uses of the household's income (Day and Mourato, 1998).

Using Whittington *et al.* (1993) framework, that is a study which describes a household's decision to agree to pay or not to pay for improved sanitation system (improved latrines), this study assumes that the household which decides to pay for an improved latrine technology does so because its consumption utility is higher than the current defecating practice. If a household's utility does not change, then a rational decision would be a household not willing to pay, as an increase in the price of an improved latrine results in a lower level of utility compared to the previous utility in the alternative defecating practice. However, if the utility increases, then the household may be willing to pay more for an improved latrine technology, on the basis that the price increase compensates for the increased value of the latrine technology in question.

In this regard, the household's willingness to pay for an improved latrine is therefore a function of the change in utility arising from the consumption choice, that is:

$$WTP \propto f(\Delta U) \quad (A1)$$

where, ΔU is the change in utility and $f' \geq 0$

Since the choice of a product/service (improved sanitation/latrine) over the other

(unimproved sanitation) is a discrete one, the household's choice problem then becomes a random utility one, hence the application of a random utility model in the estimation of a household's willingness to pay for an improved latrine technology becomes appropriate.

Following the random utility framework, it is assumed that the household faces a choice between accepting either an improved latrine technology or maintaining its current (unimproved) defecating practice. The utility derived from using a defecating practice (improved or unimproved) by the household is given by:

$$U_i = X_i \beta_i + \epsilon_i \quad (A2)$$

where, U_i is the utility arising from choosing the i th alternative, $X_i \beta_i$, the deterministic component of the utility function where X_i is a vector of explanatory factors, β_i is a vector of parameters and ϵ_i is the error term. In the rational sense, the household would choose alternative i , if $\epsilon_i > \epsilon_j$, for all $j \neq i$ or that $U_i > U_j \forall j \neq i$. In that sense and in general,

WTP can then be expressed as:

$$WTP = X_i \beta_i + \epsilon_i \quad (A3)$$

where, $X = X_i \cup X_j$ and $\beta = \beta_i \cup \beta_j$. The household characteristics could be included in the vector of explanatory factors, X_i , since WTP is likely to vary among the heterogeneous households (Deaton and Muellbaur, 1990; Whittington *et al.*, 1993).

The probability that a household will pay for an improved latrine technology can then be specified as:

$$P_i = \text{Prob} \left[\begin{matrix} \text{unimprvd}_i < X < \text{imprvd}_i \\ (X)_{\text{imprvd}_i} < (X)_{\text{unimprvd}_i} \end{matrix} \right] \quad (A4)$$

where, unimprvd_i is the current defecating practice (use of unimproved latrines or ODF) and imprvd_i is the proposed improved latrine technology.

The probability of having WTP between the two defined WTP levels is expressed as:

$$\Pr(WTP_1 < WTP < WTP_2) = \Pr(X < y) - \Pr(X < y) \quad (A5)$$

where, $\Pr(\cdot)$ is the probability of WTP between the two levels, that is the current unimproved defecating practice (WTP_1) and the proposed improved latrine technology (WTP_2), WTP_1 and WTP_2 are lower and upper limits of the household's WTP, and y and y are the point changes consistent with the lower and upper limits of WTP.

3.3.3.4 Estimating WTP using Contingent Valuation Method (CVM)

Non-market goods and services are normally valued by consumers/households contingent upon market availability for those goods and services (Venkatachalam, 2004). The use of the CVM, which involves directly asking consumers/households in a survey on how much they would be willing to pay for the product or service, helps to determine the consumer demand or WTP for such products/services in a hypothetical market situation. A number of studies have used the CVM to estimate consumers/households' WTP for a product/service

(Whittington *et al.*, 1993; Hanemann and Kanninen, 1996; Halstead *et al.*, 2002). Unlike other pecuniary methods for estimating WTP, the CVM is very useful in capturing nonmarket values.

In using the CVM, WTP can be estimated by using open-ended or closed-ended questions. Open-ended questions allow respondents to state (on their own) the maximum amount they would be willing to pay for a product/service, whereas with closed-ended questions respondents are asked if they would be willing to pay a specific amount as a dichotomous choice response for the good/service in question (Hanky *et al.*, 1997). Unlike closed-ended questions, the open-ended questions may be problematic since respondents might not have sufficient information to thoroughly consider the values they attach to such goods/services if the market were to exist, and might not provide realistic estimates; in that sense, closed-ended questions are recommended for the estimation of a consumer/household WTP for a product/service (Arrow *et al.*, 1993).

The most commonly used closed-ended questions in WTP studies are single-bounded dichotomous choice (SBDC) and double-bounded dichotomous choice (DBDC) questions (Hanemann and Kanninen, 1996). In the SBDC approach, there is only one bid where the respondent gives either a 'yes' or 'no' response; with a 'yes' response indicating that WTP is greater or equal to the proposed price, and 'no' otherwise (Mitchell and Carson, 1989). Unlike the SBDC method, the DBDC dichotomous method provides the respondent with a second bid, that is, a higher or lower bid than the first bid, which makes the method statistically more efficient and provides a tighter confidence interval than the SBDC method

(Hanemann *et al.*, 1991; Kanninen, 1993). Again, in analysing the DBDC data, a WTP function with observable utility index is used to measure the likelihood that a household would accept a particular bid level; thus unlike the referendum question data, the absolute value of the WTP function is essential (Day and Mourato, 1998).

Despite the advantages of the DBDC method over the SBDC, studies have argued that there is internal inconsistency between the initial and follow-up responses with the DBDC method; the internal inconsistency is explained as the downward mean shifting in the second response which results in a smaller mean WTP (Cooper *et al.*, 2002; Donfouet *et al.*, 2011). Some explanations have been proposed for the anomaly with the DBDC method. Mitchell and Carson (1989, in Donfouet *et al.*, 2011) explanation is based on the strategic behaviour model where respondents answer the first question truthfully but answer the second questions strategically. Carson *et al.* (1992 and 1994, in Cooper *et al.*, 2002 and Donfouet *et al.*, 2011, respectively) also suggest an explanation based on cost expectations that respondents normally conceive of the higher follow-up bids as an attempt by government to collect more funds than needed for the provision of goods/services, and also the offer of a lower bid may suspect that an inferior version of the good/service will be provided. Moreover, Altaf and DeShazo (1994, in Cooper *et al.*, 2002) suggest that the second bid converts what had seemed to be straightforward posted price into a situation involving bargaining which makes the respondent to say 'no' in order to drive the price down. DeShazo (2000, in Cooper *et al.*, 2002) also explains this anomaly as loss aversion and framing on the first question. Based on this anomaly, which became apparent in this study, the SBDC format was used to compute the mean WTP for improved latrines, although the initial study design was the DBDC format.

3.3.3.5 Population Distribution and Estimation of WTP

The distribution of WTP is based on the fact that no one has a WTP less than zero, as no one believes s/he should be paid money to have an improved product or service (Day and Mourato, 1998). Three theoretical distributions might be of use when modelling WTP (Fig. 3.2): (a) *spike distribution* - where a proportion of a population may clearly not be WTP anything for an improvement or proposed policy which may account for a large 'spike' in the population distribution at zero, (b) *normal distribution* - which although simply an approach to analysing average WTP, has a number of drawbacks in that it is symmetric and shows no skewedness, and it is not necessarily truncated at zero; assuming the normal distribution could lead to a model that can predict a portion of the population having negative WTP, (c) *log-normal distribution* - which appears to be a much closer approximation to the true underlying distribution of WTP as it accounts for skewedness and does not allow for WTP below zero (Day and Mourato, 1998).

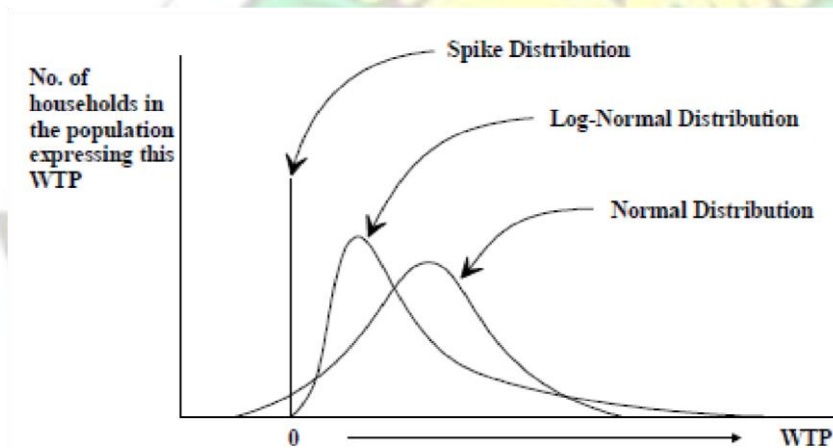


Fig. 3.2: Possible Theoretical Distributions of WTP. *Source:* Day and Mourato, 1998

WTP is assumed to have a probability density function around a mean in the function of the

'bid' price. The logistic distribution which assumes skewedness of the population distribution is normally used in WTP studies where the price enters indirectly in the argument called the index function v (Day and Mourato, 1998). The most common index function used is linear in the bid as:

$$v = \beta_0 + \beta_1 B_i \quad (A6)$$

The probability density function is expressed as:

$$P(WTP = B_i) = \exp(v) / (1 + \exp(v)) \quad (A7)$$

The logistic function has an advantage of a closed form cumulative distribution function (cdf) which represents the proportion of the population whose WTP falls below a certain value.

$$G(B_i) = P(WTP \leq B_i) = 1 / (1 + \exp(-v)) \quad (A8)$$

The acceptance of a bid indicates a WTP higher than B_i , hence the probability of someone accepting an offer is the opposite of the function above (eqn. 14):

$$P(WTP > B_i) = 1 - G(B_i) \quad (A9)$$

In the double bounded dichotomous choice (DBDC) question format, households are presented with two bids where the second bid is contingent upon the response of the first bid (Day and Mourato, 1998). If the response is 'yes' to the first bid (B_i), then the second bid (B_i'') is considered greater than the first bid ($B_i'' > B_i$), and if the response is 'no' to the first bid, then a second bid (B_i') is considered small than the first bid ($B_i' < B_i$). There is therefore four

possible outcomes in the DBDC format: a ‘yes’ to the initial bid followed by a ‘yes’ to the second bid (\square^{yy}), a ‘yes’ followed by a ‘no’ (\square^{yn}), a ‘no’ followed by a ‘yes’ (\square^{ny}), and the case of a ‘no’ followed by a ‘no’ response (\square^{nn}).

The probabilities of both responses being ‘yes’ (i.e. WTP higher than the highest bid, (\square^{yy})), a ‘yes’ followed by a ‘no’ (i.e. WTP higher than the initial bid but lower than the second higher bid, (\square^{yn})), a ‘no’ followed by a ‘yes’ (i.e. WTP lower than the initial bid but higher than the second lower bid, (\square^{ny})), and a ‘no’ followed by another ‘no’; (i.e. WTP lower than the second lower bid, (\square^{nn})) are respectively expressed in the equations below:

$$\square^{yy}(B_i, B_i^h) = \Pr(B_i^h \leq \max WTP_i) = 1 - G(B_i^h) \quad (A10)$$

$$\square^{yn}(B_i, B_i^h) = \Pr(B_i^h \leq \max WTP_i < B_i^l) = G(B_i^h) - G(B_i) \quad (A11)$$

$$\square^{ny}(B_i, B_i^l) = \Pr(B_i^l \leq \max WTP_i < B_i) = G(B_i) - G(B_i^l) \quad (A12)$$

$$\square^{nn}(B_i, B_i^l) = \Pr(B_i < \max WTP_i; B_i^l > WTP_i) = G(B_i^l) \quad (A13)$$

Adding the probabilities of the four outcomes, the log-likelihood function for a sample may take the form:

N

$$\ln L_D(i) = \sum_{i=1}^4 d_{iyy} \ln(B_i, B_{iu}) + d_{iyn} \ln(B_i, B_{iu}) + d_{iny} \ln(B_i, B_{il}) + d_{imn} \ln(B_i, B_{il}) \quad (A14)$$

where, d_i^{yy} , d_i^{yn} , d_i^{ny} and d_i^{mn} are binary choice variables with 1 = households WTP for an improved latrine technology and 0 = otherwise.

3.3.3.6 Empirical Estimation of WTP

The conventional microeconomic theory posits that the demand for a product or service depends on a set of variables which include own-price, cross-price, tastes and preferences and income of consumers as well as other demographic and socioeconomic characteristics of the consumer/household (Deaton and Muellbauer, 1990). Whittington *et al.* (1993) and Harapap and Hartono (2007) report that households' WTP for improved sanitation facilities (improved latrines) is influenced by their socioeconomic characteristics such as sex, age, household composition, education, tenancy, income. Tiltnes (1998) also reports that the household's WTP for an improved sanitation facility is influenced by supply conditions such as sources of water, stability of supply of water and quality of water.

A logit model is specified to examine the determinants of the household's WTP for an improved latrine technology in the Ningo-Prampram District, the study area. The WTP by a household j preferring an improved latrine technology can be specified as:

$$WTP = \beta_0 + \beta_1 Z_j \quad (A15)$$

The logistic model explaining a household's WTP premium for an improved latrine technology relative to open-defecation (ODF) is specified as:

$$WTP = \beta_0 + \beta_1 Z \quad (A16)$$

where, $WTP = 1$, if a household is willing to pay a premium for an improved latrine technology, and $0 =$ otherwise, $\beta =$ price bid, $Z =$ a vector of explanatory variables.

The logit model explaining a household's WTP for an improved latrine was specified as:

$$WTP_{LAT} = \beta_0 + \beta_1 GEND + \beta_2 AGE + \beta_3 HHSZ + \beta_4 HHCOMP + \beta_5 EDUC + \beta_6 INCOM + \beta_7 TENANCY + \beta_8 ACCPUBLAT + \beta_9 CMMTY + \beta_{10} ACCMPLT HDWR + \beta_{11} KNWOM \quad (A17)$$

and the mean WTP was evaluated as:

$$\text{Mean } WTP_{SBDC} = \frac{\beta_0}{\beta_1} \quad (A18)$$

where, β_0 is the coefficients of the intercept term and β_1 is the bid price.

The definitions of the variables employed in the empirical model are presented in Table 3.2.

Table 3.2: Variables for Logit Model for Households' WTP for Improved Latrine

Variable	Variable definition	a-priori sign
Dependent variable		
WTP ImprvdLAT	Households' WTP for improved latrine technologies	
GEND	Gender (1 if male, 0 otherwise)	-
AGE	Age of household head (years)	+/-
HHSZ	Household size (total number of household members)	-
HHCOMP	Household composition (1 if there is child (< 6 yrs), 0 otherwise)	+
EDU	Education level of household head:	
	- 1 if highest education level is post basic, 0 otherwise	+
	- 1 if highest education level is basic, 0 otherwise	+
INCOM	Household's average monthly income (Ghana cedis)	+

TENANCY	Tenancy status of household:	
	- 1 if respondent is landlord, 0 otherwise	+
	- 1 if respondent resides in family house, 0 otherwise	-
ACCPUBLAT	Access to public latrine (1 household uses public latrine, 0 otherwise)	+/-
CMMTY	Community (1 if household resides in Upper-Prampram, 0 otherwise)	+
ACCWAT	Household's access to water (1 = accessible, 0 = otherwise)	+
ACCMPLT/HDWR	Access to complementary products/services (1 = accessible, 0 otherwise)	+
KNWOM	Knowledge of operation & maintenance of improved latrine (1=Yes, 0=No)	+

3.3.3.7 Estimating households' Expenditure on Use of Public Latrine

An estimation approach was used to compare the costs of latrine technologies with households' expenditure on the use of public latrines as:

$$\text{exp.PT} \propto ((p * \text{av.HS}) * D)$$

where, exp.PT is average household expenditure on use of public latrine per annum, p is the price paid per household member for use of a public latrine, av.HS_i is the average household size for the sampled households, and D is the number of days per year (365 days), which is assumed to be constant for each household.

3.3.3.8 Lenders' Criteria for Assessing Creditworthiness for Household Latrine

A five-point rating scale, 1 (very important) to 5 (least important), on the *five Cs* of credit – capacity, capital, collateral, condition, character – was used to analyse the criteria that lenders use in their assessment of customers/households' creditworthiness for a loan (Ross *et al.*, 1998). Using a semi-structured questionnaire, credit officers/managers of the financial institutions in the study area were asked to rank the *five Cs* of credit as

indicators/determinants of their lending decisions. The importance and degree of agreement of the rankings of the *five Cs* by the credit officers was tested for significance using the Kendall's Coefficient of Concordance (*W*).

W ranges from 0 to 1 and it is derived as follows:

$$W = \frac{12S}{m^2(n^3 - n)}$$

where, $S = \sum_i R_i - R^2$, m = number of respondents (credit officers), and n = *five Cs*.

The *W* was tested for significance (thus, $H_0: W = 0$ versus $H_1: W \neq 0$) in terms of the *F* distribution. The *F*-ratio is given by: $((m - 1) Wc) / (1 - Wc)$, with $(n-1) - (2/m)$ degrees of freedom for the numerator and $(m-1)*((n-1)-(2/m))$ degrees of freedom for the denominator (Edwards, 1964).

3.3.4 Perceptions toward Excreta Reuse in Agriculture

A three-point Likert-type scale ranging from 1 (Agree) to 3 (Disagree) was used to measure the respondents' knowledge and perceptions in their response to pre-set statements on human excreta and perceptions on health-related risks of excreta reuse for agricultural purpose. The respondents were asked eight questions about their general attitudes and perceptions toward human excreta. Ten statements were also used to assess farmers' knowledge about the use of excreta as fertilizer, as well as their decisions to use excreta as fertilizer. Prior to the interviews, the researcher explained the purpose of the study and the possibility of using (sanitized) excreta in agriculture to the respondents. The significant differences between the mean responses of

respondents' knowledge, attitudes and perceptions on excreta and their socioeconomic characteristics were assessed using the t-test and a one-way analysis of variance (ANOVA).

The factors that influence the respondents' perceptions on health risks associated with the handling and use of excreta for agricultural purpose were estimated using the ordered probit model. The constraints/barriers that influence the respondents' decision on excreta reuse as fertilizer were examined using the Kendall's Coefficient of Concordance (W) (Mattson, 1986). The data from the FGDs were transcribed to support the quantitative findings from the individual household interviews.

Ordered probit model for respondents' perception on health risks to excreta reuse

Following Greene (2008), an ordered probit model was used to examine the factors that influence farmers' decisions to use excreta as fertilizer as well as their perceptions on the health risks of excreta reuse. The dependent variables were categorized as 0, 1 and 2, corresponding to 'disagree', 'neutral' and 'agree', respectively on farmers' decisions and perceptions on health risks of excreta reuse. The model, based on the latent regression function, was specified as:

$$Y_i^* = \beta' X_i + \epsilon_i \tag{B1}$$

where Y_i^* is the exact but latent dependent variable (decisions and health risks perception) of the i respondent, X_i is a vector of explanatory variables influencing respondents' decisions and perceptions, β' is a vector of parameters to be estimated, and ϵ_i is a random error term assumed to be standard normal distributed. Since Y_i^* is latent it is unobserved, but what is observed is the classified category Y as follows:

$$Y_i = \begin{cases} 0, & \text{if } Y_i^* \leq \mu_1(\text{Disagree}) \\ 1, & \text{if } \mu_1 < Y_i^* \leq \mu_2(\text{Neutral}) \\ 2, & \text{if } Y_i^* > \mu_2(\text{Agree}) \end{cases} \quad (\text{B2})$$

where μ_1 and μ_2 are the classifying threshold values.

The associated probabilities with the classifying categories of the ordered probit model can be specified as:

$$\begin{aligned} \Pr(Y = 0|x, \beta) &= \Phi((u_1 - \beta'x)) \\ \Pr(Y = 1|x, \beta) &= \Phi((u_2 - \beta'x)) - \Phi(u_1 - \beta'x) \\ \Pr(Y = 2|x, \beta) &= 1 - \Phi(u_2 - \beta'x) \end{aligned} \quad (\text{B3})$$

where Y is an alternative response, x is a set of explanatory variables, β is a vector of parameters to be estimated, and Φ is the standard normal cumulative distribution function which ensures that the predicted outcome of the model always lies between 0 and 1. The z-statistics provide the significance of the estimated individual β_j in the model by testing the null hypothesis $H_0: \beta_j = 0$, thus the estimated coefficient of the i th variable is zero. If H_0 is rejected as a result of the z-statistic, we conclude that the variable significantly affects the farmers' decision and perception on health risks with excreta reuse for agricultural purpose.

The direction of the effect of a change in x_j depends on the sign of the β_j coefficient.

However, the estimated coefficients cannot be interpreted as the marginal effects of the independent variable, as β_j is weighted by the factor σ , thus the normal density function which depends on all the regressors. An interpretation of the effect of the explanatory variables however requires a consideration of the marginal effects, which is specified as:

$$\begin{aligned} & \frac{\partial \Pr(Y = 0 | x', \beta)}{\partial x_j} = -\sigma \phi(u_1 | x') \\ & \frac{\partial \Pr(Y = 1 | x', \beta)}{\partial x_j} = \sigma \phi(u_1 | x') \phi(u_2 | x') \\ & \frac{\partial \Pr(Y = 2 | x', \beta)}{\partial x_j} = \sigma \phi(u_2 | x') \end{aligned} \quad (B4)$$

The sign of β_j shows the direction of change in the probability of Y with a change in x_j . $\Pr(Y=0)$ changes in the opposite direction of the sign of β_j , while $\Pr(Y=2)$ changes in the same direction as the sign of β_j . A positive coefficient in the model may therefore be interpreted as meaning that the corresponding variable has a potential to raise the predictive probability of ‘agreeing’ decision and perception on excreta reuse, that is ($\Pr(Y=2)$). This study presents the results of the marginal effects of the explanatory variables to ease interpretation and discussion.

CHAPTER FOUR

RESULTS AND DISCUSSION

This section presents and discusses the results of the study. It provides results on sanitation-related businesses in the study area; the strategies, motivations and constraints to sanitation business development; financing mechanisms and willingness to pay (WTP) for improved household latrines; and (farming) households' perceptions toward human excreta reuse for agricultural purpose.

4.1 Identification and Description of Sanitation-related Businesses

This sub-section presents a description of the types of sanitation-related businesses in the study area; the business models employed by sanitation service providers (SSPs); the performance of SSPs as perceived by community members/service users; and the general constraints to sanitation business in the study area.

4.1.1 Description of Local Sanitation-related Businesses in Ningo-Prampram

As a fast growing peri-urban area, Ningo-Prampram District has various sanitation service providers (SSPs) who operate either as solely private or public-public businesses. Based on observations and interviews with key informants and community members and SSPs, a variety of sanitation-related businesses were identified in the study area. Table 4.1 presents a description of sanitation-related businesses that were identified in the study area.

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Table 4.1: Description of Sanitation-related Businesses in Ningo-Prampram District

Sanitation business	Description of sanitation business
<p>Solid waste collection:</p> <ul style="list-style-type: none"> □ Zoomlion, Zoil, Azontaba Cottage Industry (ACI) 	<ul style="list-style-type: none"> • The sanitation workers were responsible for the general cleaning (sweeping and collection of rubbish/garbage) of communities in the study area. The tasks of the workers included cleaning of gutters, streets, public places like hospitals, schools, markets and beaches Fig. 4.1. • The workers in the different companies (Zoomlion, Zoil, ACI) usually worked together as a group even though the various groups had specific demarcations to work. <div data-bbox="604 467 1806 678" style="text-align: center;"> </div> <p style="text-align: center;">Figure 4.1: Solid Waste Collectors in Study Area</p>
<p>Latrine management:</p> <ul style="list-style-type: none"> □ Public and private toilet operators 	<ul style="list-style-type: none"> • There were seven ‘public’ latrines, comprising six KVIPs/VIPs and one water closet (WC) in Prampram (Fig. 4.2). One of the latrines was ‘privately-owned and operated’. • With the exception of the WC which was built in a ‘public place (near Prampram’s bus station and the market), the other latrines were built near the houses of community members. This offered an opportunity for community members without household latrines to use those facilities, as if they were household latrines. In view of this, those facilities were being overutilised, thereby making their maintenance very poor. • The public latrines were managed by individual natives of the study area. This allowed a compromise of non-payment for the use of those facilities by some community members, as indicated by the latrine managers. • With the exception of the privately owned public latrine, the other public latrines were built by the District Assembly, and the attendants made specific payments (one-fourth of every month's revenue) to the Assembly. The managers used part of the three-fourth revenue as remuneration (wage) and also for cleaning of the latrines. Other operational costs such as purchases of tissue/paper and chemicals for cleaning of the latrines were taken care by the District Assembly. <div data-bbox="596 1166 1814 1380" style="text-align: center;"> </div> <p style="text-align: center;">Figure 4.2: Public Toilet Business in Prampram</p>


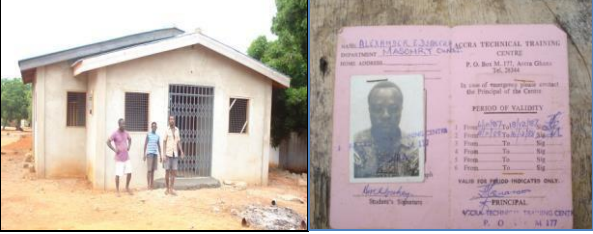

Sanitation business	Description of sanitation business	
<p>Hardware suppliers:</p> <ul style="list-style-type: none"> □ Dealers/suppliers of latrine hardware and general building materials. 	<ul style="list-style-type: none"> • There were few (less than five) latrine hardware suppliers in Prampram. The few suppliers might have been due to the low demand for household latrines in the study area, hence the low demand for latrine hardware. • The latrine hardware suppliers were also selling other building and plumbing materials (Fig. 4.3). 	 <p style="text-align: center;">Hardware Supply Business in Prampram</p>
<p>Local latrine artisans:</p> <ul style="list-style-type: none"> • Masons who build latrines as part of their general masonry work • Plumbers 	<ul style="list-style-type: none"> • There were few local 'latrine' artisans (such as masons and plumbers) in the study area. • The local artisans, particularly the masons, could be identified by the community members, and there were few of them who had specialized in the construction of latrines as part of their general masonry work (Fig. 4.4). • The plumbers usually operated hardware shops as part of their plumbing work. • The artisans operated within and outside the study area. 	 <p style="text-align: center;">Figure 4.4: Local Artisans - Masons in Prampram</p>
<p>Latrine/pit emptiers:</p> <ul style="list-style-type: none"> □ Private individuals who own septic trucks and operate pit-emptying business. 	<ul style="list-style-type: none"> • Operators of the pit-emptying business were normally located in Tema, a major industrial suburb near Prampram. • The operators also provided the service of dislodging effluents from factories in the industrial area, Tema (Fig. 4.5). 	 <p style="text-align: center;">Faecal Sludge/Pit Emptying Business in Prampram</p>

Figure 4.3:

Figure 4.4: Local Artisans - Masons in Prampram

Figure 4.5:

Bathroom and selling of water business.

□ Some native individuals/households in the study area operated commercial bathhouse business. They were also involved in the sale of water for domestic and commercial use in the study area. Those facilities/businesses were operated within the houses in which the owners lived.

Source: Survey data, 2012



4.1.2 Business Models and Nature of Competition in the Sanitation Market

Sanitation business operators in the study area employed a variety of business models in a market characterised by diverse suppliers of sanitation products and/or services. Table 4.2 presents a description of the business models employed by the service providers (SSPs), and the nature of competition, that is, the market structure in the sanitation market in the study area.



4.1.3 Perceived Performance of Sanitation Business

The performance of SSPs, particularly the solid waste collectors and public latrine managers, as perceived by the officials and community members/households in the study area were assessed using a rating scale. It can be seen from Table 4.3 that the overall performance of the services providers, particularly the public latrine managers and solid waste collectors, as rated by the study participants, was below average (48%). The district officers (including the District Coordinating Director (DCD) and Environmental Health Officers, traditional leaders and representatives of the area council (Assemblymen) rated the SSPs' performance as good (50%-60%). However, the households rated the SSPs' performance as poor (20%). In




response to the participants/service users' perceived poor performance of the public latrine managers and solid waste collectors, the SSPs also enumerated some of the constraints in their work. Among the operational constraints that mentioned as affecting the performance of the SSPs' work are summarised in Table 4.4.



Table 4.2: Business Models and Nature of Competition in the Sanitation Market

Sanitation business	Nature of competition	Business model	Type/orientation of business model	Pros and Cons of model	
				Pros	Cons
 <p>Solid waste collectors</p>	<p>There were few SSPs who tasked to clean/weed and collect solid wastes in the entire study area. The solid waste collection business was found to exhibit the characteristic of an oligopoly market.</p>	<p>The SSPs employed the service contract and partial private-sector responsibility models. Operators were hired to perform specific services (e.g. cleaning of the communities) for a fee. There was shared responsibility through one of a variety of contracts including service or concession contract. Operators were part of larger multinational corporations (e.g. Zoomlion) working through local subsidiaries. (REES, 2008; Budds, 2000).</p>	<p>The orientations of the SSPs' models were found to be economic, operational and strategic¹³ in nature.</p>	<p>The benefits of employing those business models include high sales volume in the shortrun and long-run sustainability of the business.</p>	<p>The disadvantages of those models include <i>problem with partner loyalty, the weakness of one-off transaction</i>¹⁵and (sometimes) <i>inefficiencies in service delivery</i>.</p>
 <p>Public latrine attendant</p>	<p>The public latrines served about 34% of the people in the study area. It exhibited a characteristic of a weak monopolistic market in the study area. Some attendants, e.g. the WC attendant, employed strategies such as regular cleaning of facility and provision of tissue paper. This was observed to have a positive influence on the patronage of the facility.</p>	<p>The SSPs employed the Service/management contract and Microfranchising/Rehabilitate and operate models. The attendants were hired to manage the public latrines, under the supervision of a franchisee/Assembly. Some of the public latrines (e.g. the WC) were rehabilitated and managed by private individuals who were partially accountable to the local authority, the Assembly. With this example, the attendants managed the public latrine for a specified period until the rehabilitated cost is recouped (REES, 2008; Budds, 2000; SUSA-Ghana Project, 2010).</p>	<p>The orientations of the models employed by the SSPs were economic and operational in nature.</p>	<p>The benefits of employing those models include high sales volume in the short-run and medium-term. In the long-run, the facilities are usually poorly managed and dislodging becomes a problem due to lack of a strategic model.</p>	<p>There are usually problems of <i>inefficiencies</i> with regard the use and management of facilities in the long-run. This was clearly evident by the low patronage of some of the facilities.</p>

¹³ **Economic orientation model** is most rudimentary, and it concerns the logic of profit generation, and relevant decision variables such as revenue sources and cost structures; **Operational orientation** focuses on the internal processes and design that enables the firm to create value; and **Strategic orientation** considers the overall direction in the firm's market positioning, thus emphasises on the firm's competitiveness and sustainability (Morris *et al.*, 2005). ¹⁵One-off transaction, eventually business 'dries up' and the opportunity costs and incentives associated with expanding clients become prohibitive (Bramley and Breslin, 2010).

Sanitation business	Nature of competition	Business model	Orientation of model	Pros and Cons of model	
				Pros	Cons
Hardware suppliers 	<p>There were few sanitation hardware suppliers who served about 35% of the people in Prampram. The hardware supply business in the study area exhibited a characteristic of a weak oligopoly market.</p>	<p>The business employed the one-stop-shop and network models. The business operators were selling various kinds of latrine products and hardware for general construction and maintenance of latrines and buildings. Business owners usually worked in collaboration with their colleague artisans (e.g. masons) in the study communities. (REES, 2008).</p>	<p>The orientations of the models used by the SSPs were economic, operational and strategic in nature.</p>	<p>Financial/sales risks are minimal based on product diversification. There are also minimal costs to consumers based on the diverse choices offered.</p>	<p>The high capital requirement is usually a challenge to business expansion, as confirmed by the operators.</p>
Masonry 	<p>There were few artisanmasons who had specialized in the building of improved latrines; they served about 70% of households in the study area. The business represented a strong monopolistic competition in the study area.</p>	<p>The business model used by the SSPs was mainly service contract. The masons/latrine builders were usually hired to perform a specific service for wage payment or offered a contract to construct a household/public latrine for a lump sum payment (REES, 2008).</p>	<p>The orientation of the model used by the SSPs was economic; service provision is usually on short-term basis.</p>	<p>There is relatively minimal capital requirement to acquire the 'masonry' tools to operate.</p>	<p>Partner loyalty is usually a problem to operators. There is also a high tendency of one-off transaction*</p>
Toilet/pit emptiers 	<p>The pit-emptying business exhibited a monopolistic competition in the study area. There were many substitute-service providers, but some operators employed service branding.</p>	<p>The operators employed service contract and networking models. Operators were hired to perform a specific service (i.e. pitemptying) for a fee. There was also collaboration among pit-emptiers in the execution of their services. (REES, 2008).</p>	<p>The orientations of the models used by the SSPs were economic, operational and strategic in nature.</p>	<p>There is high market potential and sustainability of business, especially when managed with good business strategy.</p>	<p>It requires high capital requirement. Partner loyalty is sometimes a problem to operators.</p>

<p>Commercial bathhouse and selling of water</p>	<p>The ‘selling of water’ business represented a <i>perfect competition</i> market. The ‘bath house’ business exhibited an <i>oligopoly</i> market. There were few operators in the study area.</p>	<p>The <i>build-operate-own (BOO) model</i> was used by operators. Operators had permission from the local authorities to construct and operate the ‘bathhouse’ business. Owners controlled all capital investment and owned the assets, and ownership was retained after recouping the initial investment (REES, 2008).</p>	<p>The orientation of the model used by the SSPs was <i>economic</i>. Services offered were usually on short-term basis.</p>	<p>There is high business potential, as access to water in the study area is problematic.</p>	<p>It requires high capital requirement. There is also the possibility of <i>oneoff transaction*</i></p>
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*One-off transaction, eventually business ‘dries up’ and the opportunity costs and incentives associated with expanding clients become prohibitive (Bramley and Breslin , 2010). Source: Survey data, 2012



Table 4.3: Perceived Performance of Sanitation Service Providers

Participants/group	Rating of SSPs' performance (%)	General comments by participants
District Officers (Administration/EHSD)	60 (Good)	<ul style="list-style-type: none"> • Smelly and unhygienic latrines - the surroundings and interior of some of the public toilets are dirty and unpleasant (Fig. 4.6). • Most of the public latrines are full and generate a lot of heat, odour and also attract flies which are nuisance during defecation. • Delayed or infrequent removal of garbage. Heaps of garbage were sometimes left uncollected for days which attract a lot of flies and also generate bad odour in the community.
Local/Traditional leaders (Chiefs)	60 (Good)	
Area Council (Assemblymen)	50 (Fair)	
Community members/households (FGDs)	20 (Poor)	
Overall (average) rating (%)	48	








Fig. 4.6: Unhygienic and Bushy Public Latrines in Study Area

Source: Field data, 2012

Table 4.4: General Constraints to SSPs' Operations and Performance

Operational constraints	
<p>i. Lack of water and detergents for effective cleaning of public latrines (Fig. 4.7)</p> <p>ii. Inadequate logistics (equipment - e.g. bins and trucks for removal of solid wastes). The failure or noninterest of local authorities to enforce regulations improper disposal of refuse and open defecation and the provide funds for the management public latrines (Fig. 4.8).</p> <p>iii. No economic value for solid/faecal wastes, thereby leading to the accumulation of wastes, which is a menace to people in the study area (Fig. 4.9).</p> <p>iv. The problem of delayed/credit payments by clients for work completed or goods supplied by SSPs, necessitating the provision of notices like 'No credit' in hardware shops (Fig. 4.10).</p> <p>v. Financial problems with regard inadequate salaries for workers and delay in payments.</p> <p>vi. Tedious and risky (health-risk) nature of work. Health risks are very high because of lack of protective equipment vis-a-vis the nature of waste collection work.</p> <p>vii. Poor behaviour and attitude of people and lack of respect for sanitation workers.</p>	<div style="text-align: center;">  <p>Fig. 4.7: Lack of Water for Public Latrine Use</p> </div> <div style="text-align: center; margin-top: 10px;">  <p>Fig. 4.8: Garbage/refuse around Public Latrine</p> </div> <div style="text-align: center; margin-top: 10px;">  <p>Fig. 4.9: Heap of Solid Waste/Faeces</p> </div> <div style="text-align: center; margin-top: 10px;">  <p>Fig. 4.10: Notice of "No Credit" to Buyers</p> </div>

Source: Field survey, 2012

4.2 Factors that Influence Sanitation Business Development in Prampram

This sub-section presents the personal and business characteristics of sanitation service providers (SSPs), particularly local latrine builders/masons, sanitation hardware suppliers and pit emptiers in the study area. It also provides information on the internal and external factors such as business strategies employed by SSPs; the motivations to operate a sanitation business; and the constraints to sanitation business development in the study area.

4.2.1 Personal and Business Profiles of Sanitation Service Providers

Based on the purpose of the study and availability of data, the study focused on three of the businesses, namely: three latrine builders/masons, two sanitation hardware suppliers and one pit-emptier as case-sanitation businesses for the study. The personal and business profiles of the three case-SSPs are presented in Table 4.5. The SSPs operated their businesses as sole proprietors, a business model which allows small businesses or entrepreneurs to operate within their own right (Hisrick and Peters, 1998). With this model, operators have advantages of needing low start-up capital, having greater control and freedom from regulations, and enjoying all profits of the business. However, there are disadvantages with unlimited liability, lack of continuity of the business, and difficulty in raising capital for business growth and development.

With the exception of one of the hardware suppliers who operated the business with his wife, all the other SSPs were men. The SSPs were aged 24 to 73 years; the youngest and oldest were the masons. They were all natives of the study area, Dangme, except the pit-emptier who was

an Akan from Ashanti Region of Ghana. The masons and pit-emptier had basic education (thus Junior High School or Middle School), and the hardware suppliers had tertiary education (Polytechnic). The business experience of the SSPs ranged from five years to over 20 years. With the exception of the masons, the hardware suppliers and the pitemptier had registered their businesses with the appropriate institution, the Registrar General’s Department. Although not registered, the oldest and most experienced of the masons had a job card, an ‘identity card’ which was previously accepted and used by all masons as evidence of professional competence.

Table 4.5: Personal and Business Profile of Sanitation Service Providers

Variables	Toilet builders /masons			Hardware suppliers		Pit-emptier
	Case I	Case II	Case III	Case I	Case II	Single Case
<i>Sex</i>	Male	Male	Male	Male	Male	Male
<i>Age (years)</i>	24	36	73	31	38	45
<i>Education</i>	JHS	JHS	MSLC	Polytechnic/ NVTI	Polytechnic (DBS)	MSLC
<i>Ethnicity</i>	Dangme	Dangme	Dangme	Dangme	Dangme	Akan
<i>Business experience</i>	5 years	7 years	> 20 years	8 years	4years	7 years
<i>Business registration</i>	Not registered	Not registered	Not registered	Registered	Not registered	Registered
<i>Staff strength</i>	One	One	Five (all males)	Three (two males and one female - wife)	Three (all males)	Four (all males)
<i>Occupational status</i>	Full-time	Full-time	Full-time	Full-time	Full-time	Full-time

Source: Field survey, 2012

It was found that the high costs and bureaucratic procedure associated with business registration were key reasons for the non-registration of the masonry business. In addition, the masons mentioned that it was not necessary for them to register their business because they

operate as local masons and did not need any formal documents to make contracts, as required by formal businesses. The staff strength of the SSPs ranged from one to five employees. The experienced ‘master’ artisans had larger staff strength. This is common in Ghana as most apprentices normally prefer to learn from the experienced artisan. In such a situation, the knowledge and skills acquired by the trainees may be idiosyncratic, as it is common in most small-scale artisan businesses.

The study found that all the SSPs operated on full-time, mostly during the week days (Monday-Friday) and sometimes on weekends (Saturday). They operated within and outside the study area. Some of the SSPs mentioned that they did not need further (formal) training to operate. The local authorities (Assemblymen and District Officers) however disagreed with the SSPs’ response of ‘no need for further training’; they mentioned that it was necessary for the SSPs to acquire further training and also register their businesses to enable them have the opportunity to access contracts on the District Assembly’s developmental projects. Moreover, Nalumansi *et al.* (2002) point out that lack of education, which is linked to poor managerial and skills competence, could be a limitation to the performance of smallscale businesses.

4.2.2 Business Strategies/Marketing Orientations of Sanitation Service Providers

In a (sanitation) market characterized by *frozen* demand as a result of the low households’ priority need for improved latrines (WFP, 2011; Card and Sparkman, 2010), it is necessary for sanitation service providers (SSPs) to employ marketing strategies that would offer a good return on their investments and also ensure sustainability of their businesses. Based on the

theory of marketing mix, thus the 'Ps' of marketing (Hoffman, 2006), the marketing strategies employed by the SSPs were examined (Table 4.6).

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Table 4.6: Business Strategies/Market Orientation of Sanitation Service Providers (SSPs)

Sanitation Service Providers	Marketing Mix/Marketing Strategy			
	<i>Product/service and Quality</i>	<i>Pricing</i>	<i>Place/ distribution</i>	<i>Promotion/Customer Information</i>
Latrine builders/masons	<ul style="list-style-type: none"> The SSPs indicated that they provide quality service to their clients (households). Quality was defined by the SSPs as ‘longevity’ of use of latrines they build for households. 	<ul style="list-style-type: none"> The SSPs allowed deferred payment for clients who could not afford full payment. Service fees (per manday) charged by SSPs (i.e. GH¢40 for ‘chief’ mason and GH¢30 for assistants) were higher than the market price of GH¢25 for general labour/masonry work. 	<ul style="list-style-type: none"> □ The SSPs had a wide operational area; they operated within and outside the study area. 	<ul style="list-style-type: none"> The SSPs lacked office space/structure and sign board. Mobile phones were used as means of business communication by the SSPs. Networking with other artisans (like hardware suppliers) was used by the SSPs; they relied on other artisans for assistance in periods of business glut. Ensuring good ‘SSP-client relationship’ and provision of ‘quality service’ were mentioned by the SSPs as means to promote their business.
Latrine hardware suppliers	<ul style="list-style-type: none"> The SSPs were dealing in different brands of quality hardware, for e.g. both local and imported latrine bowls. They offered advice to their clients, as part of customer service. 	<ul style="list-style-type: none"> □ The SSPs offered discounts to their customers; they mentioned that they sometimes reduce the prices of their products for their customers. 	<ul style="list-style-type: none"> • ‘Free’ transport for delivery of goods was used by the SSPs. • They had phone numbers of some commercial vehicles they called for delivery of their clients’ goods. 	<ul style="list-style-type: none"> • The phone numbers and pictures of latrine hardware are displayed on the shops/structure of the SSPs. • One of the SSPs was also a plumber; the plumbing service facilitated the sale of his hardware. • Networking with other artisans (e.g. masons, steel-benders, and carpenters) was used by the SSPs.



Pit-emptier	<p>□ ‘Reliability’¹⁴ and ‘responsiveness’¹⁵ were identified as key quality service attributes exhibited by the SSP to ensure customer satisfaction. The operator shared an experience that: <i>“Some customers are good, but others are rude. One day a man and his family stood on the porch of their storey building and watched us work. After the work we requested for water. We were given water in an unpleasant/dirty cup which we poured away without the notice of the client. Based on the behaviour of the family, I deliberately charged about twice the normal price. The customer did not hesitate to pay, but threw the money to us from the storey building”</i>.</p>	<p>□ Price though standard, negotiable depending on factors such as location of septic pit in customer’s house, distance to customer and disposal site, attitude of customer, etc. The SSP remarked that <i>‘there is the chance for an operator to obtain a higher deal than the normal price when customers are allowed to state what they can offer’</i>.</p>	<p>□ The SSP mentioned that he operated within and outside the study area, and sometimes in other communities in Volta Region and Eastern Region of Ghana.</p>	<p>□ The SSP had no permanent structure/office. His mobile phone numbers (which are displayed on his septic truck and saloon car) and complimentary cards were used to communicate his business to prospective clients. He mentioned he uses the slogan: <i>“the quality of service can in itself serve as a low or no cost promotional strategy for the success of a business”</i>.</p>
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Source: Field survey, 2012



¹⁴ **Reliability:** dependability of business and consistency of performance.

¹⁵ **Responsiveness:** prompt responsiveness to needs of customers.

In general, the market orientations used by SSPs in the study area deviate from what current literature stipulate, that is, being customer centred rather than product centred (Hoffman, 2006). For example, the responses from the interviews with the SSPs and households showed that in most cases individuals/households search for the SSPs when they need their service; a situation which is the reverse in most current businesses. Based on their experience, the SSPs indicated that they do not find it necessary to search for households/service users who need their services. They considered that as costly, in terms of time and possibility of being underpaid for services they may render; as they believe that their clients may consider them as being ‘hungry’ for job, which may affect their competitive power in the sanitation market. However, in general, the SSPs expressed the need to advertise their businesses by informing households about their operations and also to encourage them to build their own latrines. It was also mentioned that there was the need to form local SSPs’ associations to help strengthen and also make the operations of SSPs competitive in the study area.

4.2.3 Motivations to Operating a Sanitation Business in the Study Area

The results of the pecuniary indicators identified as motivations to the SSPs are presented in Table 4.7. A financial analysis on the profitability of the operations of the SSPs showed that sanitation business in the study area is profitable, despite the constraints in the sanitation market. The study found that the SSPs obtain profit margins of 27% to 46% for specific periods of operation. These margins were found to be at par or higher than the lending rates of 17%-26% by commercial financial institutions in Ghana <http://www.businessghana.com>, implying that they could use the surplus to ‘cushion’ their costs of operation. This finding is consistent with the study hypothesis and also concurs with the reports by WHO (2008) and UN-Water (2013) that sanitation business is profitable.

Table 4.7: Profit Margin on Sanitation Business in Study Area

SSPs	Revenue (GHC)	Operational Cost (GHC)	Operating Profit (GHC)	*Period	Average Days/ Freq. pa	**Average. annual profit (GHC)	PM (%)
Masons (N=3)	32.5	17.5	15 (USD8)	Daily	180	2,700 (USD1,431)	46
Pit-emptier (N=1)	200	140	60 (USD31)	Weekly	52	3,120 (USD1,654)	30
Hardware suppliers (N=2)	225	165	60 (USD31)	Weekly	52	3,120 (USD1,654)	27

Exchange rate: US\$1.00 = GHC1.90 (2012), *Average, but variable. **Average profit computation based on frequency of service delivery or sales. Source: Computed from field data, 2012.

Indeed, the SSPs attested that the ‘positive’ financial returns on their operations serve as motivation for them to stay and continue in their sanitation business. One of the hardware suppliers in an interview remarked that: *“the profit on my business is what I use to feed myself and my family, and so far as I get profit on what I sell, I am ok with my business”*. In addition, the pit-emptier also remarked that: *“the profit I obtain in my business is what I use to feed myself and my family, as well as to pay my workers”*.

In all the cases, it was found that the possibility of future market prospects and few service providers in the sanitation market serve as motivation to the SSPs. A statement by the pit-emptier confirms the responses by the SSPs, as he remarked that: *“once development is a never ending process and the study area is experiencing development, thus construction of new houses which consider (flush) toilet, I see a good future in the sanitation business. Sanitation is necessary and inevitable in life, so there would always be the need for a pit-emptier”*. The few service providers in the sanitation market in the study area therefore provides an opportunity for the available SSPs to operate, a situation which may not ensure effective competition and better service delivery to users.

4.2.4 Constraints to Sanitation Business Development in Study Area

Generally, there is an assertion that the rate at which businesses, especially small and medium size businesses in developing countries, are established and 'die-out' is high. Several factors have been identified to be the cause of the failure of those businesses. The constraints to sanitation business in the study area are presented in Table 4.8. It was found that credit payment by service users/households, and inadequate and irregular cash flow (wage) were the most important constraints to latrine builders/masons. The SSPs considered the constraints important, as the youngest mason remarked in an interview that: *“the people in this area do not like paying for work we normally do for them; even for those who pay, they pay in bits which doesn't help us because we hire other workers to assist in the work which we have to pay them”*. In a further discussion, he added that *“because the clients do not pay as expected, we normally decline our decision to work for them, and once we refuse our services, the clients normally hire other workers for which they do the same thing (delayed/credit payment) to the new workers”*. The study found that the SSPs were not happy about the behaviour of the clients/households, as they mentioned that there are occasions where some households hire masons outside the study area to work for them for the same fee when those clients are aware of the presence of the local masons. This may be due to the clients' acquaintance (either as family friend or relative) with the local SSPs or the informal arrangement/contract usually associated with local artisans' business. It may also imply that the market conduct of local masons, tending towards oligopolistic behaviour, is discouraging the households/customers from using the service of local masons.

Table 4.8: Constraints to Sanitation Business in Study Area

Toilet builders/Masons (N=3)	Hardware Suppliers (N=2)	Pit-emptier (N=1)
-------------------------------------	---------------------------------	--------------------------

<i>Constraints</i>	<i>Rank</i>	<i>Constraints</i>	<i>Rank</i>	<i>Constraints</i>	<i>Rank</i>
Delayed/credit payment	1	Quality of materials	1	Difficulty in accessing desludging/dumping site	1
Inadequate/irregular cash flow (wage)	2	High prices of materials	2		
Risky (accidents) and tedious job	3	Land litigation/slow rate of development	3	Inadequate/lack of capital to expand business	1
Trustworthiness in networking	4	Delayed/credit payment by clients	3	Difficulty in accessing households' septic tanks	3
Inadequate/lack of capital	5	Inadequate/lack of capital for expansion	5	Inconvenient tax system	4
Lack of protective clothing	6	Inadequate/irregular cash flow (wage)	5	Unapproved/unauthorized payments (e.g. intermittent stops by the police)	5
Water (sometimes) a challenge to work	7	Water scarcity (affecting sales)	7		
Unavailability of materials for building	7	High tax	8		

Source: Field survey, 2012

From Table 4.8, it can be observed that unavailability of quality materials and high prices of hardware were the major constraints to the latrine hardware supply business. The remarks by the hardware suppliers corroborate the importance of the constraints, as one of them said: *“the people here like good things but they are not willing to pay higher price for what they want. In the market are cheaper alternative latrine materials like the toilet bowls which do not last long, and once you sell such materials to your clients, you end up ‘killing’ your business as the client may not buy from you the next time”*. In a further discussion, the SSP remarked that: *“because I think about the future of my business, I always go for quality materials which are too expensive for the clients, so I normally have in stock few of the expensive hardware like the toilet bowl which when the people buy, then I use the money to buy new ones to sell”*.

To the pit-emptier, difficulty in accessing desludging/dumping sites and inadequate/lack of capital were identified as the most important constraints to the pit-emptying business. In an

explanation, the service provider remarked that: "*previously, there were three dumping sites for faecal sludge but all have been sold to individuals for their private businesses, a situation which compels us to travel long distances at higher costs to dump faecal sludge*". In a further discussion on the inadequate/lack of funds for his business, the SSP said that: "*I have approached the banks on several occasions for financial support, but all attempts have proved futile. I have presented the necessary document/assets like my septic truck and other vehicle to secure a loan, but the banks say my vehicles are too old to be used as collateral for a loan*".

In all the cases, lack of and/or inadequate capital and high tax payments were also identified as important constraints to sanitation business in the study area. A statement by the pitemptier confirms the importance of the tax payment as a constraint to the SSPs business, as he remarked that: "*even if you work or not work, you have to pay tax*". A number of studies have shown that the presence and magnitude of these constraints can affect the performance and growth of small businesses, the sanitation business inclusive. Keefer (2000) attests that the performance of small businesses is usually affected by unfavourable taxation systems, heavy regulatory burden and administrative bureaucracy. Other studies also attest that the performance of small businesses is usually affected by limited capital and limited access to finance (Kappel, 2004; Kappel *et al.*, 2004; Mugume and Obwona, 2001).

4.2.5 Market Potential for Sanitation Business in Study Area

Table 4.9 presents the results of the estimated market potential for latrine-based sanitation businesses in the study area. The sanitation service providers (SSPs) expressed interest to expand their businesses, and they were optimistic about the potential for sanitation business, basing their hopes on the current sanitation policy which supports the promotion of household

latrines and the potential for developmental projects in the study area. The estimated market size for latrine builders/masons and latrine hardware suppliers was about GH¢26,003,250 (US\$13,199,250) each per year. The estimated market potential for the pitemptying business and management of a public latrine in the study area were also GH¢259,984 (US\$131,968) and GH¢59,106,348 (US\$30,002,382), respectively. The estimated market potentials along the latrine value chain provide evidence of the business opportunities that exist in the sanitation market.

Table 4.9: Estimation of Market Potential for Sanitation Business in Prampram

Product/service	Potential service users/households		Av. price of product or service (GH¢)	Average purchase/frequency/year	Estimated market potential (GH¢)	Estimated market potential (US\$)
	% Potential service users	Potential popn.* users				
Masons	0.7	4,445	32.5	180	26,003,250	13,199,250
Hardware suppliers	0.35	2,223	225	52	26,003,250	13,199,250
Pit-emptiers	0.0039	25	200	52	259,984	131,968
Public latrine	0.34	6,477	25	365	59,106,348	30,002,382

*Exchange rate: US\$1.00 = GH¢1.97 (2013). *Population = 31,752 (DHSD, 2011). Source: Computation from field data, 2013*

4.3 Financing Mechanisms and WTP for Household Latrines

This sub-section presents and discusses the results on the households' socioeconomic characteristics, their defecating practice and latrine preferences, their resource mobilisation strategies for improved latrines as well as the factors that influence households' latrine financing decisions and their willingness to pay for improved latrines, and lenders' interests in financing improved household latrines.

4.3.1 Socioeconomic Characteristics of Households without Improved Latrines

Table 4.10 presents the results of the socioeconomic characteristics of the households. Of the 633 household head respondents, 62% were men and 38% were women. A majority (96%) of the respondents were above 30 years, and the average age was 48 years. More than half of the respondents (51%) had basic education (i.e. JHS/MSLC or below), a proportion below the national proportion of 54% for only JHS/MSLC (GSS, 2012). About 56% had a household size of five persons or less which is higher than the national figure of 4.4 persons per household (GSS, 2012). Almost all the respondents were Christians (98%).

A majority (92%) was self-employed (basically fishing and farming). The average household monthly income was GH¢560 (US\$280) and the modal monthly income was GH¢600 (US\$300). The per capita income was GH¢134 (US\$67.39) which is below and about half the per capita gross national average monthly income of GH¢224.7 (US\$124) (GSS, 2012).

On average, the households' monthly expenditure was around GH¢390 (US\$195), and the modal monthly expenditure was GH¢300 (US\$150). This indicates a lower household expenditure relative to the household's income, implying that a household may have surplus income for savings or to cater for other needs of the household. A majority (86%) of the households were living in their own house or family house. About two-third of the households could access the public latrines (69%), but only one-third (34%) use the public facilities, and a majority practice open defecation (67%: 32% bush; 35% beach). This result is consistent with a study by Spencer (2012) who reported that open defecation is the most common practice in the study area.

Table 4.10: Socioeconomic Characteristics of Households with Improved Latrine

Variables		Freq. (%)	Min.(Max)	Mean (SD)
Gender	Male	392 (61.9)		
	Female	241 (38.1)		
Age (years)	20-29	18 (2.8)		
	30-39	142 (22.4)		
	40-49	212 (33.5)	22 (98)	47.9 (12.4)
	50-59	144 (22.7)		
	60 and above	117 (18.5)		
Education	Tertiary (Univ./Poly/College)	15 (2.4)		
	Secondary (SHS/O’/A’Level)	51 (8.1)		
	Junior High/MSCL	143 (22.6)		
	Primary school	183 (28.9)		
	None/no formal education	241 (38.1)		
Household size	5 and below	388 (61.3)		
	6-10	222 (35.1)	1 (15)	5.18 (2.4)
	Above 10	23 (3.6)		
Occupation	Salaried ¹⁶	40 (6.3)		
	Self-employed ¹⁷	580 (91.6)		
	Unemployed	13 (2.1)		
Household income (month) (GH¢)	Below 500	272 (43.0)		560.0
	500-1000	322 (50.9)	100 (1700)	(272.9)
	Above 1000	39 (6.2)		Mode (600)
Household expenditure (month) (GH¢)	Below 500	496 (78.4)		389.9
	500-1000	131 (20.7)	90 (1200)	(175.1)
	Above 1000	6 (0.9)		Mode (300)
Tenancy	Landlord	171 (27.0)		
	Family house	374 (59.1)		
	Tenant	88 (13.9)		
Household defecating practice	Beach	218 (34.4)		
	Bush	203 (32.1)		
	Public latrine	212 (33.5)		
Access to public latrine	Yes	436 (68.9)		
	No	197 (31.1)		

N = 633. US\$1.00 = GH¢1.99 (May/June, 2013). *Source*: Computation from field data, 2013

4.3.2 Households’ Defecating Practice and Latrine Preference

4.3.2.1 Households’ Defecating Practice and Reasons for not having Own Latrine It can be observed from Fig. 4.11 that a majority of the sampled households practise open defecation (66%: 32% bush; 34% beach). This proportion (66%) is greater than the national figure of 59%

¹⁶ *Salaried workers*: public servants (e.g. teachers, nurses), bankers, security officers and sanitation workers

¹⁷ *Self-employed*: fishermen, farmers, drivers, businessmen/traders, cooks, *artisans*- tailors, carpenters

(UNICEF/WHO, 2014). Lack of money (51%) was identified as the most important reason for the households defecating practice.

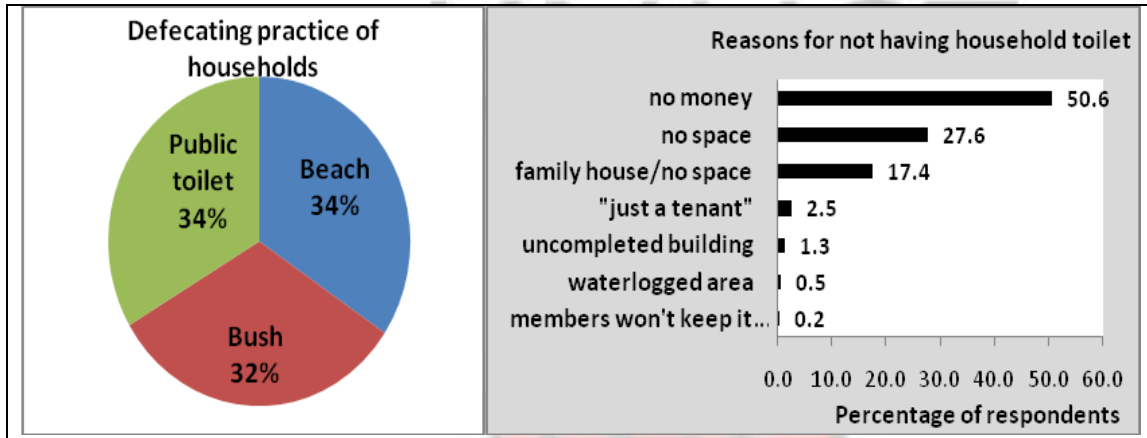


Fig. 4.11: Households' Defecating Practice and Reasons for Not Having Own Latrine

The order of importance of the households' reasons for not owning a latrine was not different across the study communities, except in Lower East-Prampram, where the second most important reason was that as members dwell in family houses, the decision on owning a latrine would require a general consensus by all family members, a decision which the respondents considered 'difficult' (Fig. 4.12).

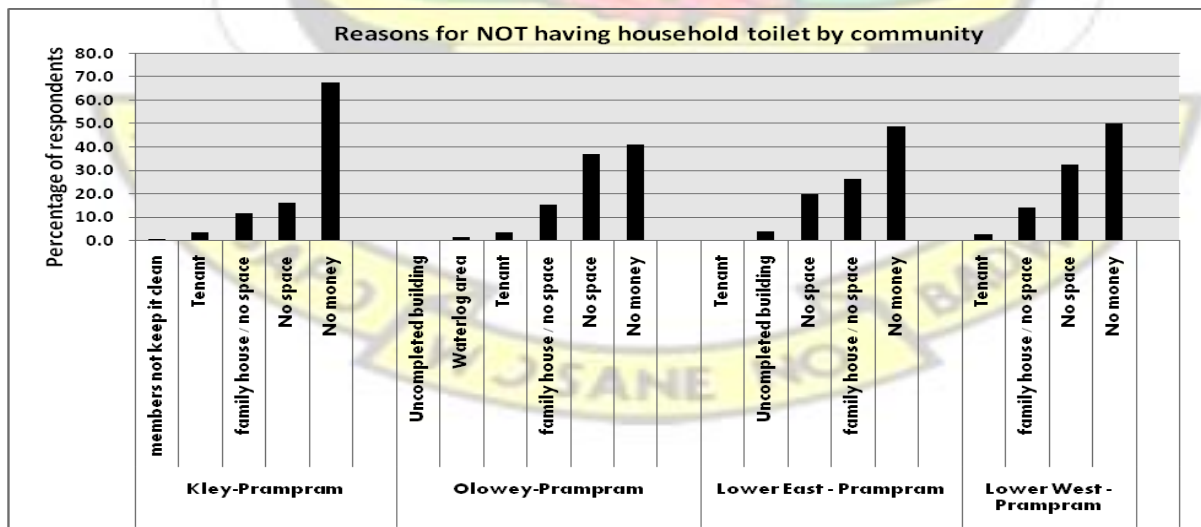


Fig. 4.12: Households' Reasons for Not Having Own Toilet by Community

4.3.2.2 Households' Latrine Preference and Reasons for their Latrine Preference More than half (54%) of the sampled households indicated that they prefer the flush or pourflush toilet linked to a piped sewer system latrine, albeit the most expensive of the latrine technologies and unrealistic in the study area due to lack of water or sewer system (Fig. 4.13). Spencer (2012) argued that it is unlikely that (poor) populations that have to purchase water will turn around and flush that water down a toilet. The second most preferred latrine was the ventilated improved pit (VIP) latrine. Relative to the flush latrine, the VIP does not require water for its use and could be the next best alternative for the households.

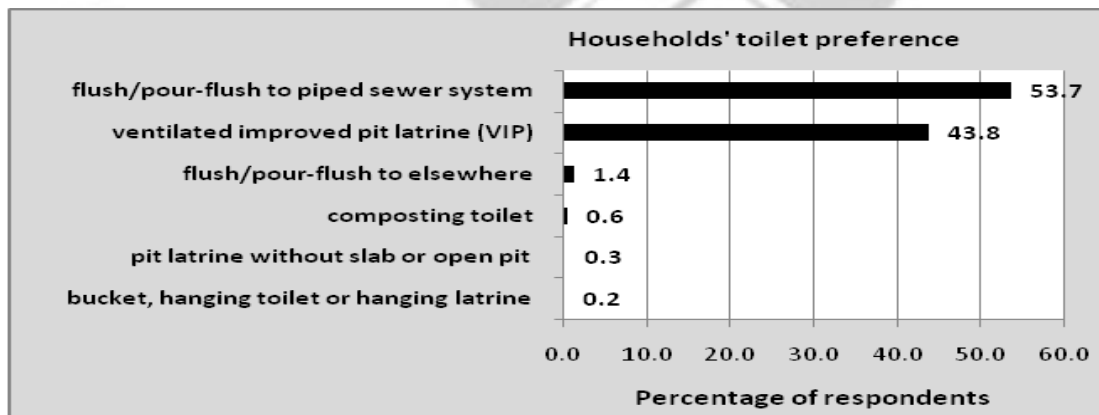


Fig. 4.13: Households' Latrine Preference

The study found that personal factors and type of latrine technology were key factors in a household's choice of latrine (Fig. 4.14). Convenience and aesthetic value (*nice latrine*) were identified as the most important factors that the households consider for a flush latrine. Affordability, which represents a household's financial asset, hence the ability to pay, was also identified as the most important factor for the choice of other facilities such as the ventilated pit latrine (VIP), pit latrine and composting latrine. This result is consistent with the findings by Wittington et al. (1993) who reported that most households prefer improved ventilated pit

latrines to conventional sewerage latrines (flush latrines) because the former is cheaper. Card and Sparkman (2010) also assert that a majority of households would not upgrade their latrine facilities (or defecating practice) without an affordable facility within their ‘means’ and current preferences. Personal factors such as safety of use of facility and concerns about user health, that is, odourless and flies-free facilities, were also identified by the households as important in their choice of latrine. This also clearly shows that the preference for a household latrine entails more than its core benefits, but also a consideration of a facility that provides value to users (Zeniell, 2013).

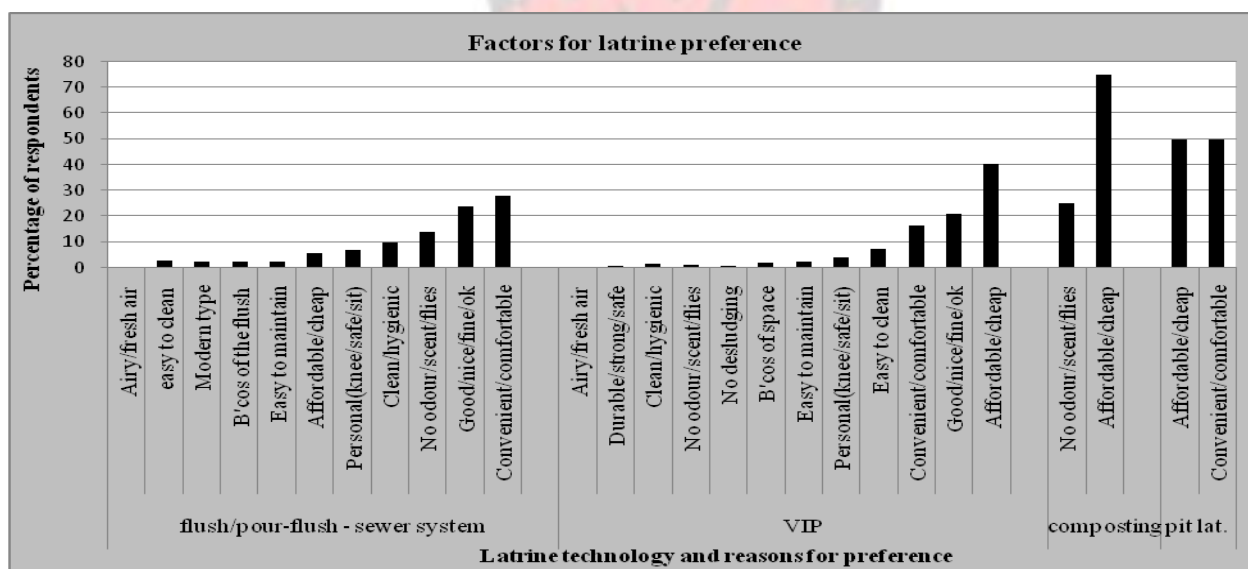


Fig. 4.14: Factors for Latrine Preference

4.3.3 Resource Mobilization Strategies for Household Latrine

4.3.3.1 Estimated Costs of Improved Latrines

Knowledge of the cost of an improved household latrine technology is important to help guide the household in making decisions regarding a latrine preference and financing. Few of the respondents (about 15%) knew about the costs of improved latrines at the time of the survey (Fig. 4.15). Information on the estimated costs²⁰ of improved latrines were provided to the

respondents, after which their financing decision were inquired. The costs of improved latrines were obtained using a budgetary estimate via data from latrine builders (masons) and hardware suppliers in the study area.

It was found that less than half of the respondents (44%) were interested to finance their latrines (Fig. 4.15). With an average household size of five persons per household (Table 4.10, sub-section 4.3.1), and using the average prices for use of the different public latrines (flush, pour-flush and KVIP/VIP) in the study area, it was found that a household spends (or would spend, for those practicing open defecation) about GH¢365 to GH¢730 per annum for use of the public latrines. This implies a high opportunity cost for not having a household latrine, in the long-run. A study by Adank *et al.* (2011) concurs this finding that the use of public latrines by households is more expensive overall than an improved (private) latrine option.

²⁰ **Flush toilet:** Total cost (yrs): **GH¢5,208** (5-year period) = [4,000, Initial Cost; 750 (150*5), maintenance & usage (150/year); 458 (FV) for pit-emptying at 150(PV), 25%DF]
Pour Flush latrine: Total cost (yrs): **GH¢3,540** (5-year period) = [2,332, Initial Cost; 750 (150*5), maintenance & usage (150/year); 458 (FV) for pit-emptying at 150(PV), 25%DF]
KVIP/VIP latrine: Total cost (yrs): **GH¢1,503** (3-year period) = [1,000, Initial Cost; 210 (70*3), maintenance & usage (70/year); 293 (FV) for pit-emptying at 150(PV), 25%DF]
Pit latrine: Total cost (yrs): **GH¢450** (3-year period) = [300, Initial Cost; 150, maintenance & usage (50/year)]
Composting latrine: Seasonally in cottages and cabins = \$700 - \$1500 (**GH¢3,000**). At home \$1200 - \$6000

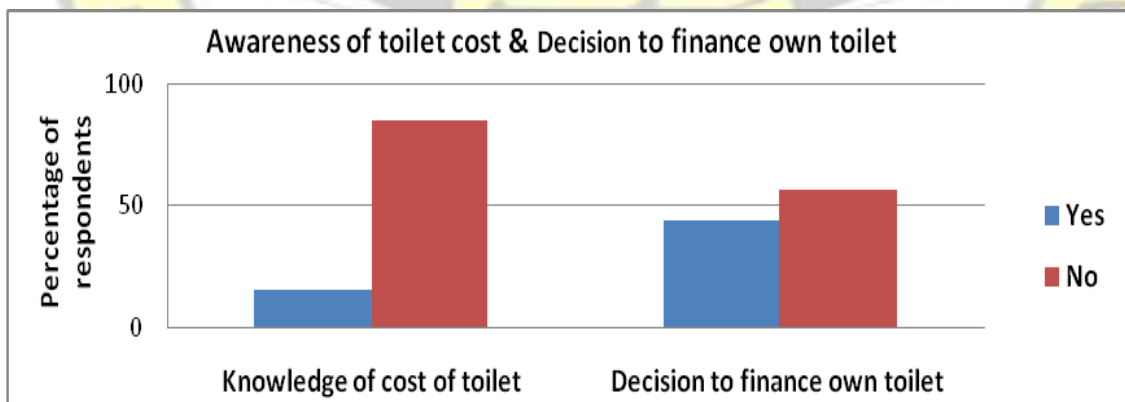


Fig. 4.15: Awareness of Cost of Latrine Facilities and Decision to Finance Own Latrine

4.3.3.2 Source(s) of Capital for Household Latrines

Figure 4.16 presents the results on the households' proposed source(s) of capital for their latrines, and specifically on how they would raise funds for their latrines. Strangely, about one-third (33%) of the sampled households indicated that they had 'nothing' (*no resources*) for the construction of their latrines. This confirms a report by Card and Sparkman (2010) in their study on 'sanitation market analysis' that households in poor peri-urban communities are normally not extremely dissatisfied with their current defecating practice, and their priorities are normally for housing (shelter), water, farming and schooling. However, about 37% and 26% of the households indicated they would provide 'money' and 'labour' which represent financial capital and human capital, respectively to build their latrines, implying an interest in a household latrine. As a common practice in Ghana, about 4% of the households also indicated that they would provide 'food' for the local labour (e.g. masons) they would hire for the construction of their latrines.

Concerning the source(s) of funds for a household latrine, half of the respondents indicated that they prefer to use their own funds via savings or 'susu' to build their latrines. Less than 10% of the households expressed interest in borrowing funds from the Banks or microfinancial institutions (MFIs) or using rent advance for their latrines. The high lending rate and other formal requirements, among others, were mentioned by the respondents as reasons for their low preference of funds from the Banks/MFIs.

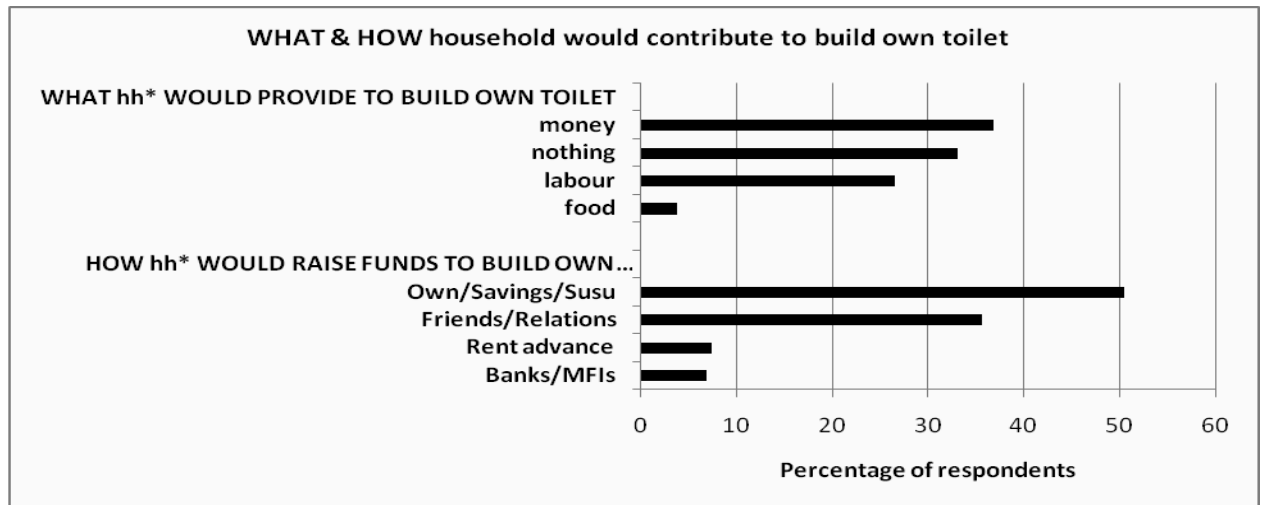


Fig. 4.16: Households’ Proposed Source(s) of Funds for Their Latrines. (NB: *hh, household)

4.3.3.3 Households’ Choice of Source(s) of Financial Capital for Own Latrine

The sampled households had various reasons for their proposed source(s) of funds for their latrines (Fig. 4.17). The respondents mentioned that the use of own funds or funds from friends/relatives was a ‘more reliable’ option of a household’s source of funds for a project, including the construction of a household latrine. Moreover, the respondents considered the use of ‘own funds’ as a better, more flexible, more convenient and problem-free option (*no debtor-creditor issue*). In addition, the respondents indicated that as dwellers of an (extended) family house it was necessary for every household member to contribute to build a household latrine. However, households that indicated that they prefer to use funds from the Banks/MFIs gave reasons that the Banks are always available and reliable to provide loans to interested creditworthy persons.

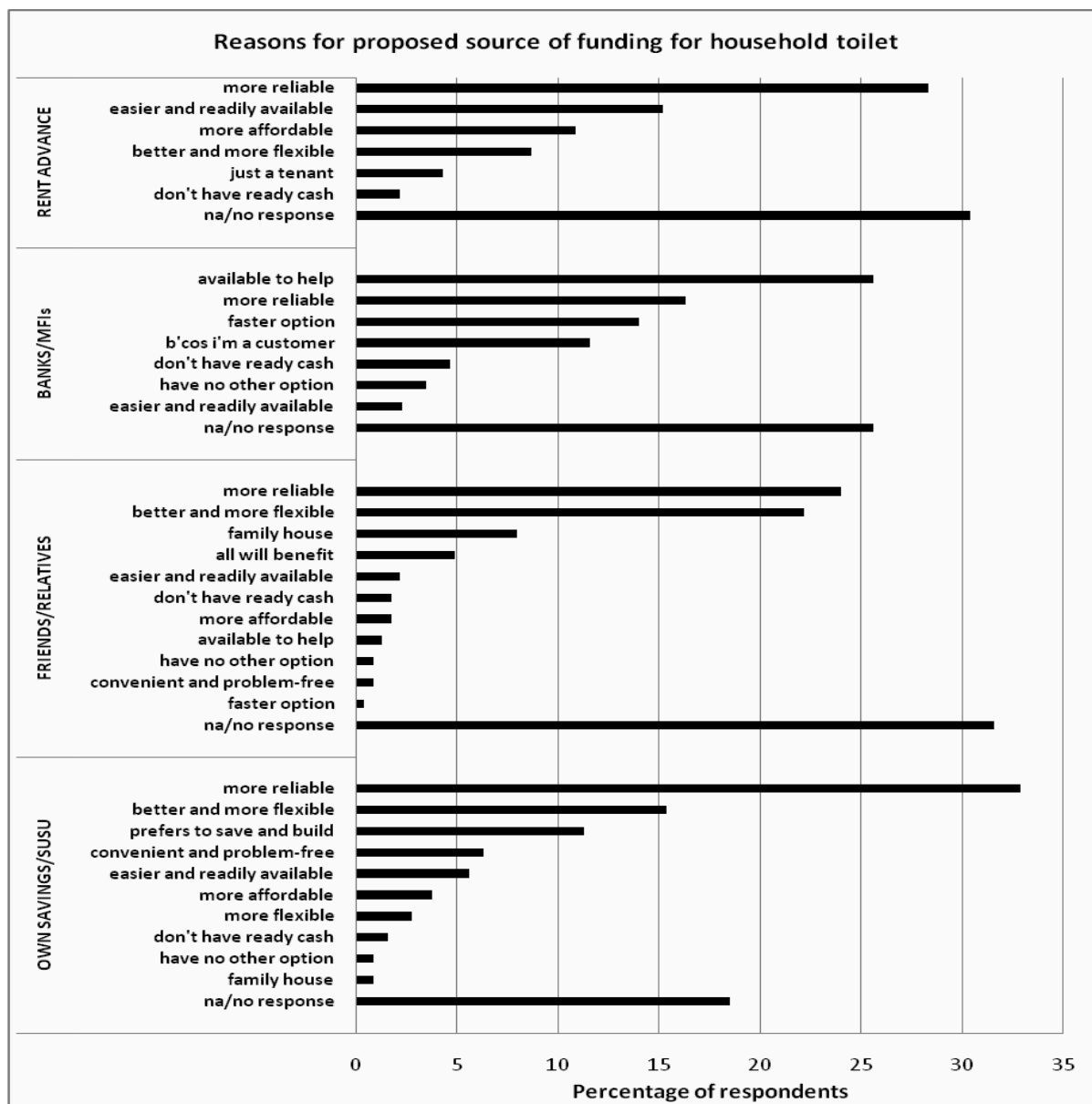


Fig. 4.17: Households' Reasons for Proposed Source(s) of Funds to Build their Latrines

4.3.3.4 Households' Latrine Financing Decision by Socioeconomic Characteristics

The variation in the respondents' decision to finance their own latrines (Fig. 4.15, sub-section 4.3.3.1) necessitated an inquiry into the socioeconomic factors that influence their financing decisions. Table 4.11 presents the results of the mean responses of the respondents' latrine financing decisions by their socioeconomic and community characteristics. The decision to use own funds to

finance a household latrine by socioeconomic factors such as gender, age, education, income and tenancy were significant at the conventional levels (1% and 5%). Moreover, households' decisions to finance own latrines by behavioural factor regarding defecating practice and type of community were also significant at 1%. It was found that women (1.43) in the study area were more likely to finance their latrines than men (1.59). This indicates that women are more interested to have a household latrine, implying that they are more concerned about their privacy and safety than men. Younger household heads were also more likely to finance their latrines than older household heads.

Moreover, higher formal education was found to be more likely to influence a household's latrine financing decision. Furthermore, higher income households were more likely to finance their own latrines. In addition, landlords (1.40) were more likely to finance their latrines than tenants (1.62). Households who used the public latrines were also more likely to finance their latrines than those who practised open defecate (beach and bush). This implies that the presence and experience with use of a public toilet in the study area could influence a household's decision to finance its latrine, likewise the type of community in which the household resides.

Table 4.11: Households' Decision to Finance Own Latrine by Socioeconomic Characteristics

Variables	N	Decision to finance own latrine			
		Mean	SD	F/t-test Stat. (p-value)	
Gender	Male	392	1.62	0.49	t-test (0.000)***
	Female	241	1.46	0.50	
Age (years)	20-29	18	1.17	0.38	ANOVA (0.000)***
	30-39	142	1.55	0.50	
	40-49	212	1.65	0.48	
	50-59	144	1.59	0.49	
	60 and above	117	1.45	0.50	

Education	Tertiary (Univ./Poly/College)	15	1.47	0.52	ANOVA (0.006)***		
	Secondary (SHS/O'Level/A'Level)	51	1.45	0.50			
	Junior High/MSCL	143	1.46	0.50			
	Primary school	183	1.63	0.48			
	None/no formal education	241	1.60	0.49			
Household size	5 and below	388	1.58	1.56	0.50	0.50	ANOVA (0.213)
	6-10	222	1.39	0.50			
	Above 10	23					
Religious affiliation	Christian	622	1.57	0.50	ANOVA (0.755)		
	Islamic	2	1.50	0.71			
	Traditionalist	9	1.44	0.53			
Ethnicity	Dangme	599	1.57	0.50	ANOVA (0.689)		
	Akan	16	1.62	0.50			
	Ewe	15	1.47	0.52			
	Northerner	3	1.33	0.58			
Occupation	Salaried	40	1.42	0.50	ANOVA (0.128)		
	Self-employed	580	1.57	0.50			
	Unemployed	13	1.69	0.48			
Household income (month) (GHS)	Below 500	272	1.55	0.50	ANOVA (0.030)**		
	500-1000	322	1.60	0.49			
	Above 1000	39	1.38	0.49			
Household expenditure (month) (GHS)	Below 500	496	1.57	1.54	0.50	0.50	ANOVA (0.428)
	500-1000	131	1.33	0.52			
	Above 1000	6					
Tenancy	Landlord	171	1.40	0.49	ANOVA (0.000)***		
	Family house	374	1.62	0.49			
	Tenant	88	1.62	0.49			
Household defecating practice	Beach	218	1.68	0.47	ANOVA (0.000)***		
	Bush	203	1.53	0.50			
	Public latrine	212	1.48	0.50			
Access to public toilet	Yes	436	1.55	1.60	0.50	0.49	t-test (0.172)
	No	197					
Community	Upper-Prampram (Kley and Olowey)	280	1.49	1.63	0.50	0.49	ANOVA (0.000)***
	Lower-Prampram (L. East/L. West)	353					

*** Significant at 1%; ** Significant at 5%. *Source:* Computation from field data, 2013

4.3.3.5 Logistic Estimates of Factors of Households' Latrine Financing Decisions

The variable definitions and results of the descriptive statistics of variables that were used in the logistic regression model for households' latrine financing decision are presented in Table 4.12. Decision to finance own latrine, which is a dichotomous variable, was used as the dependent variable in an associative model of explanatory factors relating to the personal and household characteristics as well as community characteristics that could influence a household's latrine financing decision.

Table 4.12: Variable Definition and Sample Statistics for Logistic Regression

Variable	Variable definition	Mean/Mode
<i>Dependent variable</i>		
DTF_OwnLat	Decision of household to finance own latrine	0.44
<i>Independent variables</i>		
Gender	1 if male, 0 female	0.62
Age	Age of respondent (years)	47.9
Educ_PostBasic	1 if highest education level is secondary/tertiary, 0 otherwise	0.10
Educ_BASIC	1 if highest education level is basic, 0 otherwise	0.51
hhCmpCHILD	1 if household has a child below 6 years, 0 otherwise	0.48
INCOMpCAP	Average household monthly per capita income (in GH¢)	134.77
T_Landlord	1 if respondent is a landlord, 0 otherwise	0.27
T_FamilyHouse	1 if respondent resides in family house, 0 otherwise	0.59
Def_PubLAT	1 if household uses public latrine, 0 otherwise (ODF)	0.33
Cmnty-Upper-P	1 if household resides in Upper Prampram, 0 otherwise	0.44
Pref_VIP	1 if household prefers VIP latrine, 0 otherwise	0.44

US\$1.00 = GH¢1.99 (May/June, 2013). *Source:* Computation from field data, 2013

The empirical logistic estimates of households' decision to finance their latrines are presented in Table 4.13. Other statistics presented based on the estimates include the z values, McFadden R^2 and the log-likelihood statistics. The coefficients of the predictor variables representing gender, education, household composition, income, tenancy, household's defecating practice and type of community were found to be significant at the conventional levels. The results show that male household heads (aOR = 0.498, CI: 0.346, 0.716) had a reduced odds decision to finance their latrines compared with female household heads. Men were about 50% reluctant to finance their latrines compared with women household heads. This may be due to the difficulty women have with ODF, as it is culturally unacceptable for women to be 'naked' in public. Moreover, women are responsible for household sanitation such as disposal of faeces of children; hence they may have interest in owning a household latrine rather than men. In addition, men in the study area usually spend less time at home, due to the nature of their job

as fishermen, drivers or farmers, than women; hence the men may not consider it necessary to own a private/household latrine. This finding is consistent with the *a priori* expectation. It is also consistent with the findings by Harapap and Hartono (2007) who reported that there is a higher tendency for women to have an improved household sanitation facility than men. This result supports the finding that households with children (aOR = 1.740, CI: 1.216, 2.489) had an increased odds decision to finance their latrines compared with those without children. Households with children were about two times more likely to finance their latrines than those with no children. These findings are consistent with the *a priori* expectations and also concur with the report by WSP (2004) that sanitation is more important to women and children, but men who make the investment decisions in many communities may have other priorities than sanitation.

Table 4.13: Logistic Estimates of Households' Decision to Finance Own Latrine

Variables	Odds Ratio (CI)	Std. Err	z-Value	p-Value	Ref. Group
Gender_male	0.498 (0.346, 0.716)***	0.0924	-3.76	0.000	Gender-female
Age	1.004 (0.989, 1.019)	0.0076	0.52	0.605	All other variables
Educ_PostBasic	1.919 (1.026, 3.591)***	0.6134	2.04	0.041	Educ_NONE
Educ_BASIC	1.336 (0.916, 1.950)	0.2576	1.50	0.132	Educ_NONE
hhCmpCHILD	1.740 (1.216, 2.489)***	0.3178	3.03	0.002	hh > 6 yrs members
INCOMpCAP	1.001 (1.000, 1.003)*	0.0008	1.74	0.082	All other variables
T_Landlord	3.201 (1.800, 5.693)***	0.9402	3.96	0.000	T_Tenant
T_FamilyHouse	1.124 (0.662, 1.910)	0.3041	0.43	0.665	T_Tenant
Def_PubLAT	1.521 (1.032, 2.243)***	0.3013	2.12	0.034	Cmnty-Ningo
Cmnty-Upper-P	1.905 (1.330, 2.727)***	0.3488	3.52	0.000	Cmnty-Lower-P
Pref_VIP	0.532 (0.369, 0.768)***	0.0996	-3.37	0.001	Flush/Pour-flush
Pseudo-R ² = 0.0948 Log-likelihood = -392.474 LR chi2(10) = 82.18					Prob
> chi2 = 0.0000 Observations = 633					

*** Significant at 1%; * Significant at 10%. *Source:* Computation from field data, 2013

Household heads with higher education (post basic education: secondary and tertiary) and landlords, as well as those with higher incomes and those who use public latrines and reside in the upper Prampram communities were also interested to finance their latrines. Household heads with higher education (aOR = 1.919, CI: 1.026, 3.591) had an increased odds decision to finance their latrines compared with those with no formal education. They were about two times more likely to finance their latrines than those with no formal education. This finding is consistent with the *a-priori* expectation, and also consistent with the findings by Whittington *et al.* (1993) and Harapap and Hartono (2007) who reported that there is a higher tendency for households with higher education to be more willing to finance their latrines than those with lower or no formal education. Moreover, it was found that households with slightly higher incomes (aOR = 1.001, CI: 1.000, 1.003) had increased odds decision to finance their latrines compared with lower income households, implying that the former may have some disposable income to finance their latrines. This finding is consistent with the *a-priori* expectation and also consistent with the findings by Whittington *et al.* (1993) and Tiltnes (1998) who reported that there is a higher tendency for high income households to have improved sanitation facilities/toilets than low income households. Furthermore, landlords (aOR = 3.201, CI: 1.800, 5.693) had increased odds decision to finance their latrines compared with tenant households. Landlords were three times more likely to finance their latrines than tenants. This finding is also consistent with the *a-priori* expectation of the study, and also consistent with the finding by Whittington *et al.* (1993) who reported that there is a higher tendency for landlords/house owners to be willing to finance/have improved sanitation facilities/toilets than tenants. This may be due to the requirement by the new sanitation law which stipulates the need for an improved latrine in each house and/or the relatively high income of landlords. This result also

confirms the anecdotal evidence that tenants in poor peri-urban communities normally prefer ‘low cost’ rooms, due to the high rent price associated with dwellings with latrine facilities.

In addition, households who were using public latrines (aOR = 1.521, CI: 1.032, 2.243) had an increased odds decision to finance their latrines compared with those who practice open defecation, and they were about two times more likely to finance their own latrines than those who practice ODF. This finding is also consistent with the *a-priori* expectation of the study. The experience with the use of a toilet facility and the need for privacy may account for this difference. Moreover, households residing in Upper Prampram, that is, communities far from the sea, had increased odds decision (aOR = 1.905, CI: 1.330, 2.727), and were about two times more likely to finance their latrines compared with those in Lower Prampram with communities nearer the sea. This finding is also consistent with the *a-priori* expectation of the study. The nearness of households in Lower Prampram thus, provides an opportunity for some households to practice ODF at the sea shore. Furthermore, households with preference for VIP latrine (aOR = 0.532, CI: 0.369, 0.768) had a reduced odds decision and were about 53% reluctant to finance their latrines compared with those with preference for flush/pour-flush latrine. This finding is inconsistent with the *a-priori* expectation of the study, and also inconsistent with the finding by Whittington *et al.* (1993) who reported that most households are willing to pay improved sanitation service, particularly the VIP latrine, due to the relatively low cost compared to the flush latrine. The inconsistency of this finding to the *a-priori* expectation may be due to the difficulty in the removal, the bad odour and no reuse value of the faecal sludge with the VIP latrine, as were mentioned by some households during the survey. Conversely, the lack of water in the study area may pose a challenge with the preference for the flush latrine to the VIP latrine.

4.3.4 Households' WTP for Improved Latrine

This sub-section presents the results and discussion on households' perceptions on improved latrines and their willingness to pay for improved latrines technologies in the study area.

4.3.4.1 Households' Perceptions on Improved Latrines

Households' perceptions on improved latrines can influence their willingness to pay for those technologies. Seven statements were used in this study to assess households' knowledge and perceptions on improved latrines in relation to the practice of open defecation (ODF) (Table 4.14). A majority (73%) of the respondents 'agreed' that the use of improved latrines can help protect them from diseases, implying that the respondents and their households were aware of the benefits of proper sanitation as well as the consequences of the practice of ODF.

Moreover, almost all the respondents 'agreed' that the use of improved latrines can provide more privacy and comfort, and are safer and cheaper than the use of unimproved latrines, and can also help minimise pollution. These results also indicate the households' awareness of the importance and benefits on improved sanitation (latrines) which is evident by a majority of the respondents (about 92%) who expressed dissatisfaction about their defecation practice, that is, ODF or the use of public latrines in the study area.

Table 4.14: Respondents' Perception on Improved Latrines

Statement	N	Level of agreement (%)		
		A	DK	D
Use of improved latrine can help protect household from diseases	633	72.8	18.5	8.7
Use of improved latrine provides more privacy than ODF	633	99.8	0.2	0.0
Use of improved latrine is safer than ODF	633	100.0	0.0	0.0

Use of improved latrine provides more comfort than ODF	633	100.0	0.0	0.0
Use of improved latrine is cheaper than ODF	633	97.2	2.8	0.0
Use of improved latrine can help minimize pollution	633	100.0	0.0	0.0
Household's satisfaction with its current defecating practice	633	8.2	0.00	91.8

ODF, open defecation; N, total sample; A, agree (1); DK, don't know (2); D, disagree (3) *Source:* Computation from field data, 2013

4.3.4.2 Utilities and Supply Conditions for Improved Sanitation

The use of improved latrines, particular the flush or pour flush toilets, require the availability and access to utilities and services such as water, complementary products like detergents and tissue as well as skilled service providers like mason and quality hardware. Fig. 4.18 presents the results of the utilities and supply conditions necessary for the uptake of improved sanitation in the study area. The major source of water for almost all the households was the tap/pipe water which was available to the households twice every week via the Ghana Water Company Ltd. and water vendors in the study area. Although the households indicated that the source of water was clean and a majority (86%) could access it, they were not satisfied (92%) with frequency of flow of the water. Almost all the respondents (99.5%) mentioned that there were service providers such as masons and latrine hardware suppliers they could employ for the construction of their latrines. A majority of the respondents (69%) mentioned that they could access hardware for the construction of their latrines, and less than half of them (45%) indicated they could afford complementary products such as tissue and detergents for use and maintenance of improved latrines.

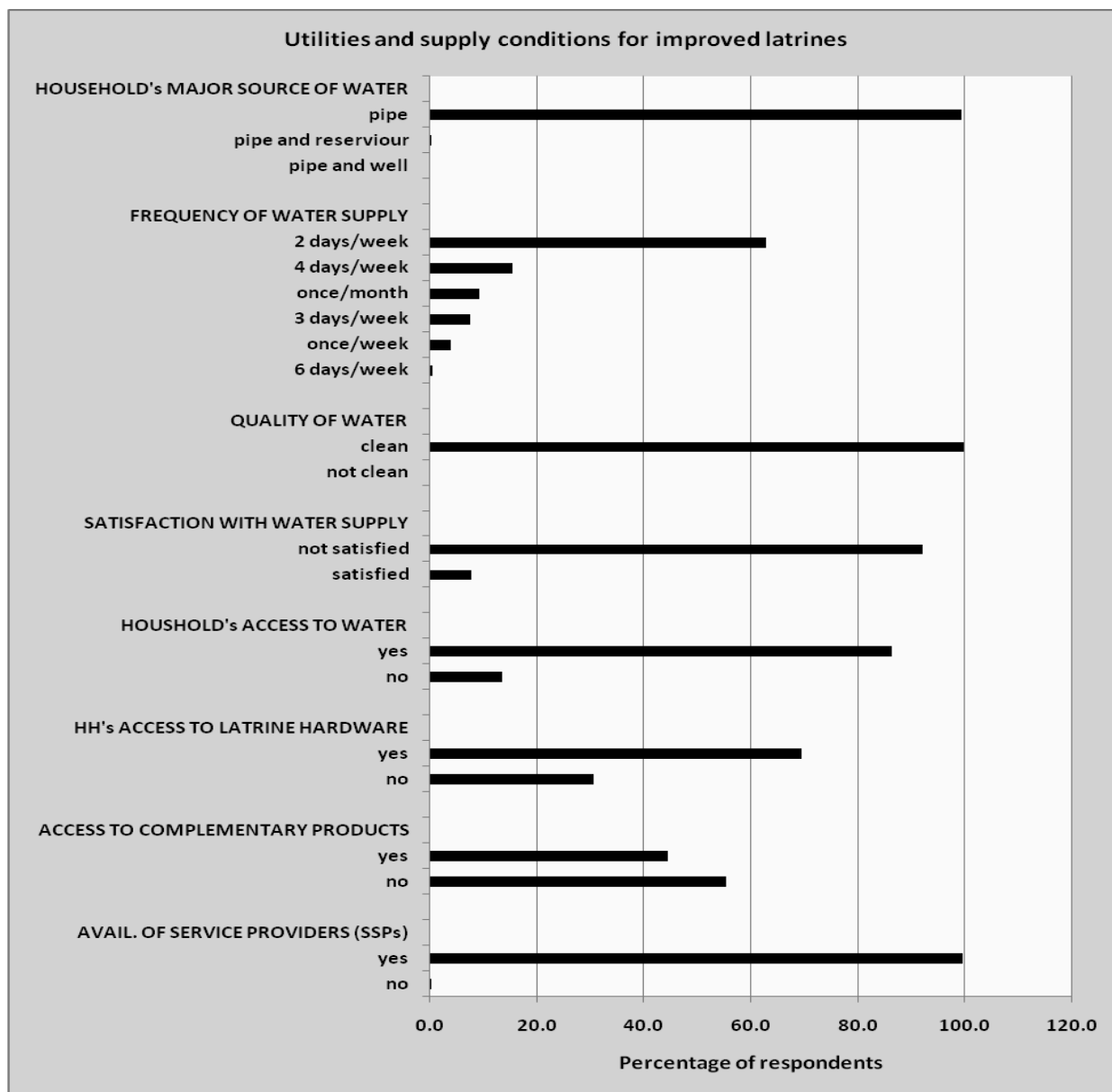


Fig. 4.18: Utilities and Supply Conditions for Improved Latrines

4.3.4.3 Knowledge of Costs and Operation/Maintenance of Improved Latrines

Households' knowledge of the costs and operation and maintenance of improved latrines could influence their response on WTP for improved latrines. Table 4.15 presents the results of the respondents' knowledge of the costs and operation of improved latrine technologies. It can be observed from the results that less than 15% of the respondents knew about the costs of

improved latrines at the time of the survey. However, about one-third (29% to 38%) of the respondents knew about the operation and maintenance of improved facilities. Information on the costs and operation of improved latrines were provided to the respondents, after which their WTP for those facilities were inquired.

Table 4.15: Knowledge on Cost and Operation of Improved Latrines

	Knowledge of cost of facility maintenance of facility Improved latrines		Knowledge of operation and	
	Yes	No	Yes	No
	Freq. (%)	Freq. (%)	Freq. (%)	Freq. (%)
Flush toilet	58 (9.2)	575 (90.8)	181 (28.6)	452 (71.4)
Pour flush toilet	58 (9.2)	575 (90.8)	216 (34.1)	417 (65.9)
KVIP/VIP toilet	90 (14.2)	543 (85.8)	243 (38.4)	390 (61.6)
Composting toilet	75 (11.8)	558 (88.2)	199 (31.4)	434 (68.6)

Source: Field survey, 2013

4.3.4.4 WTP for Improved Latrine Technologies

Information on the estimated costs²¹ of improved household latrines were provided to the respondents, after which their willingness to pay (WTP) for those facilities were inquired. From Fig. 4.15 (sub-section 4.3.3.1), it was observed that less than half (44%) of the respondents indicated that they were willing to finance/build their latrines. To estimate the households' WTP for an improved household latrine, the households' expenditures on the use of the various improved public latrines (flush, pour-flush and KVIP/VIP) in the study area were computed using the average household size of five persons per household and the average price per use of those public latrines per annum. This was used to obtain the initial

²¹ **Flush toilet:** Total cost (yrs): **GHC5,208** (5-year period) = [4,000, Initial Cost; 750 (150*5), maintenance & usage (150/year); 458 (FV) for pit-emptying at 150(PV), 25%DF]

Pour Flush latrine: Total cost (yrs): **GHC3,540** (5-year period) = [2,332, Initial Cost; 750 (150*5), maintenance & usage (150/year); 458 (FV) for pit-emptying at 150(PV), 25%DF]

KVIP/VIP latrine: Total cost (yrs): **GH¢1,503** (3-year period) = [1,000, Initial Cost; 210 (70*3), maintenance & usage (70/year); 293 (FV) for pit-emptying at 150(PV), 25%DF]

Composting latrine: Seasonally in cottages and cabins = \$700 - \$1500 (**GH¢3,000**). At home \$1200 - \$6000

bids which ranged from GH¢365 to GH¢730 per annum for the contingent valuation analysis (Table 4.16). The households were then asked about their willingness to pay premium over the initial bids, based on the assumption that an improved household latrine was better than an improved public latrine, and hence ODF.

Table 4.16: Estimating the Bid Price for Improved Household Latrine Technologies

Improved latrine technologies	Average price/person for use of latrine (GH¢)	Average household size (no. of persons)	Days per year	Hypothetical (Initial) Bid (GH¢/year)	Max. Bid (Improved latrine) (GH¢/year)
Flush toilet	0.40	5	365	730.00	1042
Pour flush toilet	0.30	5	365	547.50	708
KVIP/VIP toilet	0.20	5	365	365.00	501
Composting toilet	0.20	5	365	365.00	600

Note: US\$1.00 = GHS1.99 (May/June, 2013). *Source:* Computation from field data, 2013

4.3.4.4.1 Distribution of Responses on Households' WTP for Improved Latrines Using closed-ended questions (bids), the respondents were asked to indicate their willingness to pay a premium for improved household latrines relative to improved public latrines. The initial bids were the annual costs for use of the various improved latrines in the study area (Table 4.16). The results of the distribution of responses on households' WTP for improved household latrines are presented in Table 4.17. Less than half of the respondents were willing to pay for the flush (41%) and pour-flush (43%) improved household latrines, although a greater proportion (54%) had earlier indicated a preference for those facilities (Fig. 4.14, subsection 4.3.2.2). About one-third (33%) and more than half (57%) of the respondents were willing to pay for the household composting latrine and the VIP latrine, respectively. These results show

that the households would opt for cheaper alternative latrine facilities, irrespective of their preferences. These results are consistent with the findings by Wittington *et al.* (1993) who reported that most households prefer improved ventilated pit (VIP) latrines to conventional sewerage latrines (flush latrines) because the former is cheaper. The low response on WTP for the composting latrine may be due to the households' unfamiliarity with the facility. However, some households mentioned that the composting latrine is a prototype of the 'bucket latrine' which has some management difficulties with respect to the disposal of the faecal matter when the 'bucket' is full.

Table 4.17: Distribution of Responses on WTP for Improved Household Latrines

household latrine technologies	WTP for improved household latrine Improved	
	Not WTP Freq. (Percent)	WTP (\geq Bid) Freq. (Percent)
Flush toilet	376 (59.4)	257 (40.6)
Pour flush toilet	359 (56.7)	274 (43.3)
KVIP/VIP toilet	272 (43.0)	361 (56.9)
Composting toilet	423 (66.8)	210 (33.2)

Source: Field survey, 2013

4.3.4.4.2 Empirical Results on Households' WTP for Improved Latrines

4.3.4.4.2.1 WTP for Improved Household Latrines without Socioeconomic Factors The logit model was employed to estimate the mean WTP (without household socioeconomic factors) for the various improved latrines. The mean WTP was computed using the ratio: α/β , where α and β are the coefficients of the intercept and bid, respectively (Table 4.18). The mean WTP for a household flush latrine and pour-flush latrine were GH¢777.24 and GH¢583.42 per annum, indicating a premium of GH¢47.24 (6.47%) and GH¢35.92 (6.56%), respectively per annum over the initial bids of the improved public facilities. Moreover, the mean WTP for a

household VIP latrine and a composting latrine were GH¢396.59 and GH¢385.32, indicating a premium of GH¢31.59 (8.65%) and GH¢20.32 (5.57%),

respectively per annum over the initial bids or current prices for use of the public facilities.

Table 4.18: Mean WTP Estimates for Improved Latrines

Variable	Flush latrine	Pour flush latrine	KVIP/VIP latrine	Composting latrine
Constant (α)	89.4606*** (7.95)	71.3522*** (10.76)	68.7295*** (6.20)	101.0318*** (8.58)
Bid (β)	-0.1151*** (-8.17)	-0.1223*** (- 11.03)	-0.1733*** (-6.27)	-0.2622*** (-8.83)
<i>Mean WTP (α/β) (GH¢)</i>	777.24	583.42	396.59	385.32
Observations	633	633	633	633
Log-likelihood	-85.62	-134.00	-245.57	-37.88
LR chi2(1)	683.78	598.07	374.39	728.67
Pseudo R ²	0.7997	0.6905	0.4326	0.9058

Note: Figures in parentheses are z-values. *** denotes significant at 1%. *Source:* Field survey, 2013

Although the estimated households' WTP premium were low for all the improved latrines considered, the proportions ranging from about 6% to 9% in any case provide evidence that some households' have interest and preference for improved household latrines over the current defecation practice, that is, the use of the public improved latrines and/or open defecation. Specifically, the WTP premium was highest for the VIP latrine, which is consistent with the positive majority response on WTP for the VIP latrine (Table 4.17, subsection 4.3.4.4.1). Moreover, the relatively high cost of the flush latrine and the scarcity of water in the study area, which limit the use of the flush or pour flush latrine, and the lack of knowledge and low preference for the composting latrine, support the households' decisions for their interest in the VIP facility. Though inconsistent with the households' latrine financing decision (Table 4.13, sub-section 4.3.3.5), this finding of households' WTP for the VIP latrine is consistent with the *a-priori* expectation of the study, and also consistent with the finding by Whittington *et al.*

(1993) who reported that most households are willing to pay improved sanitation service, particularly the VIP latrine, due to the relatively low cost compared to the flush latrine.

4.3.4.4.2 Households' WTP for Improved Latrines with Socioeconomic Factors

The descriptive statistics of the variables relating to the respondents' socioeconomic factors and their WTP for improved household latrines are presented in Table 4.19. Using the maximum likelihood approach, the logit model was employed to estimate the factors that influence a household's WTP for improve latrines. The dependent variables used in the regression models were the household's WTP for the various improved latrine technologies. The explanatory variables were personal and household characteristics, as well as community factors and households' knowledge of the improved latrines.

Table 4.19: Descriptive Statistics of Variables for Empirical Model for Households' WTP for Improved Latrine Technologies

Variable	Variable definition	Mode/ Mean	SD
<i>Dependent variables</i>			
WTP_FILAT	Households' WTP for flush latrine	0.41	0.49
WTP_PFILAT	Households' WTP for pour-flush latrine	0.43	0.50
WTP_VIPLAT	Households' WTP for VIP latrine	0.57	0.50
WTP_CMPSTLAT	Households' WTP for composting latrine	0.33	0.47
<i>Socio-demographic variables:</i>			
GEND	Gender (1 if male, 0 female)	0.62	0.49
AGE	Age of household head (years)	47.9	12.3
HHSZ	Household size (total number of household members)	5.18	2.40
HHCOMP	Household composition (1 if hh has a member below 6 yrs, 0 otherwise)	0.48	0.50
EDU_POSTBASIC	Education (1 if highest education level is post basic, 0 otherwise)	0.10	0.31
EDU_BASIC	Education (1 if highest education level is basic, 0 otherwise)	0.51	0.50
INCOMpCAP	Household's average monthly per capita income (Ghana cedis)	134.8	119
T_LANDLORD	Tenancy (1 if respondent is landlord, 0 otherwise)	0.27	0.44
T_FAMILYHSE	Tenancy (1 if respondent resides in family house, 0 otherwise)	0.59	0.49
Def_PUPLAT	Access to public latrine (1 household uses public latrine, 0 otherwise)	0.33	0.47
CMMTY_UPPER-P	Community (1 if household resides in Upper-Prampram, 0 otherwise)	0.44	0.50
<i>Utilities and Supply Conditions, Knowledge and Awareness:</i>			
ACCWAT	Household's access to water (1 = accessible, 0 = otherwise)	0.86	0.34

ACCMPLT/HDWR	Access to complementary prods/services (1 = accessible, 0 otherwise)	0.45	0.50
FLUSH_OM	Knows operation & maintenance of flush latrine (1 = yes; 0 = no)	0.29	0.45
POURFI_OM	Knows operation & maintenance of pour-flush latrine (1 = yes; 0 = no)	0.34	0.47
VIP_OM	Knows operation & maintenance of VIP latrine (1 = yes; 0 = no)	0.38	0.49

Note: US\$1.00 = GHS1.99 (May/June, 2013). Source: Computation from field data, 2013

The marginal effects of the empirical logit estimates of households' WTP for improved latrines are presented in Table 4.20. Other statistics presented, based on the estimates, include the z-value, Mcfaddan R² and the log-likelihood statistics. It can be seen from the table that the coefficients of all the bids were negative and statistically significant. This implies that a household's WTP decreases with higher bids, which is consistent with economic theory.

Table 4.20: Marginal Effects of Logit Estimates of Households' WTP for Improved Latrines

Variable	Flush latrine	Pour flush latrine	VIP latrine	Composting latrine
	<i>dy/dx</i>	<i>dy/dx</i>	<i>dy/dx</i>	<i>dy/dx</i>
Bid (β)	-0.0238*** (-5.54)	-0.0261*** (-7.73)	-0.0229*** (-7.45)	-0.0394** (-2.12)
GEND	-0.1068 (-0.99)	-0.0054 (-0.05)	0.0114 (0.32)	-0.2465 (-1.50)
AGE	-0.0015 (-0.30)	-0.0057 (-1.28)	-0.0021 (-1.25)	0.0006 (0.14)
HHSZ	0.0268 (1.00)	0.0239 (0.98)	-0.0162* (-1.65)	-0.0023 (-0.10)
HHCOMP	-0.1233 (-1.02)	-0.3349*** (-3.17)	0.0592 (1.57)	0.1269 (0.97)
EDU_POSTBASIC	0.2003 (1.58)	0.1238 (1.01)	0.0501 (1.08)	0.4957* (1.90)
EDU_BASIC	0.2410* (1.81)	-0.0459 (-0.47)	0.0131 (0.37)	0.0637 (0.49)
INCOMpCAP	0.0006* (1.74)	0.0007** (2.13)	-0.0001 (-0.79)	-0.0009 (-1.28)
T_LANDLORD	0.1638 (0.89)	0.0294 (0.22)	-0.0547 (-0.88)	0.1095 (0.76)
T_FAMILYHSE	0.2373 (1.16)	-0.0753 (-0.62)	0.0316 (0.64)	-
Def_PUPLAT	0.1155 (1.08)	0.0757 (0.77)	-0.0463 (-1.09)	-0.0700 (-0.79)
CMMTY_UPPER-P	0.0493 (0.43)	-0.2202** (-2.06)	-0.0115 (-0.31)	1.1885 (1.20)
ACCWAT	0.1099 (0.59)	0.0196 (0.15)	-	-
ACCMPLT/HDWR	-0.1667 (-1.18)	-0.0273 (-0.24)	0.1207** (2.63)	0.2152 (1.60)

KNOM_Latrine	0.5762*** (5.41)	0.4780*** (3.86)	0.0236 (0.38)	-
Observations	633	633	633	633
Log-likelihood	-73.89	-117.79	-230.27	-27.54
LR chi2(15/14)	707.23	630.50	404.99	749.34
Pseudo R ²	0.8272	0.7280	0.4679	0.9315

NB: Figures in parentheses are z-values. ***, sig. at 1%; **, sig. at 5%; *, sig. at 10% *Source:* Field survey, 2013

From Table 4.20, it can be observed that the estimated coefficients for education, basic and post-basic, on WTP for the flush latrine and composting latrine were positive and statistically significant at 10%. Likewise, estimated coefficients of income for the flush and pour-flush latrines were also positive and significant at 10% and 5%, respectively. The positive and significant coefficient of education implies that there is a tendency for educated households to increase their willingness to pay for the household flush latrine by 24% and for the composting latrine by about 50%. Generally, educated people are more knowledgeable about the consequences of poor sanitation and would therefore be willing to pay for improved latrines. Moreover, higher income households were more willing to pay for the flush and pour-flush latrines by about a percent each. The significant effects of household income have clear economic interpretations on WTP for improved sanitation. These results corroborate with the *a-priori* expectations and are also consistent with the findings by Harapap and Hartono (2007), Tiltne (1998) and Whittington *et al.* (1993) who reported that households with higher education and incomes bid significantly more for improved sanitation services than households with low level of education or without formal education and with lower incomes.

The coefficient of the explanatory variable, household composition - that is, presence of a child in the household, was negative and statistically significant for the pour-flush latrine, likewise

for households in Upper Prampram. Households with children below six years were about 33% less likely to pay for the pour-flush latrine. This implies that households with more children (*dependents*) may be economically overburdened, and therefore may be less WTP to pay for improved latrines, particularly the flush latrines which are more expensive than other improved latrines like the VIP facility. Moreover, households in Upper Prampram (communities far from the sea) were about 22% less likely to pay for the pour-flus latrine; residents in Upper Prampram prefer the flush and composting latrine to the pour-flush and VIP latrines. It was also found that households with large family size were about 2% less likely to pay for the VIP latrine technology. The finding is consistent with the *a-priori* expectation. The negative relationship between household size and WTP for the VIP latrine may be due to the fact that a large family size may have a high tendency to increase the accumulation of faecal sludge; some households mentioned this as undesirable due to the difficulty in the removal of the sludge when the pit is full which creates bad odour, and the lack of reuse value of the faecal sludge.

With respect to utilities and supply conditions, it was found that household were about 12% more willing to pay for the VIP latrine with access to complementary products like toilet tissue and detergents for cleaning latrines and latrine hardware. This finding is consistent with the *a-priori* expectation and also concurs with findings by Tiltnes (1998) and Whittington *et al.* (1993) who reported that households' access to supply conditions such as water, hardware and complementary product have positive effect on willingness to pay for improved sanitation facilities. The results also showed that a household's knowledge on the operation and maintenance of the flush/pour-flush latrine was positive and statistically significant on WTP for those facilities. It was found that households who were knowledgeable

about the operation and maintenance of the flush latrine and pour-flush latrine were about 58% and 49% more willing to pay for those facilities. This finding is consistent with the *a-priori* expectation and also confirms the general notion that knowledge about a product or service is an important pre-requisite to the expression of willingness to pay for that product or service.

4.3.4.4.3 Households' Budget and Ability to Pay for Improved Latrines

The estimated households' WTP for the improved latrines were all greater than the initial bids (Table 4.18), though the different amounts were lesser than the actual costs of the improved latrines (Table 4.21). The study examined households' ability to pay (ATP) for improved latrines based on an analysis of households' monthly incomes and expenditures (Table 4.21). A comparison of the households' monthly average expenditure and their monthly average income showed that the households had a monthly average income surplus of GH¢170.35 (about GH¢2,080.20 per annum) and a modal monthly average surplus of GH¢120.00. The households' monthly average and modal income surpluses were found to be greater than the hypothetical bids and the estimated households' WTP for the improved latrines. In that sense, it may be possible for an interested household to use its own funds to build an improved household latrine. This implies that the households could finance their latrines, though they claimed they do not have funds (Figure 4.11, sub-section 4.3.2.1), hence there may be other reasons for the low uptake of improved household latrines in the study area which may include the presence of alternative defecating places (open defecation in the beach and bush) and the perceived low/no economic value for human excreta, as were mentioned by some of the respondents during the survey.

Table 4.21: Households' Budget and Ability-to-Pay (ATP) for Improved Latrines
Households' average monthly income surplus

Income/ Expenditure	Mean (GH¢) per	Mode (GH¢)	SD
month			
Income	560.25	600.00	272.62
Expenditure			
<i>Food</i>	275.36	200.00	128.17
<i>Clothing</i>	21.59	20.00	22.76
<i>School Fees</i>	71.41	60.00	62.01
<i>Utilities</i>	36.61	20.00	30.53
<u>Total expenditure</u>	<u>389.90</u>	<u>300.00</u>	<u>175.07</u>
<u><i>Income surplus/month</i></u>	<u><i>170.35</i></u>	<u><i>120.00</i></u>	<u><i>260.53</i></u>
<u><i>Income surplus/year</i></u>	<u><i>2080.20</i></u>		

Comparison of hypothetical bids, WTP premium and estimated costs of latrines

<i>Improved latrine</i>	<i>Actual public cost (GH¢) /year</i>	<i>Estimated cost of improved latrine (GH¢/ lifespan)</i>	<i>Cost of improved household latrine (GH¢/ year)</i>	<i>Diff. public and household latrine /year</i>	<i>WTP over public cost (GH¢) /year</i>	<i>premium over public cost (GH¢) /year</i>	<i>Premium shortfall over actual cost of latrine</i>
Flush	730.00	5,208 (5 years)	1,041.60	311.60	777.24	47.24 (6.47%)	264.36
Pour-flush	547.50	3,540 (5years)	708.00	160.50	583.42	35.92 (6.56%)	124.58
VIP	365.00	1,503 (3 years)	501.00	136.00	396.59	31.59 (8.65%)	104.41
Composting	365.00	3,000 (5 years)	600.00	235.00	385.32	20.32 (5.57%)	214.68

N = 633. US\$1.00 = GHS1.99 (May/June, 2013). *Source*: Computation from field data, 2013

4.3.5 Lenders' Interest to Finance Household Latrines

This sub-section presents the results and discussion on households' banking profile and the interests/opinion of lenders in financing household latrines.

4.3.5.1 Households' Banking Profile and Access to Credit

About half (48%) of the sampled households had accounts with the financial institutions in the study area, with a majority (30%) of this proportion being clients of the Dangme Rural Bank (DRB), the indigenous rural bank in the study area (Fig. 4.19). Some households were also customers of the microfinance institutions in the study area, namely: IDEAL Way

Microfinance, SKY Cooperative Credit Union, Supremacy Microfinance Service, and PROMent Microfinance.

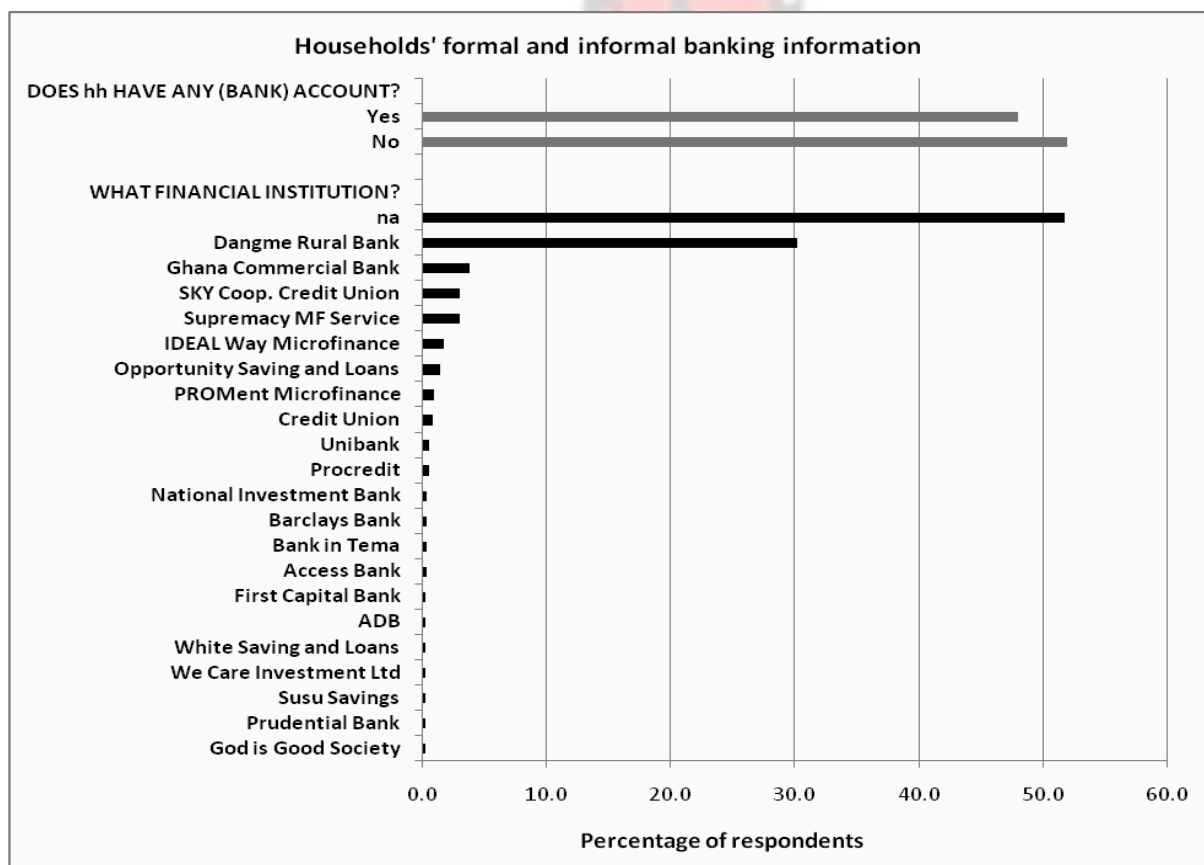


Fig. 4.19: Households' Banking Information

Only 13% of the sampled households had ever applied for a loan from the financial institutions (FIs), and a majority of this proportion was to do business/trading with the loan (Fig. 4.20).

This is not surprising as trading/self-employment, is one of the major occupations of most of

the households in the study area (Table 4.10, sub-section 4.3.1). The purpose of the loan was also for building, schooling and farming. This result corroborates the report by Card and Sparkman (2010) that the priorities of households in poor peri-urban communities are normally for housing, water, farming, and schooling, instead of for proper sanitation. Of the proportion of households that had ever applied for a loan, a majority of the applications were successful. Among the reasons that were identified for the refusal of the households' loan applications were that they did not meet the criteria by the financial institutions or they did not have enough savings.



Fig. 4.20: Households' Banking Affiliation and Access to Credit

4.3.5.2 Lenders' Profile and their Interests in Financing Household Latrines

There were five registered financial institutions in the study area, namely: Dangme Rural Bank, IDEAL Way Microfinance, SKY Cooperative Credit Union, Supremacy Microfinance Service, and PROMent Microfinance (Table 4.22). The oldest and most staffed financial institution was the Dangme Rural Bank which was established in 1982 with staff strength of 103 employees. All the financial institutions provided savings and *susu* and credit services as part of their products.

Table 4.22: Profile of Financial Institutions in Ningo-Prampram

Financial institution	Location	Year Est.	Total staff	Products/services
Dangme Rural Bank	Prampram <i>Other Branches:</i> Ningo, Kpone, Ashaiman, Tema, Asutsuare, Lebanon	1982	103	<ul style="list-style-type: none"> • <i>Savings:</i> deposit, susu, group savings, trust, current, zero (salary workers) • <i>Lending:</i> microfinance, institutional, Funeral, overdraft, top-up, Personal • <i>Investments:</i> T-Bills, Fixed Deposit • <i>Transfers:</i> Apex, Western Union
IDEAL Way Microfinance	Ningo	2010	10	<ul style="list-style-type: none"> • Savings and Susu • Kids account • Credit service
SKY Coop. Credit Union	Prampram	2008	25	<ul style="list-style-type: none"> • Savings and credit, Susu, Mobile banking • Fixed deposit • Financial/educational advisory service
Supremacy Microfinance Service	Prampram	2011	50	<ul style="list-style-type: none"> • Savings and Susu • Fixed deposit • Credit service
PROMent Microfinance	Ningo	2010	14	<ul style="list-style-type: none"> • Savings and Susu • Mobile banking • Credit service

Source: Field data, 2012

Table 4.23 presents the (latrine) lending policies of the financial institutions in the study area.

It was found that none of the financial institutions (FIs) in the study area had ever granted a

loan for the construction of a household latrine, because no household/client had ever requested for such loan. However, the FIs were interested in financing household latrines; they indicated that a ‘latrine loan’ could be considered as a personal loan, implying an opportunity for interested households to access credit to build their latrines.

Table 4.23: Lenders’ Interest and Policy for Financing Household Latrines

Financial institution	Granting or interested in latrine loan?	FI Terms on latrine loan	Max. amount GH¢	Repayment term?	Why FI is not granting latrine loan.
Dangme Bank (DRB)	Rural Not granting latrine loan, but interested and can be considered as personal loan.	Same as other personal loans ¹⁸	2,000	12-24 month, depending on total amount and must be a customer for min. 6 months.	Customers/ households not specifically asked before.
IDEAL Way Microfinance	Not granting, but interested and can be considered as personal loan.	Same as other personal loans, but must be a customer for min. 3 months.	50% of total savings	Based on 50% of total savings as collateral.	No one has asked/applied before.
SKY Coop. Credit Union	Not granting yet, but would depend on the Union Board’s decision and may not be a problem.	Same as other personal loans, but must be a customer for min. 6 months and 3 months for mobile banking.	50% of total savings	Based on 50% of total savings as collateral and/or use of immovable property as collateral	No one shown interest/applied before, and Board would have to decide.
Supremacy Microfinance Service	Not granting, but would not be a problem to do that.	Same as other personal loans, but must be a customer for min. 3 months.	50% of total savings	Based on 50% of total savings as collateral.	No one has asked/applied before.
PROMent Microfinance	No granting, but can be considered as personal loan.	Same as other personal loans, but must be a customer for min. 3 months.	50% of total savings	Determined by the customers, but based on 50% of savings as collateral.	No one has asked/applied before.

Source: Field data, 2012

¹⁸ Based on amount approved, an applicant must complete an application/contract form, provide collateral/guarantors, past records and must show ability to pay (e.g. based on savings).

4.3.5.3 Lenders' Criteria for Assessing Creditworthiness for Household Latrine Based on the *five Cs* for credit scoring (Ross *et al.* 1998), it was found that ‘collateral’ was the most important indicator that the FIs would consider in their assessment of a household’s creditworthiness for a ‘latrine loan’ (Fig. 4.21). To qualify for a ‘latrine loan’ the FIs explained that a would-be-borrower/household would need 50% of its savings or immovable item(s) as collateral. This result concurs the finding by Olagunju and Ajiboye (2010) who reported that the provision of collateral by borrowers is an important determinant of lenders’ decision in their approval or otherwise of a loan application. The next most important indicators that were considered by the FIs were capital and character. A test of significance of W (0.76) among the lenders was statistically significant at 1%, implying a unanimous agreement by the FIs on the importance and order of ranking of the indicators (*five Cs*) for a household ‘latrine loan’.

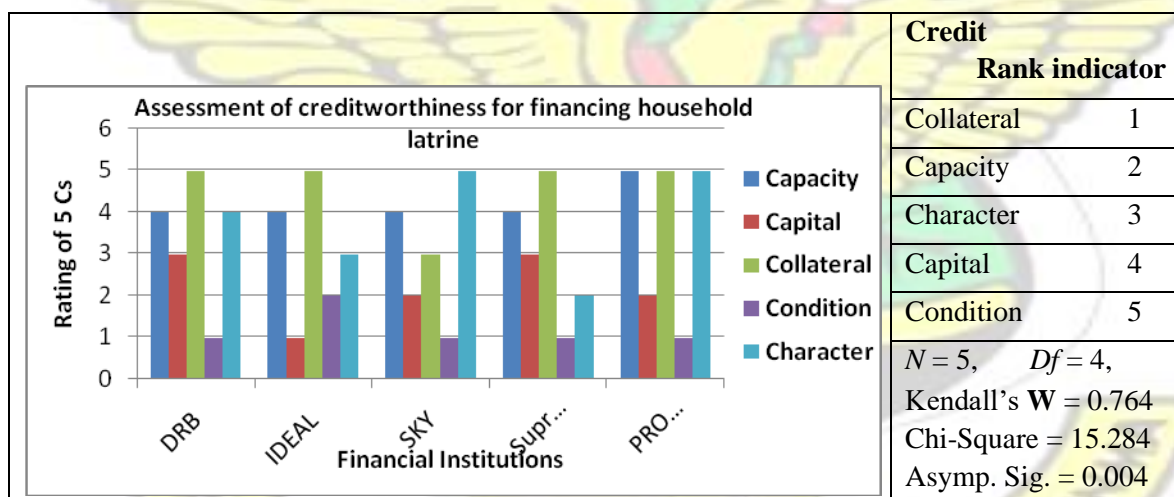


Fig. 4.21: Assessment of Creditworthiness for ‘Latrine Loan’. *Source:* Field data, 2013

4.4 Crop Farmers' Attitude and Perceptions toward Excreta Reuse in Agriculture

This section presents the results and discussion on the socioeconomic characteristics of the farming households, and their knowledge, attitude and perceptions on human excreta reuse for agricultural purpose.

4.4.1 Socioeconomic Characteristics of Crop Farmer-respondents

Table 4.24 presents the results of the socioeconomic characteristics of respondents. A majority (68%) of the respondents were men and had lived in the study communities for more than 10 years (about 90%). The average age of about 43 years of the respondents was found to be almost similar to the national average of 45 years for farmers in Ghana (GSS, 2012). A majority had basic education (73%; primary to JHS/MSLC¹⁹) and about 65% had a household size of at most five persons. The average farm size of 0.62 hectares was found to be relatively low than the district and national average of 1.5 ha and 3.0 ha respectively (Shai-Osudoku District Assembly, 2006). The crops that were cultivated by the farmers were plantain, maize, cassava, yam, mango, watermelon, pineapple, and vegetables, mostly on rented plots (71%). Maize was the most cultivated crop, followed by vegetables and root/tubers. A majority of the households earned GH¢400 (US\$150) per month which is above the per capita gross national average monthly income of GH¢224.7 (US\$124) (GSS, 2013). This modal monthly income which is positively skewed reflects a characteristic of that of most countries worldwide.

¹⁹ Junior High School/Middle School Leaving Certificate

Table 4.24: Socioeconomic Characteristics of Farmers

Variables		Freq. (%)	Mean (SD)
Gender	Male	272 (68.0)	
	Female	128 (32.0)	
Age (years)	20-29	32 (8.0)	42.5 (10.9)
	30-39	137 (34.2)	
	40-49	134 (33.5)	
	50-59	62 (15.5)	
	60 and above	35 (8.8)	
Length of stay in community	Below 10 years	44 (10.5)	24.6 (14.2)
	10-19 years	107 (26.8)	
	20-29 years	92 (23.0)	
	30-39 years	87 (21.8)	
	40 and above	72 (18.0)	
Education	Tertiary (Univ./Poly/College)	18 (4.5)	
	Secondary (SHS/O'Level/A'Level)	58 (14.5)	
	Junior High/MSCL	161 (40.2)	
	Primary school	134 (33.5)	
	None/no formal education	29 (7.2)	
Household size	5 and below	259 (64.8)	4.9 (1.8)
	6-10	141 (35.2)	
Household monthly income (GHS)	Below 500	219 (54.8)	488.73 (204.1) Mode (400)
	500-1000	177 (44.2)	
	Above 1000	4 (1.0)	
Land tenure system	Own land	61 (15.2)	
	Family land	57 (14.2)	
	Rented land	282 (70.5)	
Crops cultivated	Vegetables (pepper/tomato/onion)	93 (23.2)	
	Maize	184 (46.0)	
	Root/Tubers (cassava/yam)	106 (26.5)	
	Plantain	3 (0.8)	
	Fruits (mango/melon/pineapple)	14 (3.5)	
Farm size	Below 0.5 ha	179 (44.8)	0.62 (0.28)
	0.5-1 ha	183 (45.8)	
	Above 1 ha	38 (9.5)	

Note: US\$1.00 = GHS1.99 (May/June, 2013). Source: Field data, 2013

4.4.2 Farmers' Attitude and Perceptions toward Human Excreta

The respondents were asked eight questions about their attitudes and perceptions toward human excreta. More than half of the respondents 'disagreed' that human excreta are waste and not a resource for agricultural production (Table 4.25). A majority (81%) however

‘agreed’ that handling human excreta can pose great health risk and for that matter human excreta should not be handled in any way (87%). The comments in the FGDs confirmed the respondents’ diverse perceptions toward excreta. A participant in the women’s FGD remarked: *“Even when you go to toilet you will wash your hands before you do something and now you want to touch it (excreta).”* Another participant with a contrary view said that: *“It (excreta) came from you so you can touch it.”* In contrast, another participant said: *“When we put cow dung on the floor you can pick it with your two hands but when we put human excreta there it will be a different thing”*. The facial expression of a participant in the women’s FGD provided evidence of a ‘disagreeing’ perception towards excreta. Considered as not a taboo (72%), a participant in the men’s FGD remarked: *“If you cannot touch faeces then you should not shit at all because sometimes you will touch it when you are wiping so it is not a taboo”*. Moreover, more than half of the respondents (60%) also ‘agreed’ that a household toilet should not be far from the place of residence; implying the necessity and importance of a household latrine.

Table 4.25: Respondents’ Attitudes and Perceptions toward Human Excreta

Statement	Level of agreement (%)		
	A	DK	D
Human excreta are waste and suitable only for disposal	32.5	14.2	53.2
Human excreta are not resource for agricultural production	31.0	16.0	53.0
Human excreta have no (economic) benefit to humans	30.8	17.0	52.2
Toilet should not be built in/near the household’s place of residence	34.8	5.0	60.2
Human excreta should not be handled in any way	87.0	4.8	8.2
Use of human excreta in agriculture is a great health risk	80.8	4.2	15.0
It is a taboo to touch faeces	21.5	7.0	71.5
It is a taboo to touch treated faeces	13.0	9.5	77.5

Note: N= 400; A, agree (1); DK, don’t know (2); D, disagree (3) *Source:* Computation from field data, 2013

4.4.3 Farmers' Perception on Excreta Reuse in Agriculture and Sanitation Business

This sub-section presents the results and discussion on farmers' knowledge and perceptions on excreta reuse for agricultural purpose and the influence of their socioeconomic characteristics on their perceptions.

4.4.3.1 Farmers' Knowledge and Perceptions on Excreta Reuse in Agriculture

A number of studies have reported on the importance or otherwise of (sanitized) excreta and households' attitudes and perceptions toward the reuse of excreta as fertilizer (Asare *et al.*, 2003; Cofie *et al.*, 2004; Cofie and Koné, 2009; Cofie *et al.*, 2010; Mariwah and Drangert, 2011). Ten statements were used in this study to assess farmers' knowledge and perceptions on human excreta reuse as fertilizer in agriculture (Table 4.26). From Table 4.26, it can be observed that more than half of the respondents 'agreed' to the statement that human excreta are a resource to the soil and that sanitized excreta could be used as fertilizer, although only 11% of them had ever used excreta as fertilizer. About 63% 'agreed' to use (sanitized) excreta as fertilizer. This was corroborated by a participant in the men's FGD who remarked that: *"Yes, excreta is good for the soil, it is manure, and for example, when there are faeces on the ground and crops germinate there, like tomatoes and water melon, they become very fresh and green"*. In addition, another participant said: *"Even human excreta are better for crops than animal manure"*.

Moreover, more than half of the respondents 'agreed' to the statement that crops fertilized with human excreta are good for consumption. A participant in the women's FGD remarked that: *"Yes, we can eat crops fertilized with excreta."* This was supported by another woman who

said: *“The crop will change at maturity and you will not see any excreta, but the crop.”* Another respondent also said: *“It is the food you eat which turns into toilet and when you harvest the crop you don’t see the toilet on it so it will make the crop sweeter instead”*. A participant in the men FGD also remarked that: *“Even the taste will be better; you eat salt so the taste of the salt will go inside the crop and would even taste better”*.

More than half (58%) of the respondents ‘disagreed’ to the statements that ‘use of excreta as fertilizer can affect the smell and taste of crops, or can destroy crops’. A statement by a participant in the women’s FGD corroborates the general view by the sampled respondents; she remarked: *“No, excreta cannot destroy crops; even at the public toilet the cocoyam there are very fresh and we harvest kontomire (spinach) from there”*. In support of this statement, another participant said: *“People defecate behind our house, and a tractor came to plough the land for farming, and the maize there looked nicer than using inorganic fertilizer”*. These findings show that the respondents were knowledgeable about the potential benefits of human excreta for agricultural purpose.

Table 4.26: Respondents’ Knowledge on Utilization of Human Excreta in Agriculture

	A	DK	D
Human excreta are a resource to the soil	61.5	27.0	11.5
Sanitized human excreta can be used as fertilizer	63.0	27.8	9.2
I will use human excreta on my crops if sanitized	62.5	26.8	10.8
Taste of crops will change when fertilized with human excreta	14.0	30.0	56.0
Smell of crops will change when fertilized with human excreta	12.0	31.0	57.0
Crops can be destroyed when fertilized with human excreta	11.0	32.2	56.8
Crops fertilized with human excreta are good for consumption	57.8	30.2	12.0
I will never consume crops fertilized with human excreta	12.0	31.0	57.0
Animal manure (faeces) can be used as fertilizer	90.5	6.2	3.2

Ever used human excreta as fertilizer on my farm

11.2

0.0

88.8

Level of agreement (%) Statement

KNUST

Note: N= 400; A, agree (1); DK, don't know (2); D, disagree (3) *Source:* Computation from field data, 2013

4.4.3.2 Excreta Reuse in Agriculture and Sanitation Business

From the results in Table 4.25 and 4.27, it can be said that crop farming households in the study area had a positive perception on the benefits of excreta as a resource for agricultural production, though the use of excreta as fertilizer was affected by their perceived health risk with excreta reuse for agricultural purpose. The lack of economic value for excreta in the study area has effect on the costs of operating a sanitation business, particularly the pitemptying business, as operators have to travel long distances to disposal sites for faecal sludge. In fact, the pit-emptying business operator ranked the lack of disposal sites for faecal sludge and the associated negative effect on their business performance as the most important constraint to the operation of the pit-emptying business (*see:* Table 4.8, sub-section 4.2.4).

Moreover, the public latrine managers in the study area also associated the 'lack of economic value for excreta' as one of the constraints to the operation of their business (Table 4.4, subsection 4.1.3). They mentioned that the no economic value for excreta did not create any incentive for frequent collection of the excreta, thereby leading to accumulation of faecal matter in the pits that generates bad odour and also invites flies as nuisance to users. This situation can

also serve as a disincentive for owning a household latrine, as some households' views supported the opinions of the service providers.

4.4.3.3 Perceptions on Excreta Reuse in Agriculture by Socioeconomic Factors

Table 4.27 presents the mean responses of the respondents' overall attitudes and perceptions on human excreta by their socioeconomic characteristics with regard to the value of excreta and decision to use excreta as fertilizer. From Table 4.27, it can be observed that women were generally more negative to excreta than men. This is consistent with a report by Mariwah and Drangert (2011) who observed that women are more negative towards excreta reuse than men.

Table 4.27: Respondents' Attitudes/Perceptions on Excreta by Socioeconomic Characteristics

Variable	N	Human excreta are waste and suitable only for disposal			Will use (sanitized) human excreta in agriculture		
		Mean	SD	F/t-test Stat. (p-value)	Mean	SD	F/t-test Stat. (p-value)
Sex Male				t-test			t-test
Female	272	2.29	0.88	(0.010)**	1.44	0.67	(0.078)*
	128	2.04	0.93		1.57	0.71	
Age (years)							
20-29	32	2.62	0.75	ANOVA (0.010)**	1.19	0.47	ANOVA (0.010)**
30-39	137	2.31	0.89		1.39	0.63	
40-49	134	2.13	0.91		1.55	0.71	
50-59	62	2.08	0.91		1.63	0.73	
60 and above	35	1.97	0.89		1.57	0.74	
Length of stay in community							
Below 10 years	42	2.76	0.62	ANOVA (0.000)***	1.07	0.26	ANOVA (0.000)***
10-19 years	107	2.46	0.85		1.34	0.66	
20-29 years	92	2.00	0.94		1.62	0.71	
30-39 years	87	1.93	0.89		1.69	0.70	
40 and above	72	2.11	0.88		1.51	0.69	
Education							
Tert. (Univ./Poly/College)	18	2.94	0.24	ANOVA (0.000)***	1.06	0.24	ANOVA (0.000)***
Sec. (SHS/O'A' Level)	58	2.76	0.66		1.17	0.53	
Junior High/MSCL	161	1.93	0.91		1.65	0.73	
Primary school	134	2.20	0.88		1.46	0.63	
None/no formal education	29	2.24	0.87		1.59	0.78	
Household size							
5 and below	259	2.20	0.90	ANOVA (0.932)	1.48	0.67	ANOVA (0.996)
6-10							

	141	2.21	0.91		1.48	0.71	
Household income/mth (GH¢)							
Below 500	219	1.99	0.91	ANOVA	1.64	0.72	ANOVA
500-1000	177	2.47	0.83	(0.000)***	1.30	0.59	(0.000)***
Above 1000	4	2.50	1.00		1.00	0.00	
Land tenure system Own							
land	61	2.56	0.79	ANOVA	1.15	0.44	ANOVA
Family land	57	2.28	0.90	(0.002)***	1.40	0.62	(0.000)***
Rented land	282	2.12	0.91		1.57	0.71	
Crops cultivated							
Veg. (pepper/tomato/onion)	93	1.80	0.83		1.69	0.71	
Maize	184	2.20	0.94	ANOVA	1.51	0.72	ANOVA
Root/Tubers (cassava/yam)	106	2.60	0.74	(0.000)***	1.23	0.52	(0.000)***
Plantain	3	2.67	0.58		1.67	0.58	
Fruits (mango/melon/pineapple)	14	1.93	0.92		1.64	0.63	
Farm size							
Below 0.5 ha	179	2.20	0.88	ANOVA	1.49	0.67	ANOVA
0.5-1 ha	183	2.13	0.94	(0.004)***	1.53	0.72	(0.030)**
Above 1 ha	38	2.66	0.67		1.21	0.47	

Note: *** Sig. at 1%; ** Sig. at 5%; *Sig. at 10%. Source: Computation from field data, 2013

From Table 4.27, it can be observed that perceptions on the value of excreta and decisions on excreta reuse for agricultural purpose by length of stay in the study communities, education, household income, type of crop cultivated and farm size were all significant at the conventional levels. Respondents with less experience in the study area were more likely to ‘disagree’ that excreta are a waste than those with more experience. In addition, younger people were more likely to ‘disagree’ that excreta are a waste and were willing to use it as fertilizer on their crops than the aged. This result concurs with the finding by Mariwah and Drangert (2011), although their result was not significant. It can be inferred from this results that younger farmers in the study area are more ambitious and ready to bear risk than elderly farmers.

The results also show that respondents with higher formal education were more likely to ‘disagree’ that human excreta are a waste and were more likely to ‘agree’ to use excreta for agricultural purpose than those with no formal education. Moreover, higher income earners

were more likely to use excreta as fertilizer than lower income farmers. Land owners were also more likely to ‘disagree’ that excreta are waste and were more willing to use excreta as fertilizer than tenant farmers. Although inconsistent with the findings of Cofie *et al.* (2010) who observed that lack of ownership of land does not affect the decision to use excreta, it can be inferred from the results of this study that tenant farmers are more careful in their decision on the use of excreta on rented plots. Moreover, large-scale farmers were more likely to ‘disagree’ that excreta are a waste than small-scale farmers, and they were more willing to use excreta as fertilizer than small-scale farmers. This result concurs with the findings by Cofie *et al.* (2010) who reported that the high cost of inorganic fertilizers normally compels farmers to use alternative products (such as like excreta), particularly with increasing farm size. However, vegetable and fruit crop farmers were more likely to ‘agree’ that excreta are a waste and were less willing to use excreta as fertilizer than as perceived by arable crop farmers. This result concurs with the findings by Cofie *et al.* (2010) that due to possible health risks, excreta are used mainly for maize production than for vegetables.

4.4.3.4 Constraints on Human Excreta Reuse in Agriculture

Certain that not all the respondents were willing to use human excreta as fertilizer (Table 4.26, sub-section 4.4.3.1), it was necessary to examine the factors that constrain their decisions on excreta reuse as fertilizer. As shown in Table 4.28, the respondents’ perceptions on the health risks of excreta reuse was identified as the most important factor that limit their decisions to use excreta as fertilizer. A test of the significance of W (0.318) among the respondents was found to be significant at 1%, indicating that the respondents unanimously agreed in the order of ranking of the constraints that limit their decisions to use excreta as fertilizer. This result

concur with the findings by Cofie *et al.*, (2010) and Mariwa and Drangert (2011) who report that although farmers consider excreta as a resource in agriculture, the most important factor that prevents them from using excreta as fertilizer is the perception on the health risks associated with excreta reuse. Besides, a majority (81%) of the sampled respondents ‘agreed’ that excreta reuse can pose health risks (Table 4.25, subsection 4.4.2).

Table 4.28: Ranking of Constraints affecting Decision to use Excreta in Agriculture

Variable	Mean rank	Overall rank
Health risk	1.99	1
Appearance of crop may be affected	2.89	2
Smell/aroma of crop may be affected	3.23	3
Consumers may not patronage my crop	3.85	4
Taste of crop may be affected	3.96	5
Religious belief of respondent	5.07	6

Kendall’s **W: 0.318**; Chi-square: 448.34; df.: 5; Asymp. Sig.: 0.000

Source: Computation from field data, 2013

4.4.4 Households’ Knowledge and Perceptions on Health-risk of Human Excreta

This sub-section presents the empirical results and discussion on the determinants of the respondents’ perceptions on the health risks associated with excreta reuse for agricultural purpose.

4.4.4.1 Descriptive Statistics of Variables relating to Respondents’ Decisions to use Excreta and Perceptions on Health-risks with Excreta Reuse in Agriculture

Table 4.29 presents the variable definitions and results of the descriptive statistics of the variables used in the ordered probit model for the relationship between the respondents’ socioeconomic characteristics and their decisions to use excreta as fertilizer, as well as their

perceptions on the health risks associated with excreta reuse for agricultural purpose. The results and discussion of the descriptive statistics have been provided in section 4.4.1.

Table 4.29: Variable Definition and Sample Statistics for Estimating the Determinants of Excreta Reuse in Agriculture

Variable	Variable definition	Mean/Mode	SD
<i>Dependent variables</i>			
HE_useAGRIC	Respondents' decision to use excreta for agricultural purpose	1.48	0.68
HE_HlthRISK	Respondents' perception on health risks of excreta reuse	1.34	0.73
<i>Independent variables</i>			
Gend_M	1 if male, 0 otherwise	0.68	0.47
Age	Age of respondent (years)	42.5	10.9
LengthStay	Length/duration of stay in community (years)	24.6	14.2
HHSize	Household size	4.9	1.8
FarmSz	Farm size (ha)	0.62	0.28
HH_Income	monthly Average income (GH¢)	488.73	204.10
Educ_TERT	1 if highest education level is tertiary, 0 otherwise	0.05	0.21
Educ_SEC	1 if highest education level is secondary, 0 otherwise	0.14	0.35
Educ_BASIC	1 if highest education level is basic, 0 otherwise	0.74	0.44
OwnLAND	1 if respondent cultivates crops on own land, 0 otherwise	0.15	0.36
RentLAND	1 if respondent cultivates crops on rented land, 0 otherwise	0.71	0.46
VEG_Crop	1 if respondent cultivates vegetables, 0 otherwise	0.23	0.42
MAIZE_Crop	1 if respondent cultivates maize, 0 otherwise	0.46	0.50
R&T_Crop	1 if respondent cultivates root & tuber crops, 0 otherwise	0.26	0.44
HE_Waste	1 if respondent perceives excreta as waste, 0 otherwise	0.32	0.47
HE_HlthRisks	1 if respondent perceives excreta as health risks, 0 otherwise	0.81	0.40
HE_UseBf	1 if respondent has used excreta as fertilizer before, 0 otherwise	0.11	0.32
ANIM_Manure	1 if respondent has used animal manure before, 0 otherwise	0.90	0.29

US\$1.00 = GH¢1.99 (May-June, 2013). *Source:* Computation from field data, 2013

4.4.4.2 Empirical Estimates of Farmers' Perception on Excreta Reuse

Using the maximum likelihood approach, an ordered probit model was used to estimate the marginal effects of the respondents' perception on the health risks' of excreta reuse. The dependent variable of the regression model was farmers' health-risks perception

(HE_HlthRISK) indicator ranked into three coded responses (*see* Table 4.25 and Table 4.26).

The explanatory variables were personal and household characteristics and their perceptions on excreta reuse in agriculture. Other statistics presented based on the estimates include the *z*-value, McFadden R^2 and the log-likelihood statistics.

From Table 4.30, it was observed that the coefficient of the variables representing length of stay in the study area, household size, income, use of rented land for production and perception that excreta are a waste were all significant at the conventional levels. Specifically, length of stay in the study area, household size, use of rented land for production and perception that excreta are a waste had positive effects on households' 'agreeing' perceptions that excreta reuse can pose health risks. It was found that each additional year of stay in the study area was positively related to the household 'agreeing' perception on the health risks of excreta reuse by 0.4%. This implies that the experience of the farmer in the study area could marginally influence farmers' perceptions on the health risks of excreta reuse.

Table 30: Marginal Effects of Ordered Probit Estimates of Farmers' Perception on the Health Risks of Excreta Reuse in Agriculture

Variables	dy/dx	Std. Error	z-Value
Gend_M	0.0432	0.0424	1.02
Age	-0.0028	0.0018	-0.52
LengthStay	0.0037**	0.0015	2.50
HHSize	0.0207**	0.0101	2.05
FarmSz	-0.0681	0.0860	-0.79
HH_Income	-0.0002**	0.0001	-2.29
Educ_TERT	-0.1343	0.1512	-0.89
Educ_SEC	-0.0718	0.1027	-0.70
Educ_BASIC	-0.0218	0.0668	-0.33
OwnLAND	0.0367	0.0509	0.72
RentLAND	0.1385**	0.0657	2.11
VEG_Crop	0.0291	0.0492	0.59
MAIZE_Crop	0.0441	0.0430	1.02

HE_UseBf	-0.0707	0.0606	-1.17
HE_Waste	0.2010***	0.314	6.42

Pseudo-R², 0.1895; Log-likelihood, -191.755; LR chi2(15), 89.65; Prob > chi2, 0.0000;
Observations = 400

Note: *** Sig. at 1%; ** Sig. at 5%. Source: Computation from field data, 2013

Moreover, households with more members were 2.1% positive to have an ‘agreeing’ perception that excreta reuse can pose health risks. According to Jensen *et al.* (2005), handling of excreta can cause severe health hazards; implying that household members may therefore be at risks of contagious diseases with excreta reuse. Furthermore, the respondents who operated on rented land were 13.9% positive to have an ‘agreeing’ perception that excreta reuse can pose health risks. This implies that tenant farmers are more risk averse than landowners. Also, the perception that excreta are a waste was found to increase the ‘agreeing’ perception on the health risks of excreta reuse by 20%. This result corroborates the argument by Douglas (1966) that ‘dirt is matter out of place’; implying that the perception that excreta are a waste can negatively influence farmers’ perceptions on excreta reuse for agricultural purpose.

Conversely, higher-income households were 0.02% negative to have an ‘agreeing’ perception that excreta reuse can pose health risks. This implies that farmers’ perceived economic benefits tend to marginally override their perceptions on the health risks with excreta reuse for agricultural purpose. Moreover, Cofie *et al.* (2010) point out that farmers know the associated health risks of excreta reuse, but the agronomic benefits tend to make them want to use excreta in agriculture. Experience with excreta reuse in agriculture also showed a negative effect on the ‘agreeing’ perception that excreta reuse can pose health risks, albeit the variable was statistically insignificant. However, the type of the crop cultivated showed a positive effect on

the 'agreeing' perception that excreta reuse can pose health risks, albeit also not statistically significant.

4.5 Regulatory Policies for Sustainable Sanitation

Regulation has been viewed as the top agenda in the reforms to improve sanitation (Trémolet and Binder, 2010). Regulations of facilities are of different forms such as government, private, community-based (Sansom, 2006). Many governments place a heavy reliance on community-based organizations, particularly for operation and management of water and sanitation facilities in rural and low income urban settlements. Participatory projects where community groups are mobilized to contribute to the decision-making and project costs are often initially effective. There are concerns, however, about the longer-term sustainable management, in terms of operation, maintenance and cost recovery. There seems to be a lack of incentives for community groups to continue with activities, particularly where the community groups are reliant on voluntary inputs from its members (Sansom, 2006).

While there are still very good reasons for promoting community management, the reality remains that community management approaches have not been evidently better at sustaining systems (Schouten and Moriarty, 2003). With community management, there are often risks of local political capture of the management of public toilets, as has happened in Accra and Kumasi in Ghana, where poor services have been the result (Ayee and Crook, 2003). This has occurred despite the contracting out of services and involvement of communities in management, and is attributable to the politics of patronage (Sansom, 2006). It has also been proposed that consumers as 'watch groups' can play an effective role in regulation (Franceys, 2005). In general, the choice of regulatory instruments should be based on a comparative

assessment of the trade-offs between effectiveness, ease of implementation and costs and benefits (Gerlach and Franceys, 2005).

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This section presents the summary, conclusions and recommendations based on the key findings of the study.

5.1 Summary and Conclusions

Proper sanitation has positive implications on the health and socio-economic development of nations, worldwide. The importance of proper sanitation calls for its recognition in the MDG on water and sanitation which aims to ‘halve by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation’. Improving access to proper sanitation services is considered a ‘disease’ preventive intervention, where the main outcome is the reduction in the number of episodes of diarrhoea, and consequently a proportionate reduction in the number of deaths and the improvement of the potential of people needed for economic growth and development. Conversely, poor sanitation causes health-related problems which lead to high financial and economic costs which negatively impact on economic growth and development.

This study sought to analyse the sanitation market in peri-urban fishing and crop farming communities in Dangme West district (now Ningo-Prampram and Shai Osudoku districts) of Ghana. Specifically, the study examined and described local sanitation-related businesses in

the study area; assessed the constraints, motivations and strategies to operation of sanitation-related businesses; assessed households' financing mechanisms and their willingness-to-pay for improved household latrines; assessed crop farmers' attitude and perceptions toward human excreta reuse for agricultural purpose; and examined regulatory policies for sustainable sanitation in the study area. The study was motivated by the need to provide an in-depth analysis of the peri-urban sanitation market in peri-urban communities in Ghana in order to understand the business, financial and regulatory environment that influence sanitation business development and uptake of improved sanitation by households in periurban communities so as to help inform policy on the measures that could be considered to improve the sanitation situation in Dangme West District, and in Ghana as a whole.

The study population comprised fishing and crop farming households and sanitation businesses/service providers in peri-urban communities in Dangme West district of Ghana. Dangme West was chosen purposively because it had gone through rapid urbanization representing that of sub-Saharan Africa in general. The communities, Prampram and Shai Osudoku, were chosen purposively due to Dodowa Health Research Centre (DHRC) familiarity in those areas, and also as being part of the communities for the SUSA-Ghana Project which provided funding for this study. Both primary and secondary data were used for the study. The study used observations, interview guide (for focus group discussions (FGDs) and key-informant interviews), and survey questionnaire (structured and semistructured) to collect primary data from the study participants (households, local government representatives and sanitation service providers (SSPs)).

Based on clustering (that is, fishing and crop farming communities) and the diversity of participants involved in the sanitation business system, the study employed different, but composite, sampling and data collection and analytical methods to address the various objectives of the study. The participants who were considered for the description of the sanitation businesses comprised local sanitation service providers (SSPs) such as *latrine builders/masons, pit emptiers, sanitation hardware suppliers, solid waste collectors* and *public latrine attendants/managers* in the study area and its environs, as well as local and government representatives such as chiefs/elders, assemblymen and district assembly officers in the study area. Using a household list from the DHRC, the study employed a cross-sectional data collected on 633 randomly selected households in Prampram to help analyse households' latrine financing mechanisms and their willingness-to-pay for improved household latrines. Additionally, using a household list from the Shai-Osudoku District's Agriculture Unit, the study employed cross-sectional data collected on 400 randomly selected crop farming households to help analyse farmers' knowledge, attitude and perceptions on excreta reuse for agricultural purpose. In addition, focus group discussions (FGDs) were conducted to complement the responses from the structured interviews. In each selected household, the head (or adult member) who gave consent was interviewed with a survey questionnaire. With the help of field assistants/interpreters, all the instruments were administered by the researcher in the local language, 'Dangme'.

Appropriate models of qualitative and quantitative components were employed to achieve the various objectives of the study. Tables, narrative texts and quotations from participatory appraisal techniques were used for qualitative analyses and reporting, and descriptive and inferential statistics were employed for quantitative analyses and reporting. The local

sanitation-related businesses that were identified in the study area were described using pictures and texts. Based on analyses of data from the study participants and review of relevant literature, the various business models used by the SSPs as well as the structure of the sanitation market (based on the nature of competition) were described using tables, percentages and text narratives. The conventional structure-conduct-performance (S-C-P) theory of market analysis was used as a guide to understand the nature of competition and performance of the sanitation businesses in the study area. The perceived performance of SSPs by community members/households were assessed using a rating scale.

Case studies of SSPs (*latrine builders/masons, pit-emptier, hardware suppliers*) were used to make empirical investigation into the strategies (based on the *four P's* - product, price, place, promotion - of marketing), motivations and constraints to sanitation business development in the study area. Descriptive case methods using tables and narrative texts were used for data analysis and reporting. The general business constraints faced by the SSPs were identified and presented in pictures, narrative texts and ranking analysis. The market potential for sanitation businesses along the latrine-based sanitation value chain, that is, from latrine construction to pit emptying, was also evaluated.

Analyses of households' financing mechanisms and their WTP for improved latrine technologies were conducted using budget estimations and the logit/logistic model. Using the single bounded (*SBDC*) and double bounded dichotomous choice (*DBDC*) formats, the contingent valuation method (*CVM*) was employed to assess households' WTP for improved latrines. Descriptive statistics (graphs and pie charts) were used to summarise households'

latrine preferences and their proposed resource mobilisation/financing strategies for improved latrines. A five-point rating scale on the *five Cs* of credit - capacity, capital, collateral, condition, character - and the Kendall's Coefficient of Concordance (W) were also used to analyse the criteria that lenders consider in their assessment of the creditworthiness for a 'latrine loan'. Farmers' knowledge, attitude and perceptions on human excreta reuse for agricultural purpose and their perceived health risks on excreta reuse were assessed using a three-point Likert-type scale and the ordered probit model. The constraints to excreta reuse in agriculture were also examined using the Kendall's Coefficient of Concordance (W).

5.1.1 Summary of Findings

The following specific findings were made from the study, among others:

5.1.1.1 Description Sanitation Businesses and Business Sustainability

- The study found that there exist various sanitation-related businesses in the study area, which include: solid waste collection (Zoomlion, Zoil, and ACI) and latrine-related businesses such as latrine building/masonry, latrine hardware supply and pit-emptying.
- Focusing on three latrine-related businesses/sanitation service providers (SSPs), namely: masons/latrine builders, hardware suppliers and pit-emptiers, it was found that the SSPs operate their businesses as sole proprietors with staff strength of two to five employees. They operate on full-time, mostly during the week days (Monday-Friday) and sometimes on weekends (Saturday) within the study area and neighbouring communities. All the SSPs were mostly men aged 24 to 73 years with business experience of minimum of five years and maximum of over 20 years, and were natives of the study area, except the pit-emptier who was an Akan from Ashanti region. The

masons and pit-emptier had basic education (thus JHS or MSLC), and the hardware suppliers had tertiary education (Polytechnic). Some SSPs (hardware suppliers and the pit-emptier) had registered their business, though others (masons) did not consider it necessary to register their business as they believed they did not need any formal documents in making contracts for business opportunities.

- The nature of competition in the sanitation market was found to be characteristic of *monopolistic competition*; this was found to have a negative influence on the performance of the service providers, as the service users/households' rated the SSPs' performance, specifically public latrine managers and solid waste collectors, as below average in the study area.
- Most of the SSPs were using the economic, operational and strategic business models for their operations. The use of 'service contract' business model by some SSPs (particular, the masons/latrine builders) may not ensure sustainability of business as it is more economically oriented and represent a '*one-off transaction*' where the business can eventually '*fold up*' and the opportunity costs and incentives associated with expanding clients may be prohibitive.
- The operations of the SSPs were constrained by some financial, logistical, institutional and social challenges that limit their performance. Among the constraints identified to affecting the operations of SSPs include: lack/inadequate logistics (e.g. equipment - bins, trucks for removal of solid waste); financial difficulties with regard to inadequate salaries for workers and delays in payment; tedious and risky (healthrisks) nature of sanitation work, lack of water and detergents for effective cleaning of the public latrines; poor behaviour and attitude of people and lack of respect for sanitary workers;

absence/no reuse of solid/faecal waste, thereby causing accumulation of waste; delayed/credit payments by customers/households; and the failure or non-interest of local authorities to enforce regulations on improper disposal of refuse or penalise individuals who practise open defecation.

- Notwithstanding the threats of the business constraints, the operation of a sanitation business in the study area was found profitable. It was found that the SSPs obtain profit margins of 27% to 46% for specific periods of operation; their margins being at par or higher than the lending rates of 17%-26% charged by commercial financial institutions in Ghana. Moreover, the market potential/opportunities along the latrine value chain were estimated at GH¢26,003,250 (US\$13,199,250) each per annum for latrine builders/masons and latrine hardware suppliers, and at GH¢259,984 (US\$131,968) and GH¢59,106,348 (US\$30,002,382) for the pit-emptying business and management of a public latrine, respectively. This provides evidence of the profitability and prospects of sanitation business in the study area, thus an acceptance of the hypothesis of the study.

5.1.1.2 Financing Mechanisms and WTP for Household Latrines

- A majority of the household heads in Prampram were men with average age of 48 years, and had basic education (JHS/MSLC). The average household size was five persons and a majority of the participants were self-employed, basically fishing. The average household monthly income was found to be GH¢560 (US\$280) and the modal monthly income was GH¢600 (US\$300). The per capita income was GH¢134 (US\$67.39) which was found to be less than and about half the per capita gross national average monthly income of GH¢224.7 (US\$124). On average, a household's monthly

expenditure was about GH¢390 (US\$195), and the modal monthly expenditure was GH¢300 (US\$150), indicating a lower household expenditure relative to the household's income, thus

implying that a household may have surplus income to finance its other needs such as improved latrines.

- The study found that a majority of the households practise open defecation (ODF), though they prefer improved latrines. More than half of the households indicated that they prefer the flush/pour-flush to piped sewer system latrine, albeit the most expensive latrines among the improved latrine technologies. Moreover, it was found that a household's access to water and complementary products such as tissue paper and detergents for use and maintenance of improved latrines could be a challenge to the use of the flush latrine in the study area. The ventilated improved pit (VIP) latrine was identified as the second most preferred latrine, which is cheaper and also does not require water for its use.
- Lack of space and funds, availability of alternative option (beach) and no economic value for excreta were mentioned by the households as key considerations to owning a household latrine. A comparison of the households' income and expenditure showed that the households could have surplus income to finance their latrines, though they claim they do not have funds to build a household latrine. About 44% of the households were willing to finance their latrines via savings; few (10%) indicated that they prefer borrowed funds from the Banks or micro financial institutions (MFIs) for their latrines, though the financial institutions (FIs) in the study area were interested to provide loans for household latrines. Collateral, among the *five Cs* of credit, was found to be the most important criterion that the FIs would consider in their assessment of a household's

- creditworthiness for a 'latrine loan'. The next most important criteria were capital and character.
- Empirical results from a binary logistic model showed that there exist some relationship between households' latrine financing decision and their socioeconomic and community characteristics, such as gender, education, household composition, income, tenancy, defecating practice, type of community and latrine technology. Notably, higher education (post-basic), households with children below six years, per capita income, ownership of land/house, access to public latrine, and residents in Upper Prampram were found to positively influence a household's interest and financing decision for an improved latrine. Gender (male) and preference for VIP latrine were found to negatively influence a household latrine financing decision. These findings, except that for the preference for VIP latrine, concur with the *a-priori* expectations and the study hypotheses.
 - The study also found that the households were willing to pay premium for improved latrines via own savings and by yearly or monthly instalments. Less than half of the households (about 40%) were willing to pay premium for the flush/pour-flush latrines, and more than half (57%) were willing to pay premium for the VIP latrine. About one-third (33%) of the households were also willing to pay for the composting latrine.
 - Empirical results from a logit model showed that the mean WTP for improved latrines were GH¢777.24 and GH¢583.42 per annum for a household flush latrine and pour flush latrine, respectively. Moreover, the mean WTP for a household VIP latrine

and a composting latrine were GH¢396.59 and GH¢385.32 per annum, respectively. The WTP premium was highest for the VIP latrine. The empirical logit estimates of households' WTP for improved latrines showed that the a household socioeconomic characteristics and other factors such as education, income and access to complementary products like toilet tissue and detergents for cleaning latrines and latrine hardware, and household's knowledge of the operation and maintenance improved latrines have positive and significant effects on WTP for improved latrines. However, variables representing household composition, household size, and type of community have negative and significant influence on WTP for improved latrines. These findings concur with the *a-priori* expectations and the study hypotheses.

5.1.1.3 Farmers' Attitude and Perceptions toward Excreta Reuse in Agriculture

- It was found that men dominate in agriculture, as an occupation, in the study area. The farmers cultivated an average farm size of 0.62 hectares which is below the district and national averages of 1.5 ha and 3.0 ha, respectively. The average age of the respondents was 43 years, and a majority had basic education. The average household size was five persons and a majority of the households had lived in the study area for more than 10 years. The crops cultivated by the households were plantain, maize, cassava, yam, mango, watermelon, pineapple, and vegetables, mostly on rented plots. The modal household monthly income was GH¢400 (US\$150).
- It was found that more than half of farming households disagree that excreta are waste and would use excreta as fertilizer or consume crops fertilized with excreta, albeit a majority perceive that excreta can pose health risks. The study showed that farmers'

attitude and perceptions toward excreta differ with respect to their socioeconomic characteristics. Women were found to have a negative perception toward excreta reuse in agriculture than men. Moreover, perception on excreta reuse for agricultural purpose tend to be statistically different for the households with respect to length of stay in the study area, education, household income, type of crop cultivated and farm size. Farmers who had not stayed longer in the study area

‘disagreed’ that excreta are a waste than those who had stayed longer in the study area. Higher educated farmers and higher income earners were more likely to use excreta as fertilizer. Land owners were also more likely to ‘disagree’ that excreta are waste and were more willing to use excreta as fertilizer than tenant farmers, likewise large-scale farmers. However, vegetable and fruit crop farmers were less likely to ‘disagree’ that excreta are a waste and were less willing to use excreta as fertilizer than as perceived by arable crop farmers.

- Farmers’ perception on the health risks of excreta reuse was identified as the most important factor that limit their decisions to use excreta as fertilizer. Empirical results from an ordered probit model showed that variables such as length of stay in the study area, household size, income, use of rented land for production and perception that excreta are a waste have significant influence on farmers’ perception on the health risks with excreta reuse for agricultural purpose. With the exception of income which showed a marginal negative effect on the ‘agreeing’ perception that excreta reuse can pose health risks, all the other statistically significant variables had positive ‘agreeing’ perception that excreta reuse for agricultural purpose can pose health risks.

These findings concur with the *a-priori* expectations and the study hypotheses.

5.1.1.4 Regulatory Policies for Sustainable Sanitation

The study makes the following conclusions upon examination of different approaches regarding regulatory policies for sustainable sanitation:

- The lessons learnt from the solitary operation of the sanitation sub-sector by the municipal government in the colonial days call for public-private partnership (PPP) in the management of sanitation in Ghana.
- Engagement of the private sector in sanitation service delivery can take several forms: full privatization (divestiture); partial private-sector; co-operative; and informal sector provision. Whatever arrangement it takes, it is important for governments to ensure proper *recognition, dialogue, facilitation/collaboration, contracting* and *regulation*.
- Regulation of facilities can be of different forms or approaches such as government, private, community-based. Sustainable sanitation can be achieved through effective regulatory policies such as those that consider community-based organisations (CBOs), the professional and trade associations, and consumers as 'watch groups'.

5.1.2 General Conclusions

- The study has confirmed that sanitation business is profitable, though the operations of sanitation service providers (SSPs) are constrained by some financial, institutional and social challenges. The lack of competition among SSPs in the study area has influence on the poor perceived performance of service providers, hence the low uptake of improved household sanitation in the study area.

- The study has shown that households in peri-urban communities can finance their latrines, though they normally claim they do not have funds. There are other reasons for the low uptake improved household latrines, which include the presence of alternative defecating places (open defecation in the beach and bush) and the lack of economic value or reuse value of human excreta, among others.
- The study further revealed that households in peri-urban communities would probably accept improved sanitation technologies if human excreta could be sterilized and accommodated with the agricultural production system and be seen as offering an economic benefit.

5.2 Recommendations

Based on the findings of the study, the following recommendations are made to inform policy on the measures that could be considered to help improve the sanitation sub-sector and the uptake of proper sanitation (latrines) among peri-urban residents in Dangme West District, and in Ghana as a whole.

5.2.1 Improving Sanitation Business

Policy efforts by the government and other stakeholders (such as financial institutions) toward addressing the constraints to sanitation business are crucial for the survival of the service providers. The provision of financial and logistical support and education of service users would help to encourage more private participation for effective competition, and hence better service delivery to all stakeholders in the sanitation market. Moreover, there is the need for SSPs, particularly latrine builders/masons, waste collectors and latrine managers, to be more

market oriented, that is, to consider service users/households as the focal point of their business to help encourage households' uptake of proper sanitation. Furthermore, there is the need for SSPs to acquire further training and register their businesses, and also form local SSPs' associations to help strengthen their competitiveness to access contracts on the District Assembly's developmental projects.

5.2.2 Financing Improved Household Latrines

Based on the challenges with the use on some improved latrines, like the scarcity of water for the flush latrine, there is the need for households to consider a more feasible and 'cheaper' latrine technologies such as the VIP latrine, and also adopt joint-resource mobilization strategies such as 'ROSCAs' to acquire their latrines. There is also the need to educate households on the possibilities and conditions for alternative sources of funds, such as funds from the financial institutions, for the construction of their latrines. Moreover, policy efforts by the government and other stakeholders, including local financial institutions and sanitation service providers (such as hardware suppliers), toward addressing the challenges in the sanitation sector, and in assisting households to access improved latrines should also consider the socioeconomic characteristics of the heterogeneous households such as gender, education, household composition, income, tenancy, type of defecating practiced, and other community factors such as type of community that influence households' latrine financing decisions and their willingness-to-pay for improved latrines.

5.2.3 Reusing Excreta for Agricultural Purpose

Since farming is one of the predominant livelihoods for the people in the study area, it is important that programmes aimed at promoting improved sanitation should consider alternative

ecological sanitation systems such as the use of (sanitized) excreta in farming to help improve crop yields at minimal cost. There is also the need for more open discussions on the benefits and risks associated with excreta reuse in agriculture; this could help enrich farmers' knowledge of appropriate ways of handling and using excreta as fertilizer for agricultural purpose. Other policy options toward risk reducing strategies that involve relevant government institutions and local media are also crucial for safer use of excreta in agriculture.

5.2.4 Regulatory Policies for Sustainable Sanitation

To ensure sustainable sanitation, there is the need to consider effective regulatory policies such as those that use community-based organizations, the professional and trade associations, and consumers as 'watch groups'. Community-based management of sanitation should be based on an enabling framework of technical support, policies and laws to enable effective implementation, and agreement on the distribution of roles between government, community groups and other stakeholders for sustainable service delivery. Although in reality formal recognition of the private sector and CBOs occur through development of sanitation projects, clearer legal requirements would help reduce misunderstanding, and could lead to more scaling-up of private sector and community-based approaches. The choice of regulatory instruments should however be based on a comparative assessment of the tradeoffs between effectiveness, ease of implementation and costs and benefits.

5.3 Suggestions for Future Research

- Future research on households' access to credit for their latrines should be considered, as lenders have interest in financing household latrines.

- Future research on households' demand for water, as complement to proper sanitation (flush latrines), is also vital to help address the sanitation challenges.
- The impact of sanitation on households in peri-urban farming communities was not given much attention in the study and therefore needs to be investigated in future research.

A careful consideration of the above recommendations would help improve the sanitation sub-sector, and hence improve the potentials of people for socioeconomic development among peri-urban residents in Dangme West District, and in Ghana as a whole.

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APPENDIX:
Research Instrument - Interview Guide/Questionnaire

A. Identification and description of local sanitation businesses

1. Identification and description of Local Sanitation Businesses - FGD and Key-informant Interview Guide	
1.	How would you describe the sanitation situation in this community?
2.	What are the key sanitation businesses/service providers (SSPs) in this community?
3.	How do sanitation businesses operate in this community? (Please, explain)?
4.	How would you describe the performance (reliability, responsiveness, etc.) of SSPs in this community?
5.	What are the business constraints to sanitation business in this community?
6.	How do those constraints affect the sanitation business in this community?
7.	Where do people in this community defecate?
8.	What are the challenges to acquiring a household latrine in this community?
9.	What regulations exist in the control of open defecation in this community?
10.	What consequences/rewards should be implied for (non) compliance?
11.	In your opinion, how could household latrines be financed in this community?
12.	How do you see the future of sanitation business in this community?
13.	What policy could enhance the operations of SSPs in this community?
14.	How can sanitation be improved in this community?
15.	What stakeholders can be identified or engaged in an attempt to improve sanitation in this community?

2. Identification and description of business models (Pls. Tick, where applicable and describe model) - SSPs		
Sanitation business model	Tick	Describe business model
Service contract		
Management contract		
BOT (Build-operate-transfer)		
BOO (Build-operate-own)		
Lease		
Concession		
One-stop-shop model		
Micro-franchising model		
Network-model (horizontal or vertical)		

Other (Specify)		

3. Nature of competition in the sanitation market - SSPs					
Type of business	Total No. in community?	No. out of total you serve?	Specific service you provide?	Frequency of service	Price per service

4. General Constraints to sanitation business (Tick ad rank, where applicable) - SSPs									
Constraints (specify where necessary)		Latrine builders		Pitemptying		Hardware suppliers		Public latrine Management	
		Tick	Rank	Tick	Rank	Tick	Rank	Tick	Rank
Management	Organisation and management								
	Technical capacity/skills								
	Partnership/integration								
	Market information								
	Space access/topography								
	Customer perception								
Risks	Environmental and health issues								
	Competition								
	People/consumers								
	Disposal site								
	Imitation/protection								
	Availability of (raw) materials								
	Availability of market								
Political/ Policy	Govt. /donors interference								
	Interest rate								
	Bureaucracy								
	Taxation system								
	Infrastructure								
	Political								
Resources/ Capacity	Capital investment								
	Cash flow								
	Equipment/machine								
	People/labour/staff								

	Matching supply and demand								
Other									

B. Strategies, Motivations and Constraints to Sanitation Business - *Case study*

1. SSPs' Business Profile	
1. Name of business owner :	
2. Age:	3. Sex: 4. Education (specify): 5. Ethnicity:
6. Type of sanitation business: Latrine builder/Pit-emptier/Hardware supplier 7. Year established:	
8. Is the business a part-time or full time occupation ? 9. If part-time: Why?	
10. What are other occupations or sources of income? i. Occup I....., % income to total Income:	
11. Is your business registered? 1. Yes 2. No	
13. If Yes, name institution which registered your business:.....	
14. If No, Why and What would you need to register (formalize) your business?	
15. Number of employees?	No. male: No. female:
16. Do you have any training on your business? 1. Yes 2. No	
17. If YES : who provided/provide the training?	18. What did you learn?
19. If NO training, how do you learn on your business?	
20. Do you require any OTHER training?	21. If yes, what kind of training?
22. What major product/service do you offer?	
23. Do you operate only in this community/district? 1. Yes 2. No 24. If no, where again do you operate?	
25. How many customers do you serve in this community (per Day/Week/Month/Year, <i>if applicable/possible</i>)?	
26. Average sales/revenue (GH¢) per Day/Week/Month/Year? <i>Circle appropriate time period</i>	
27. Please provide a brief history of business:	

Production/Marketing Strategies	
How do you generate market intelligence? (Variety - yourself, customers and competitors; extent of information -single or multiple source; and what specific information - product, pricing, promotion and place/distribution).	
Dimension	Type of Information and Response
Product/Service	i. How do customers respond to your products/services (<i>Do you look for buyers or buyers look for you</i>)? ii. What is your opinion about dealing in different products/services? iii. How do you respond/ react/deal with Competition/other service providers? iv. How do you respond/ react/deal with other segments/heterogeneous buyers? v. Quantities - Are you able to meet the demand for your products/services? vi. How do you see the sanitation business (in relation to the existing products/services/markets)?
Price	i. How do you see the price of your products/services relative to your competitors customers? ii. What pricing strategies do your (potential) competitors use? iii. Market structure (extent of substitution/alternatives)? iv. How do people pay for the products/services they buy? v. Are there different payment options/What are they? vi. Can customers pay in installments? vii. How would you describe the trend of the price of your products/services?

Place	i. How do you deliver your products/services (do you have facilities/infrastructure for deliveries)? ii. What consideration do you give to the various buyers/segments, size and locations? iii. What range of products/services do you offer for customers in this community? iv. Where do you get your supplies? v. Do you co-operate with urban suppliers?
Promotion	i. How do customers know about your business (products/services)? ii. What advertisements/promotion strategies do you use? iii. What sales promotion strategies do you have for different segments/buyers? iv. Customer knowledge of the technology (different products)? v. Customer's knowledge of access option? vi. Do you provide info. on operation and maintenance requirements?
In your opinion, what improvements are necessary for your products, pricing, promotion and distribution?	
i. Products: ii. Pricing: iii. Promotion: iv. Distribution:	

Motivations business		
On the average, what is the performance (profitability) of your business operations (per week/month/year)?		
Description		Response/Value (GH¢)
Average Monthly/yearly revenues (GH¢)	Total number of services provided	
	Price per service	
Average Monthly/yearly cost (GH¢)	Operational costs	
	Fixed cost	
	Total cost	
Pre-tax profit (GH¢)		
Monthly/yearly gross margin		
Monthly or yearly profit		
What are the non-financial factors that motivate you in your business?		

Constraints to sanitation business	
1.a. List and rank the key <i>constraints/obstacles</i> to your business.	
<u>Constraint</u>	<u>Rank</u>
1. ....	..... 2.
2. ....	.....
3. ....	.....
4. ....	.....
5. ....	.....
6. ....	.....
7. ....	.....
8. ....	.....
9. ....	.....
10. ....	.....
NB: constraints in terms of management, risks, political/policy, resources/financial, etc.	

1b. Explain *effect of the constraints* on the performance/profitability of your business:

1.c. What would be needed to overcome the obstacles/constraints in 1.a.?

2. Do you get any financial support?

- If yes, what kind of support?

- Who should provide the support?

- If no, would you like to receive any support?

- If yes to (no), what kind of support?

- Who do you think might be able to provide the kind of support you need?

Market potential for sanitation business

1. How do you relate with other firms in relation to responding to customer needs?

2. Do you plan to expand your business?

- If yes, where is the market?

- What do you think detains people from making use of your service?

3. Market Potential for Sanitation Businesses

Parameter	Latrine construction	Pitemptying	Hardware supplies	Other (specify)
Total No. of potential consumers (HHs and institutions) in community/district				
Market share (%)				
Average price per product/service (GH¢)				
Average annual consumption (demand/usage)				

C. Latrine preference, financing mechanisms and WTP for improved latrines

Household characteristics

1. Sex of HH head? 1. M 2. F 2. Are you the HH head? 1. Yes 2. No 3. Age of HH head? years

4.a. HH size? 4.b. Composition of HH: Adults (≥ 18 yrs)..... 6-17 yrs < 6 yrs

5. Status of respondent? 1. HH head 2. Spouse of HH head 3. Child of HH head 4. Other (specify

6. Education level of HH head? 1. Tertiary (Univ/Poly/College) 2. SHS 3. JHS/Middle Sch 4. Primary 5. None

7. Marital status: 1. Married 2. Divorce/Separated 3. Single/Never married 4. Other (specify

8.a. Occup (HH head): 8.b. Average INCOME/month(GH¢)?: Source:

9.a. Occup of Spouse: 9.b. Average INCOME/month(GH¢)?: Source:

10.a Occup other hh member(s): 10.b Average INCOME/month(GH¢)?: Source:

11. Religion? 1. Christian 2. Islamic 3. Traditional 4. Other (specify)

12. HH perceived self-wealth (in community relative to others or available resources)? 1. Poor 2. Average 3. Rich

13. Ethnicity? 1. Dangme 2. Akan 3. Ewe 4. Northerner 5. Other (specify)

14. Tenancy status: 1. Landlord 2. Tenant 3. Family house 4. Other (specify

Household's latrine preference, proposed financing and expenditure

15. Do you have latrine in (this/the) house? 1. Yes (specify type) 2. No
16. Where do you defecate? 1. Own latrine 2. Beach 3. Bush 4. Other (specify.....)
17. Where do other members of the household defecate?
.....
18. If response is NOT 1(*Own latrine*) for Q16, indicate reason(s) for not having own latrine.
19. Availability of public toilet? 1. Yes 2. No 20. HH's access to Public Latrine? 1. Yes 2. No
21. What type(s) of latrine do you know (refer codes)?
22. Which ones have you tried/used or using?
23. Which is your favourite one?
24. What makes you prefer that latrine?
25. What latrine technology/technologies do you prefer to use?
26. What makes this latrine desirable for you?
27. What is the cost of this latrine (GH¢)?
28. Which latrine technology would you/household be ABLE to construct?
29. On average, how much does household SPEND per MONTH on the following? Expenditure (GH¢):
1) Food 2) Clothing 3) Fees (School) 4) Utilities 5) Other (specify: ...)

- Utilities and Supply Conditions**
30. What is your household's **MAJOR source of domestic water**?
31. What is the **frequency of supply** of the water? 1.days/week 2. Weekly 3. Monthly 4. Irregular/Never
32. How would you describe the **quality** of the water? 1. Clean 2. Not Clean
33. How satisfied are you with the supply of the water? 1. Satisfied 2. Not satisfied
34. Do you have access to water for domestic and other use by the household? 1. Yes 2. No
35. HH access to hardware/materials (e.g. blocks, bowls, etc.) for construction of household latrine? 1. Yes 2. No
36. HH access to complementary products/services (e.g. detergents, tissue) for household latrine? 1. Yes 2. No
37. Availability/reach of sanitation service providers (e.g. pit emptier/hardware suppliers)? 1. Available 2. Not Avail

Latrine budget

Item/activity	Type I (GH¢)	Type II (GH¢)	Type III (GH¢)
a.			
b.			
c.			
d.			
e.			
f.			
g.			
h.			
i.			
j.			
Total			

Types of Latrine: 1. flush/pour-flush to piped sewer system 2. septic tank and pit latrine 3. ventilated improved pit latrine (VIP/KVIP) 4. composting toilet

Sources of capital for construction of latrine
<p>Would you build your latrine entirely yourself (HH)? 1. Yes 2. No</p> <p>- If yes, do you know someone (mason) who could help you with building the latrine?</p> <p>- For which parts/work would you pay?</p>
<p>How would you raise funds to build your latrine?²⁰</p> <p>- Why are you interested in this option?</p> <p>- If the banks (MFIs), what particular bank/MFI?</p> <p>- Do you qualify for a loan?</p> <p>- What do you have to secure a loan?</p> <p>- How would you like to repay?</p>

Household expenditure on use of public toilet and bath
<p>i. How many people in your household use the Public latrine? Public bath?.....</p> <p>ii. How much (GH¢) do you pay per person for use of the Public latrine? Public bath?</p> <p>iii. How many times (on average) do you use the facilities: Public latrine? Public bath?</p> <p>iv. What is your income (GH¢)?: Weekly..... Monthly Yearly</p>

Households' Perception: Improved Latrine vs. Open Defecation (ODF)	1. Agree	2. Neutral	3. Disagree
1. Use of an improved latrine can help protect you from diseases than ODF			
2. Use of an improved latrine provides more privacy than ODF			
3. Use of an improved latrine is safer than ODF			
4. Use of an improved latrine provides more comfort than ODF			
5. Use of improved latrine is economically ²¹ better than ODF			
6. Use of improved latrine can help minimize environmental pollution			
7. Is household satisfied with its current defecation practice?			

Willingness to Pay for household latrine
Flush toilet

²⁰ a. Personal savings/Susu, b. Loan from friends/relations, c. Loan from the bank (MFIs), d. Credit Union.

²¹ *Economic value*: money saved for avoidance of sanitation-related diseases, time saved, satisfaction, long-run effects

<p>2. : 1. Do you know the cost of a hh Flush Toilet? 1. Yes 2. No (<i>Inform HH about cost after response</i>)</p> <p>3. willing to pay for household flush latrine? 1. Yes 2. No</p> <p>4. The cost now the operation and maintenance (O&M) of this toilet? 1. Yes 2. No</p> <p>5. (household's expenditure) for not having own latrine or use the public flush latrine is about GH¢730/year.</p> <p>6. If YES, you pay MORE for a household Flush Toilet? 1. YES 2. NO</p> <p>(Q 3), how much (GH¢) more are you willing to pay? a.803 b.876 c.949 d.1022 d.1095 e.1168</p> <p>7. If NO (3), are you willing to pay GH¢ 730/year for it? 1. Yes 2. No (why?)</p> <p>(Q 3 or Q5), how would you pay/repay? 1. All at once 2. Installment (specify time/period.....)</p> <p>8. If Yes (3 or Q5), indicate source(s) of funds? 1. Own funds 2. Friends/relations 3. Bank/MFIs 4. Other ()</p> <p>9. If Yes (Q3 or Q5), how ready are you to build this toilet? 1. Now 2. Later (specify:)</p> <p>(specify)</p> <p>10. If YES (</p>
<p>Pour Flush Latrine: 11. Do you know the cost of a hh Pour Flush Toilet? 1. Yes 2. No</p> <p>12. Are willing to pay for household pour-flush latrine? 1. Yes 2. No</p> <p>13. operation and maintenance (O&M) of this toilet? 1. Yes 2. No</p> <p>14. The cost having own latrine or using the public flush latrine is about GH¢ 547.5/year.</p> <p>15. Would you pay household Pour Flush Toilet? 1. YES 2. NO</p> <p>MORE for a</p> <p>16. If YES (Q10), how much (GH¢) more are you willing to pay? a.602 b.657 c.712 d.767 d.821 e.876</p> <p>17. If NO (Q10), are you willing to pay GH¢ 547.5/year for it? 1. Yes 2. No (why?)</p> <p>18. If Yes (Q10 or Q12), how would you pay/repay? 1. All at once 2. Installment (specify time/period.....)</p> <p>19. If Yes (Q10 or Q12), indicate source(s) of funds? 1. Own funds 2. Friends/relations 3. Bank/MFIs 4. Other (specify)</p> <p>20. If YES (Q10 or Q12), how ready are you to build this toilet? 1. Now 2. Later (specify:)</p>
<p>VIP Latrine: 19. Do you know the cost of a household VIP latrine? 1. Yes 2. No</p> <p>21. willing to pay for household VIP latrine? 1. Yes 2. No</p> <p>22. now the operation and maintenance (O&M) of this toilet? 1. Yes 2. No</p> <p>23. The cost for not having own latrine or using the public VIP latrine is about GH¢ 365/year.</p> <p>24. ou pay MORE for a household VIP Latrine? 1. YES 2. NO</p> <p>25. If YES 18, how much (GH¢) more are you willing to pay? a.402 b.438 c.475 d.511 d.548 e.584</p> <p>(Q 18), are you willing to pay GH¢ 365/year for it? 1. Yes 2. No (why?)</p> <p>26. If NO (Q18 or Q20), how would you pay/repay? 1. All at once 2. Installment (specify time/period.....)</p> <p>27. If Yes (Q18 or Q20), indicate source(s) of funds? 1. Own funds 2. Friends/relations 3. Bank/MFIs 4. Other</p> <p>28. If Yes (Q.....)</p> <p>(Q18 or Q20), how ready are you to build this toilet? 1. Now 2. Later (specify:)</p> <p>29. If YES (</p>
<p>Composting Latrine</p>

31.	: 30. Do you know the cost of a HH Composting Toilet ? 1. Yes 2. No
32	o pay for household composting latrine? 1. Yes 2. No
33. Th	operation and maintenance (O&M) of this toilet? 1. Yes 2. No e price
34. Would you pay	penditure) for not having own latrine or using the public latrine is about GH¢ 365/year . MORE for a Composting Toilet ? 1. YES 2. NO
35. If YES (Q23)	ow much (GH¢) more are you willing to pay? a.402 b.438 c.475 d.511 d.548 e.584
36. If NO (Q23)	you willing to pay GH¢ 365/year for it? 1. Yes 2. No (why?
37. If Yes (Q23 or Q25),	how would you pay/repay? 1. All at once 2. Installment (specify time/period.....)
38. If Yes (Q23 or Q25),	indicate source(s) of funds? 1. Own funds 2. Friends/relations 3. Bank/MFIs 4. Other (specify
39. If YES (Q81 or Q83)	, how ready are you to build this toilet? 1. Now 2. Later (specify:
40. In general, would you be willing to pay a premium for any improved latrine technology?	1. Yes 2. No
41. In general, would you be willing to pay for any improved latrine technology?	1. Yes 2. No

D. Lenders' Interest and Requirements for Credit

Profile of Bank/MFI		
Name of Bank/MFI:		
Location:	Year established:	Total staff:
What products/services do you offer?		
What specific things/items do you consider for consumer loans?		
Is Bank/MFI interested in financing HH latrines?		
- If no, why?		
- If yes, what are the conditions or what do consumers require to qualify for a loan?		
Credit scoring: evaluation of creditworthiness based on the 5 Cs of credit		
Indicator	Score (%)	Ranking
Capacity (<i>ability to pay/returns</i>)		
Capital (e.g. assets)		
Collateral/security		
Conditions (economic)		
Character of borrower (e.g. household)		

E. Farmers' perceptions on excreta reuse in agriculture

1. Personal/household characteristics:

2.1 Sex: M / F	2.2 Age: years	2.3 Length of stay in this community: .....years
2.4 Education: 1. Tertiary (Univ/Poly/College) 2. SHS 3. JHS/Middle Sch 4. Primary 5. None		
2.5 Occupation (primary): 1. Farming 2. Fishing 3. Artisan 4. Trader 5. Other (specify)	2.6 Religion: 1. Christian 2. Islamic 3. Traditionalist 4. Other (specify)	2.7 Household Size? # Male # Female
2.7 Land tenure system: 1. Own land 2. Family land 3. Rented	2.8 Crop(s) cultivated: i.SZacreage ii.SZacreage iii.SZacreage	2.9 Household's monthly/annual income: 1. Primary occupationGH¢ 2. Other sources:GH¢), (Specify.....)

Ethnicity:	HH Head: Yes / No	HH Status in HH?
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2. Attitudes and Perceptions of Human Excreta (Faeces/Toilet)

Please indicate your level of agreement by 'ticking (√)' the options in the following statements:

No.	Statement	Level of Agreement		
		Agree (A)	Don't Know (DK)	Disagree (D)
1	Human excreta is a waste and suitable only for disposal			
2	Human excreta is not a resource/has no economic value			
3	Human excreta has no (economic) benefit to humans			
4	Toilet should not be built in/near the house			
5	Human excreta should not be handled in any way			
6	Handling human excreta is a great health risk			
7	It is a taboo to touch faeces			
8	It is a taboo to touch treated faeces			

3. Knowledge on utilization of Human Excreta (Faeces/Toilet) as fertilizer

No.	Statement	Level of Agreement		
		Agree (A)	Don't Know (DK)	Disagree (D)
1	Human excreta is a resource to the soil			
2	Sanitized human excreta can be used as fertilizer			
3	I will use human excreta on my crops if sanitized			
4	Taste of crops/vegetables may/will change (can be affected) when fertilized with human excreta			
5	Smell of crops/vegetables may/will change (can be affected) when fertilized with human excreta			
6	Crops/vegetables can be killed/destroyed when fertilized with human excreta			
7	Crops fertilized with excreta are good for consumption			
8	I will never consume crops fertilized with human excreta			
9	Animal manure (faeces) can be used as fertilizer			
10	Ever used human excreta as fertilizer on my farm			

4. Factors that influence households on use of Human Excreta (Faeces/Toilet) on their crops

Please identify/list and rank the factors that influence your decision to use excreta as fertilizer:

No.	Factors	Rank (1, 2, 3, ....N)*
1	May affect taste of produce/crops	
2	May affect smell of produce/crops	
3	Health risk	
4	May affect appearance of produce/crops	

5	Consumer will not buy produce/crops (patronage will be poor)	
6	Religious belief	
7	Availability of product	
Other		

*Rank: 1 = most important, N = least important

6. In your opinion, how should human excreta in your household and/or community be treated/disposed-off?

FGD - HHs' Perceptions on HEC for Agriculture

1. **Attitudes and Perceptions on Excreta:** Please indicate your level of agreement on the following statements:

No.	Statement	Discussion
1	Human excreta is a waste and suitable only for disposal	
2	Human excreta is not a resource/has no economic value	
4	Toilet should not be built in/near the house	
5	Human excreta should not be handled in any way	
6	Handling human excreta is a great health risk	
7	It is a taboo to touch faeces	
8	It is a taboo to touch treated faeces	

2. **Knowledge on utilization of Human Excreta (Faeces/Toilet) as fertilizer**

No.	Statement	Discussion
1	Human excreta is a resource (with economic value) for the soil	
2	Sanitized human excreta can be used as fertilizer	
3	I will use human excreta on my crops if sanitized	
4	Taste of crops can be affected) when fertilized with human excreta	
5	Smell of crops/vegetables may/will change (can be affected) when fertilized with human excreta	
6	Crops/vegetables can be killed/destroyed when fertilized with excreta	
7	Crops fertilized with human excreta are good for consumption	
8	I will never consume crops fertilized with human excreta	
9	Animal manure (faeces) can be used as fertilizer	
10	Ever used human excreta as fertilizer on my farm	

3. *What factors influence households on use of Human Excreta as fertilizer?*

4. **How should human excreta/faeces in your household and/or community be treated/disposed-off?**

.....