SOCIO-CULTURAL ASPECTS OF ECOLOGICAL SANITATION IN CHIKHWAWA DISTRICT, RURAL MALAWI

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Socio-cultural Aspects of Ecological Sanitation in Chikhwawa District, Rural Malawi

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Abstract

A household survey was conducted in the rural district of Chikhwawa, Southern Malawi, to determine the socio-cultural aspects of ecological sanitation eight months after a subsidized promotional project of ecological latrines was launched in the district.

Standard interviews were conducted with 400 randomly selected households. Their responses were validated and cross-checked with physical observations and focus group discussions.

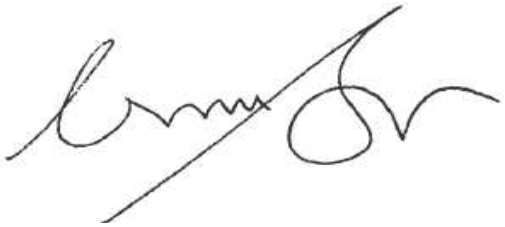
Results show that only 3% of all households had constructed the Arborloo. Ownership of the Arborloos was significantly higher among educated respondents, those who were married and in male-headed households. Age, sex, and religion of respondents were found not to be important social factors that influence ownership of neither pit latrines nor the Arborloo. Construction of household latrines is regarded as a man's job. Most people prefer the traditional pit latrine to the Arborloo as the latter is regarded as a temporary sanitation facility. Defecation in the bush appears to be a well established norm. Male respondents had a higher knowledge of the fertiliser value of human excreta than females. Although most people expressed willingness to use human excreta to fertilize their gardens and eat the food produced, it remains to be seen whether they can actually do so. The current low uptake of the Arborloos casts doubt on the acceptability of latrine compost and urine for agricultural use. However, those willing to eat food grown in human excreta (both faeces and urine) were 10.03 times more likely to use human excreta in their gardens than those who would not accept (PR: 10.03; 95% CI: 4.00-28.29; χ^2 = 37.10; p<0.0000000). *Faecophobia* was one of the reasons for people's unwillingness to use human excreta. Community training on how to use o human excreta, coupled with demonstration plots, could increase knowledge and change people's perceptions and attitudes towards ecological sanitation in rural Malawi.

Figure 1: Map of Malawi

Source: GOM (2005)

Declaration

This thesis is the result of the author's original research. It has been composed by the author and has not been previously submitted for examination which has led to the award of a degree.



Signed: ----------

Kingsley Lungu

Date: ----------

Dedication

This thesis is dedicated to my late father, Mr Sandress Baihati Lungu, who did not enjoy the fruits of my achievements.

This work is also dedicated to my wife, Grace, and my two children, Faith and Emmanuel who endured the absence of a husband and dad when I worked very late. May God bless you.

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Last but not the least; I would be remiss if I do not thank all the village chiefs and members of households in the selected villages for their acceptance to participate in this project.

May God Almighty Bless You All.

Acronyms and Abbreviations

AIDS	:	Acquired Immune Deficiency Syndrome
BASNEF	:	Beliefs Attitudes Subjective Norms and Enabling Factors
CCAP	:	Church of Central Africa Presbyterian
CIDA	:	Canadian International Development Agency
CI	:	Confidence Interval
COMWASH	:	Community Water Sanitation and Hygiene
DelPHE	:	Development Partnerships in Higher Education
EcoSan	:	Ecological Sanitation
EcoSanRes	:	Ecological Sanitation Research
FGD	:	Focus Group Discussion
GDP	:	Gross Domestic Product
GOM	:	Government of Malawi
GTZ	:	Deutsche Gesellschaft für Technische Zusammenarbeit (GmbH)
HDI	:	Human Development Index
HIV	:	Human Immuno-Deficiency Virus
HMIS	:	Health management Information System
HSA	:	Health Surveillance Assistant
IPS	:	InterPress Services News Agency
JMP	:	Joint Monitoring Programme
KAP	:	Knowledge Attitude and Practice
MDG	:	Millennium Development Goal
MDGS	:	Malawi Growth and Development Strategy
MOH	:	Ministry of Health
NGO	:	Non-Governmental Organization
NPK	:	Nitrogen Phosphorous Potassium
NWP	:	Netherlands Water Partners
NSO	:	National Statistical Office
ODF	:	Open Defecation Free

OD	:	Odds Ratio
PR	:	Prevalence Ratio
SADC	:	Southern Africa Development Community
SanPlat	:	Sanitation Platform
SCHI	:	Scotland-Chikhwawa Health Initiative
SD	:	Standard Deviation
TA	:	Traditional Authority
USD	:	United States Dollar
VH	:	Village Headman
VHC	:	Village Health Committee
VIP	:	Ventilated Improved Pit latrine
WASHTED	:	Centre for Water Sanitation Health and Appropriated Technology Development
WfP	:	Water for People
WPC	:	Water Point Committee
UNESCO	:	United Nations Education Scientific Organization
WHO	:	World Health Organization
UNICEF	:	United Nations Children's Fund

List of Tables

List of Figures

Table of Contents

CHAPTER 1 INTRODUCTION

This thesis stems from a household survey which was conducted in Chikhwawa district in Southern Malawi in July/August, 2008. The survey set out to determine the socio-cultural aspects of ecological sanitation (EcoSan) in rural Malawi.

This chapter highlights the statement of the problem, the relevance and objectives of the study. The background and context on Malawi is also provided. Finally, it presents information on the evolution of EcoSan in Malawi.

1.1 Problem statement

EcoSan is being explored in Malawi in three main forms: Arborloo, Forsa Alterna and Urine-Diversion Dry Toilet (UDDT, or Skyloo). The Arborloo is the simplest and cheapest form of EcoSan toilet. EcoSan has been shown to be less costly than conventional systems. Simpson-Herbert (2007) argues that that the cost in building an Arborloo is mainly in the slab — about $4 — as compared to $60 for constructing a traditional pit latrine and $100 for a Ventilated Improved Pit (VIP) latrine.

Various organizations are promoting EcoSan in Malawi. These include Water for People (WfP) and the Scotland-Chikhwawa Health Initiative (SCHI) which introduced EcoSan in their impact areas in the rural district of Chikhwawa in Southern Malawi. The aim was to reduce the level of open defecation within communities with an associated increase in the number of effective pit latrines available for use combined with the promotion of EcoSan.

Early surveys of the SCHI indicated that the predominant reason for the lack of sanitary facilities in the district was the loose soils (41percent) in the target area and the lack of funds (34 percent) for construction (Morse *et al.*, 2008). As such, the programme sought to promote systems which would be appropriate for these conditions by using shallow pits and local materials for construction. Due to loose soils in the study area, communities are encouraged to reinforce the shallow pits

with woven baskets (Figure 2). The Arborloo was chosen as the model for communities and demonstrations were set up by village health committees (VHCs) and water point committees (WPCs). The SCHI subsidized the materials for the production of sanitation platforms which were sold at a minimal cost (US$0.20) to achieve ownership and raise money for a village revolving fund.

Despite the subsidized cost of the Arborloo, SCHI observed that the uptake of Arboloo was very slow in all its four impact villages. Since the possible physical and economic deterrents to adoption of the Arborloo were addressed, it was suspected that there could be some socio-cultural factors influencing the community's unwillingness to adopt the Arborloo; hence this study.

One of the problems with sanitation is that it is rarely a strong felt need, especially in rural areas. In areas where sanitation coverage is also low, the adoption of new excreta handling approaches, which may be at odds with the prevailing cultural understanding and practices may not be readily welcomed (Esrey et.al., 1998). Another of the big challenges in mobilization for sanitation is that human excreta disposal is an extremely individual issue as the use of toilets and hygiene behaviour is a private subject in most cultures. Therefore, one has to understand both people's attitudes and behaviour and develop feasible strategies for sensitizing and motivating people on the needs for developing appropriate environmental practices. This is critical because people look at things through their cultural lenses (Douglas & Wilddavsky, 1982). These aspects help to explain the "why" and "why not" of denial and acceptability of a proposed sanitation system or approach.

Many sanitation projects have failed due to a poor consideration of the socio-cultural aspects of a sanitation system or technology (Drangert, 2004). This has largely been due to the fact that defecation is a highly private and intimate topic and related to habits which may vary between regions and cultures. In some faecophobic cultures, handling of excreta is a subject of strong taboos and may relate to aspects of human dignity. Knowledge and perceptions of reuse of excreta also vary between regions and cultures.

While there is literature on the socio-cultural aspects of EcoSan from other parts of the world, there is an information gap on this subject in Malawi. What exist are lessons learnt from various EcoSan projects across the country (Sugden, 2003, World Bank., 2007, Lungu *et al*., 2008, Manda, 2009.). This shares the view of Drangert (2004) who contended that there is a general lack of studies on the socio-cultural aspects of EcoSan systems, and what is available is often mainly in the form of anecdotal accounts.

Figure 2: A pit dug in loose soil showing locally woven basket reinforcement

Source: Masangwi et al (2008)

1.2 Relevance of the study

Cultural beliefs vary so widely in different parts of the world that it is not possible to assume that any of the practices that have evolved in relation to human excreta use can be readily transferred elsewhere (Warner, 2006) considering that there are both faecophobic[1] and faecophilic[2] cultures. Therefore, an in-depth understanding of the social and cultural fabric concerning people's views towards EcoSan arrangements and recycling of nutrients will enlighten EcoSan promoters about motivational factors behind people's acceptance or rejection. No known study has been done in this field of study in Malawi. The present study will therefore provide some information on socio-cultural aspects of EcoSan upon which rural sanitation development efforts can be advanced in rural Malawi. The findings from the study will also add on to the literature on the topic area.

Malawi is predominantly a rural country, with about 90 percent of its people residing in the rural areas, where they are engaged in subsistence farming. The soil fertility has been steadily declining for a number of years and population pressure means that new fertile land is unavailable. The land is such that maize (the country's main staple food) will not yield any cobs unless artificial fertilizer is applied. But the price of commercial fertilizer has increased to unaffordable levels such that subsistence farmers find themselves in a downward spiral of declining yields and decreasing ability to buy fertilizer. In such circumstances the free fertilizer that EcoSan provides is a powerful driver for adoption and ready acceptance of using human waste to grow food.

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[1] **Faecophobic culture** - persons/cultures **with strong taboos** against handling and talking about human excreta

[2] **Faecophilic culture** - persons/cultures **with no taboos** against handling and talking about human excreta

EcoSan is firmly established as an accepted technology in many countries. There are, in most cases, no socio-economic barriers to its continuing implementation, as people of all income groups, in both developed and developing countries, have installed EcoSan toilets in their homes (Austin *et al*., 2005). However, EcoSan does not suit everybody. The handling of human excreta and its use for growing crops may still be very foreign ideas in a certain society. Human excreta might be seen as waste products, unhealthy, unhygienic and detrimental to humans. Attitudes and perceptions about health hazards and people's revulsion against faeces and urine vary between cultures all over the world, and often people's attitudes towards urine differ from those towards faeces (Dunker *et. al*., 2007). Drangert *et al.* (1997) indicated that every social group has a social policy for excreting; some norms of conduct will vary with age, marital status, sex, education, ethnicity, religion, locality, employment and physical capacity.

However, the promotion of EcoSan should be high on the sanitation agenda in Malawi as a contribution to the Millennium Development Goals (MDGs) and due to the high poverty levels and declining soil fertility in most areas. It is known that human excreta contain all nutrients essential for crops (nitrogen, phosphorous and potassium). Wolgast (1993) argues that the annual amount of human excreta of one person corresponds to the amount of fertilizer needed to produce 250 kg of cereal which is also the amount of cereal that one person needs to consume per year. Human excreta are a natural resource and are freely available in all societies – even in the poorest ones. Therefore, this "free" fertiliser should be promoted where appropriate.

The EcoSan concept has been promoted in Malawi since 2003 (World Bank, 2007). There are two basic design options: the simplest and most widely used is the "Arborloo", and a more durable structure called the "Fossa alterna. The 'urine diversion' toilet is also promoted but its high cost has precluded widespread use.

World Bank (2007) argues that an Arborloo is an entry point to introduce the EcoSan concept in a community. In this concept there is no physical handling of the faecal compost (Section 2.8.1.1). This makes the Arborloo a popular concept in many cultures. However, as highlighted in Section 1.1, this concept has been met with a slow start in the study area; hence the present study to investigate the community's unwillingness to build the Arborloo.

This thesis seeks to compile information about the people's prevailing excreta disposal practices and their level of knowledge of the EcoSan concept; the traditional use of human excreta and how people perceive faeces and urine and their use in food production in rural communities in Chikhwawa, Southern Malawi

1.3 Research Questions

The study set out to answer the following questions:

1. Why is the community not willing to construct subsidized Arborloos in the study Area?

2. What are the community's values, norms, perceptions and attitudes towards the use of human excreta as fertiliser for growing crops?

3. What can motivate people to change their attitudes toward the use of human excreta as fertiliser for growing crops in the study area?

1.4 Objectives of the study

1.4.1 Main objective

The main objective of the study was to investigate the socio-cultural factors that influence the communities to adopt or not adopt EcoSan in the rural district of Chikhwawa, Southern Malawi.

1.4.2 Specific objectives

The specific objectives of the study were five-fold:

1.4.2.1 To determine the proportion of households with pit latrines in the study area.

1.4.2.2 To assess the general knowledge and attitude of communities towards usage of sanitation facilities (pit latrines).

1.4.2.3 To explore and describe the traditional uses of human excreta in the study area.

1.4.2.4 To determine the community's values, norms, attitudes and perceptions towards the use of human excreta as fertiliser for growing crops.

1.4.2.5 To gain an insight and understanding of what can motivate people to adopt the use of human excreta as fertilizer for growing crops in the study area.

1.5 Structure of the thesis

Chapter two reviews and discusses the literature on ecological sanitation. Firstly, it examines the sanitation crisis in the world, sub-Saharan Africa, Malawi and Chikhwawa District (study area). Secondly, factors that motivate people to adopt or not adopt sanitation systems are discussed. Thirdly, it dwells at length defining the EcoSan concept and reviews the use of human excreta in the world, Africa and Malawi. Lastly, previous studies on socio-cultural aspects of EcoSan are reviewed and discussed.

Chapter three describes the methodology that was used to achieve the research objectives. This includes the description of the study design, study location, the study villages, sampling, data collection and analysis.

Chapter four reports the findings of the survey. It presents data on sanitation overage in the study villages, the community's general knowledge and attitudes towards the use of sanitation facilities, traditional uses of human excreta (faeces and urine), the people's values, norms, attitudes and perceptions towards the use of human excreta as fertiliser for growing crops and what can motivate people to adopt the use of human excreta as fertiliser for growing crops in the study area.

Chapter five discusses the results presented in Chapter four in relation to the socio-cultural context of the community in the study area. It relates the present findings to other studies done elsewhere. It ends with the conclusions in relation to the study objectives and results presented in Chapter one and four, respectively. Recommendations, based on the findings, for EcoSan promotion in Malawi are also highlighted.

1.6 Malawi's background information

This section provides background information on Malawi: general, social and cultural. It also highlights the evolution of the EcoSan initiative in the country.

1.6.1 General

1.6.1.1 Geography and topography

Malawi is a landlocked country in southeastern Africa, bordered by Zambia to the northwest, Tanzania to the northeast and Mozambique to the south, southwest and southeast. The Great Rift Valley runs through the country from north to south, and to the east of the valley lies Lake Malawi**,** making up over three-quarters of Malawi's eastern boundary (Figure 1).

The Shire River flows from the south end of the lake through Chikhwawa district and joins the Zambezi River 250 miles (400 km) farther south in Mozambique. In the mountainous sections of Malawi surrounding the Rift Valley, plateaus rise generally 3,000 to 4,000 feet (910 to 1,200 m) above sea level, although some rise as high as 8,000 feet (2,400 m) in the north. To the south of Lake Malawi lie the Shire Highlands, gently rolling land at approximately 3,000 feet (910 m) above sea level. In this area, the Zomba and Mulanje mountain peaks rise to respective heights of 7,000 feet (2,100 m) and 10,000 feet (3,000 m). Malawi's climate is hot in the low-lying areas in the south of the country and cold in the highlands. The country has two distinct seasons: the cold-dry season and the hot-wet season. The hot-wet season is from November to April, characterized with warm temperature and equatorial rains and thunderstorms. After March, the rainfall rapidly diminishes and the cold-dry season starts from May to September with wet mists float from the highlands into the plateaus, with almost no rainfall during these months.

The country is divided into three regions: the Northern, Central, and Southern Regions. There are 28 districts in the country. There are 6 districts in the Northern Region, 9 in the Central Region, and 13 in the Southern Region. Administratively, the districts are subdivided into traditional authorities (TAs), presided over by chiefs. Each TA is composed of villages, which are the smallest administrative units and are presided over by village headmen.

1.6.1.2 Population

Malawi is one of the most densely populated countries in sub-Saharan Africa. It has a population of 13,066,320, with an annual growth rate of 2.8 percent per annum (GOM, 2008). About 85 percent of the people live in rural areas (GOM, 2000), with most of these people depending on small scale, subsistence farming for their livelihood, a situation made even more difficult due to the very poor quality of the soil.

The country's population density is one of the highest in Africa with 139 people per square kilometre and across the regions, there are more people per square kilometre in the Southern Region (n=185 per km^2) than in the other two regions (GOM, 2008).

1.6.1.3 Health

Malawi has one of the worst health indicators in the world. Under five mortality is one of the highest in the world with one in eight children failing to reach the age of five years due to preventable diseases such as malaria, upper respiratory infections and diarrhoea. Overall life expectancy is one of the lowest in the world at 40.2 years, and these poor life expectancies for both adults and children can be attributed to a number of factors not least HIV/AIDS, whose prevalence rate stands at 14.1 percent (UNDP, 2006), housing standards, quality and quantity of water, lack of sanitation and poor hygiene facilities and practices. These are further exacerbated by a poor level of education and poor socio-economic status of the majority of families.

1.6.1..4 Economy

Malawi is one of the least developed and poorest countries in the world, ranked 166th out of the 177 countries on the Human Development Index -HDI- (UNDP, 2006). Within the Southern African Development Community (SADC), only Mozambique has an HDI value less than that of Malawi (Chunga *et. al*., 2004).

Malawi is predominantly a rural country with high levels of poverty. In 2006, 45 percent of the country's population lives below the national poverty line - i.e. less than US$1 per day expenditure on basic needs (GOM, 2006a). This translates into about 5.9 million Malawians who are poor, with the poorest people in the Southern Region (60 percent). This means that three out of five people live in poverty in the rural areas of this region. Nationally, 22 percent of the population is ultra poor. That is, about one in every five people lives in dire poverty such that they cannot even

afford to meet the minimum standard for daily-recommended food requirement (GOM, 2005). Poverty weighs heaviest on children and mothers. As highlighted in section 1.6.1.3, one in eight children die before celebrating her fifth birthday. Almost half of all children under five are chronically malnourished.

The economy is predominately agricultural, with about 90 percent of the population living in rural areas, engaged in subsistence and smallholder farming. Agriculture accounts for 37 percent of GDP and 85 percent of export revenues. With minimal industry and mining, Malawi's national economy relies on basic agricultural exports, mainly tobacco, sugar and tea. Maize is the main staple food. Smallholder farmers produce a variety of crops, including maize, beans, rice, cassava, tobacco, and groundnuts (peanuts).

However, the high costs of fertilizers and other agricultural inputs coupled with inadequate knowledge on diversification of staple foods make the population vulnerable to food insecurity and malnutrition. Most households are food secure only for eight to ten months of the year.

With declining soil fertility and high costs of inorganic fertilizers, use of EcoSan products can be a major contribution towards achieving sustainable food security at household level. EcoSan regards human excreta as a resource to be recycled, rather than a waste to be disposed of (Esrey et al. 1998). However, EcoSan does not suit everybody. It may be a new phenomenon to some people altogether. Generally, sanitation is to a large extent a social phenomenon, rather than a technical one. Therefore, it is essential that background information on cultural, social,\economic and environmental factors influencing sanitation behaviour is acquired before introducing a new sanitation system (Wegelin-Schuringa and Ikumi, 1997).

1.6.2 Social and cultural background

There are eight major tribes in Malawi: the Chewa, Yao, Tumbuka, Lomwe, Sena, Tonga, Ngoni and Ngonde. While these tribes have many traditions in common, they also have a diversity of cultural beliefs and practices. The social system in rural areas is characterized by the extended family system, in which both matrilineal and patrilineal systems are in existence. In urban areas, the family system is predominantly nuclear. The position of women is subordinate to that of the men, and men tend to dominate decision making both in the household and at community level and retain control over most of the household resources and assets. Rural communities are organized on the basis of villages, normally led by a village headman who is assisted by elders.

Groups of villages from a common tribe form a chieftain headed by a chief. The chiefs have a very great influence on all activities affecting their territory and they play a large role in the developments taking place. For example, villagers organize themselves collectively to undertake activities for the common good such as building infrastructure

Approximately 80 percent of the population is Christian, with the Roman Catholic Church and the Church of Central Africa Presbyterian making up the largest Christian groups. There are also smaller numbers of Anglicans, Baptists**,** Evangelicals and Seventh Day Adventists. Around 13 percent of the population is Muslim**,** with most of the Muslim population being Sunni, of either the Qadriya or Sukkutu groups. Other religious groups within the country include Jews**,** Rastafarians, Hindus and Baha'is. Atheists make up around 4% of the population, although this number includes people who practice traditional African religions.

Churches have an influential role to play, traditional customs and beliefs have an important bearing on how Malawian society functions. Initiation ceremonies, traditional ceremonies for the honouring of spirits and natural forces to ensure good harvesting are used to strengthen the social fabric in the communities. Witchcraft continues to influence people's behaviour and practices, especially in rural areas where it is used to explain misfortunes and is also used to ensure good fortune. Fear for witchcraft guides the behaviour of many people and can often contribute to an atmosphere of suspicion within a community.

This study investigated the socio-cultural aspects of EcoSan in rural Malawi in order to gain an in-depth understanding of the social and cultural fabric concerning people's views towards the EcoSan concept in the study area.

1.6.3 Evolution of EcoSan in Malawi

Excreta reuse in Malawi is not a new concept: bananas and fruit trees have traditionally been planted on filled traditional pits (Morgan, 1990). However, the EcoSan concept, as it is known today, only began in 2003, by Water Aid, through the Church of Central Africa Presbyterian (CCAP), at Embangweni in Mzimba district in the Northern Region in 2003 (Sugden, 2003).

As the sanitation project grew, other organizations became interested in EcoSan and visited Embangweni to gain first-hand experience. As a result of these visits EcoSan began to spread to the following districts:

- Tholyo and Phalombe in the south of Malawi, through a COMWASH project funded by the Canadian International Development Agency (CIDA) in Southern Malawi.
- Dwangwa, with the Malawi Wildlife and Environmental Society.
- Salima district with the District Assembly.
- Lilongwe rural, with the French nongovernmental organization, InterAid.
- Ekwendeni near Mzuzu in Northern Malawi

Three years later, there were about 13,000 EcoSan units had been built across the country as shown in Table 1.

Table 1: Number and type of ecological latrines built in Malawi by mid 2006

Location	EcoSan Latrine Type			Total
	Arborloo	***Fossa Alterna***	***Skyloo***	
Embangweni, Ekwendeni (CCAP) Salima/Dwangwa/Chipoka (WATERAID)	3,601	2883	39	**6,523**
Thyolo (COMWASH)	265	1045	18	**1328**
Phalombe (COMWASH)	3357	1445	58	**4860**
TOTAL	**7,223**	**3735,**	**115**	**12,711**

Source: Adapted from World Bank (2007)

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

This chapter reviews and discusses the literature on EcoSan. Firstly, it examines the sanitation crisis in the world, sub-Saharan Africa, Malawi and the study area. Secondly, factors that motivate people to adopt or not adopt a sanitation system are discussed. Thirdly, it dwells at length defining the EcoSan concept and reviews the use of human excreta in the world, Africa and Malawi. Lastly, previous studies on socio-cultural aspects of EcoSan are reviewed and discussed.

2.2 Global situation of sanitation

"Water and Sanitation is one of the primary drivers of public health. I often refer to it as "Health 101", which means that once we can secure access to clean water and to adequate sanitation facilities for all people, irrespective of the difference in their living conditions, a huge battle against all kinds of diseases will be won."

Dr LEE Jong-wook, Director-General, World Health Organization, 2004.

Sanitation has for long been the poor cousin of water supply. Globally, 1.1 billion people lack access to safe drinking water. The the majority of these are in Asia (20 percent) and sub-Saharan Africa (42 percent). In addition, an estimated 2.6 billion people – representing half the developing world - lack toilets and other forms of improved sanitation (UN, 2005). The consequence of this deprivation is that every year 1.8 million people die from diarrhoeal diseases and that 15% of all child deaths under the age of 5 years in the developing countries are due to waterborne diseases (Gutierrez, 2007). This is catastrophic to the socio-economic development of these countries (WHO/UNICEF, 2000; WHO/UNICEF-JMP, 2004).

The initial global recognition of the need for action resulted in the United Nations (UN) General Assembly declaring 1981 to 1990 as the International Drinking Water Supply and Sanitation Decade. This was to be a global initiative with the primary goal of "supplying full access to water supply and sanitation for all". This was an ambitious programme that yielded impressive results: 1,347 million additional people gained access to safe drinking water and 748 million additional people gained access to sanitation facilities (Mintz *et al*., 2001). However, the decade was considered to have failed as by 1990, 1.1 billion people remained without access to safe water and 2.4 billion people without adequate sanitation. The reasons for the failure are listed by Mintz *et al*., (2001) as follows:

- population growth (the rate of new supply was outpaced by spiraling population growth)
- funding limitations
- inadequate operation and maintenance
- insufficient trained personnel
- "business as usual approach – drawing on traditional policies, resources and technologies" (rather than trying new approaches and emerging technologies).

2.2.1 Definition of access to improved sanitation

Access to improved sanitation is one the Millennium Development Goals (MDG) targets. According to the joint monitoring programme for water supply and sanitation by World Health Organization (WHO) and United Nations Children Fund (UNICEF), improved sanitation refers to connection to piped sewer system, septic tank, ventilated improved pit latrine, pit latrine with slab and composting toilet (WHO/UNICEF JMP, 2005). Unimproved sanitation includes public or shared latrine; pit latrine without slab or open pit; hanging toilet or hanging latrine; bucket latrine and no facilities, where people use any area, for example a field (WHO/UNICEF JMP, 2005).

2.2.2 Millennium Development Goals and Johannesburg Plan

In September 2000, 189 United Nations (UN) member states committed to a series of the following eight MDGs:

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV / AIDS, malaria and other diseases
7. Ensure environmental sustainability
8. Develop a global partnership for development

Goal 7 of the MDGs tackles water and sanitation provision in both urban and rural areas of developing countries. Target 10 of goal 7 of MDGs was reaffirmed and further elaborated at the 2002 World Summit for Sustainable Development in Johannesburg and included the objective to halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation. The targets are based on 1990 figures and therefore 2002 was seen as the half way mark which led to joint monitoring from WHO and UNICEF (WHO/UNICEF, 2004). They report that:

"The *world is on track to meet the drinking water target, but sub-Saharan Africa lags behind"*

and poor progress on sanitation will mean:

"…..the world will miss the sanitation target by a half a billion."

It should be considered that water supply and sanitation are only two of the many problems that face the developing world. Although Kofi Annan, former UN Secretary General stated:

"We shall not finally defeat AIDS, tuberculosis, malaria, or any of the other infectious diseases that plague the developing world until we have also won the battle for safe drinking water, sanitation and basic health care." (WHO, 2004).

2.3 Sanitation in sub-Saharan Africa

Of the 2.2 billion people who have no access to improved sanitation worldwide, 64 percent are in sub-Saharan Africa (UN, 2005). Furthermore, of the 1.1 billion people with no access to safe drinking water, 42 percent are in sub-Saharan Africa. As a result of these appalling figures, infants and young children are innocent victims of the worldwide failure to make safe drinking water and improved sanitation services available to impoverished people. In sub-Saharan Africa alone, some 769,000 children under 5 years of age died annually from diarrhoeal diseases in 2000 – 2003 (WHO/UNICEF JMP 2005). This means that more than 2000 children's lives are lost every day, in a region where just 36 percent of the population has access to hygienic means of sanitation. Compared to developed countries, a baby in sub-Saharan Africa has almost 520 times the chance of dying from diarrhoea compared with a baby born in Europe or the United States of America (UN, 2005).

Obstacles to accelerating the rate of progress in the provision of safe drinking water and improved sanitation in sub-Saharan Africa include conflicts, political instability and high rates of population growth (UNDP, 2003).

2.4 Sanitation in Malawi

Malawi is committed to attain the set targets of the eight MDGs through a medium term development strategy known as the Malawi Growth and Development Strategy (MGDS) which is being implemented for a period of five years from 2006 to 2011 (GOM, 2008). The country, relative to many other sub-Saharan countries, has a high level of access to safe potable water and some form of basic sanitation (GOM, 2008). Despite this improvement, water and sanitation coverage statistics for Malawi

are uncertain. In 2004, the WHO/UNICEF joint monitoring programme (JMP) for water and sanitation estimated that 73% (98% urban and 68% rural) of Malawi's population had access to safe drinking water and 61% (62% urban and 61% rural) had adequate sanitation (WHO/UNICEF- JMP, 2006). These figures may be overestimates for the following reasons. There are insufficient resources available for measuring either population or coverage of these basic services. The urban water coverage estimate of 98% masks the situation in the unplanned peri-urban settlements that are not included in official statistics. The estimated rural water coverage figure of 68% may fail to account for the significant percentage of non-functioning facilities. As for sanitation, the usefulness of the figures depends on the definition of improved sanitation**.** Most of the sanitary facilities in Malawi are traditional pit latrines, the majority of which are merely holes in the ground inadequate to break the cycle for faecal-oral disease transmission. The JMP recognizes this and has reduced its previous estimates to arrive at the above figures, but most major agencies active in Malawi including the government itself, estimate rural sanitation coverage at 40 percent or less (GOM, 2006b). Access to improved sanitation is estimated to be between 25 percent and 33 percent, dropping to less than 7 percent in some rural communities (GOM, 2006b).

2.4.1 Latrine technology

WHO (1992) defines a pit latrine as a latrine with a pit for the accumulation and decomposition of excreta from which liquid infiltrates into the surrounding soil. A pit latrine is usually a dry system and the most basic form of disposal for human defecation. In rural areas, the commonest latrine used is the traditional pit latrine (Figure 3). It usually consists of a single unlined pit or hole in the ground covered by a slab with a drop hole and a superstructure. The floor slabs are usually made of wood poles or logs covered by mud (Figure 4). This wood floor structure is often susceptible to termite attack and rotting resulting in collapse of the latrines. This of course does not stimulate interest in having a latrine. However, there are also a few types of wood available which are less liable to rot and which ants do not like such

as *muwanga*. However, *muwanga* is scarce these days due to rampant deforestation in Malawi. A traditional pit latrine can be improved by laying a sanplat on top of the logs or other supporting material traditionally used to cover the pit. The purpose of the sanplat is to provide a sanitary (san) platform (plat) which can be easily cleaned. Once the pit is full, the san plat can easily be moved onto the next pit.

Traditional pit latrines are usually rectangular and unlined where soil conditions are sufficiently stable. The failure to line pits or to provide structurally sound foundations to support the weight of the latrine structure has been shown to be the cause of both pit and superstructure collapse (Morgan, 2001). Various methods of pit lining are available. In general, pit lining methods can be grouped as cement based linings (including bricks and blocks made of local mud); waste product linings (oil drums, vehicle tires); and local linings (like bamboo) (Blacket, 1993). The depth of the pits is around three metres. This has a gender dimension as highlighted in Section (2.8.1.1).

Figure 3: A typical traditional pit latrine in Malawi

Figure 4: A traditional pit latrine showing logs placed over the pit covered by earthen mud in Lungwena, Mangochi District

2.5 Sanitation situation in Chikhwawa

Chikhwawa is one of the poorest rural districts in Southern Malawi with a population of 438,895 people (GOM, 2008). Over 80% of its population is farmers with an average holding size of cultivated land of about 0.8 ha per farm family (GOM, 2006c). The district has very low pit latrine coverage. It is estimated that only 42 percent of the households have pit latrines (GOM, 2006c). However, the district environmental health office puts the coverage at 37 percent or less (Veronica Mkukumila, Deputy District Environmental Health Officer, pers. comm.). These pit latrine coverage figures for Chikwawa mean that over 50 percent the population within the district has no sanitary facilities with the remaining using pit latrines of poor construction.

There are a number of reasons why sanitation coverage is so poor including, traditional taboos, sandy soil and high water table leading to collapse, and lack of understanding of the transmission of disease in absence of sanitation.

2.6 Users of sanitation facilities

In recent years, there has been a growing realization that access to sanitation does not increase unless there is demand from the user, and as most expenditure for sanitation is at the household level. Previous attempts to market sanitation have relied on the promotion of the health benefits that sanitation and hygienic behaviour can bring (UNESCO and GTZ, 2006). Whilst this is clearly the most important reason for promoting sanitation and hygiene from an institutional point of view, it often proves to be much less of a motivating factor for spending money on sanitation at the individual or household level. When households contemplate a shift, other factors may prove to be a greater motivation. Research by the World Bank Water and Sanitation Programme has identified several other factors that serve to motivate even very poor households to invest in sanitation (Cairncross, 2004). Drivers for sanitation in the Philippines, for example, include: convenience and comfort, privacy and safety, avoidance of sexual harassment and assault for women and girls, less embarrassment with visitors and dignity and social status (UNESCO and GTZ, 2006). Knowledge, Attitude and Practice (KAP) studies in Zambia revealed the following reasons why people are interested in having a latrine (Wegelin-Schuringa and Ikumi, 1997):

- there is insufficient cover in the bush
- the bush is too far
- the densities are too high
- health reasons, especially cholera
- being modern
- convenience
- able to get one with a subsidy
- ability to take a bath in the (improved) latrine

The same studies revealed the following as the most common reasons for not using latrines are (Wegelin-Schuringa and Ikumi, 1997):

- do not want to share a latrine with in-laws
- do not want to share a latrine with the opposite sex
- do not want to share a latrine with non- related people
- bad smell
- fears of safety for elderly and young children
- bush is sufficiently convenient
- faeces is food for the pigs
- fear for snakes in a dark latrine
- do not want to be seen using a latrine

This study explored drivers for EcoSan in the study area. Table 2 presents some of the factors that may either motivate or constrain the households to opt for EcoSan solutions. The table does not present an exhaustive list, but aims to provoke thought on what these factors might be. In many cases the motivating factors represent expectations of the beneficiaries while constraints represent their fears.

Both the motivating factors and the constraints of the stakeholder community can vary enormously and may not always be obvious to outsiders. This survey sought the stakeholder's motivating factors and reservations they may have about the EcoSan concept.

2.7 What is EcoSan?

" For most people sanitation means sitting on a toilet and flushing away the excreta to waste or simply sitting or squatting on a pit toilet and letting the waste matter build up in a pit. In both cases the excreta is disposed of and forgotten in the quickest and most convenient way. But in a world which is becoming increasingly polluted from excreta, and where many of the world's population do not have access to a decent toilet at all, it does make sense to look at excreta in another way" (Morgan, 2004).

Table 2: Factors motivating/constraining households in EcoSan programme.

Stakeholder	Examples of motivating factors	Examples of constraints
Household	• hygiene improvement • structural stability • local geophysical factors (eg. high groundwater table, rocky ground,) • reduced costs • increased comfort • greater security • interest in recycled nutrients • prestige • ecological reasons • water scarcity • unreliable water supply • economic reasons • local and reliable availability of agricultural inputs • increase of crop yields for either the market or family need	• culture, habits, taboos • hygienic concerns • unfamiliarity • fear of loss of comfort • economic factors (e.g. for start-up etc) • lack of logistics • fear of negative consumer perception • fear of negative long term effects on soil

Source: Adapted from UNESCO and GTZ, 2006

The term "sanitation" comprises all interventions which aim to protect and promote human health by providing a clean environment and breaking the cycle of disease It refers to the principles and practices relating to the collection, removal or disposal of human excreta, household wastewater and refuse as they impact upon people and the environment (http://www.ecosan.at/en/frameset.htm).

Sanitation is any system that promotes sanitary, or healthy, living conditions. It includes systems to manage wastewater, storm water, solid waste and household refuse and it also includes ensuring that people have safe drinking water and enough water for washing (DWAF 2002). The focus here is on the safe management of human excreta. The basic purpose of any sanitation system is to contain human excreta (particularly faeces) and prevent the spread of infectious diseases, while avoiding danger to the environment (Austin and Duncker, 2002).

Morgan (2004) argues that in a perfect world, EcoSan refers to *a system that makes use of human excreta and turns it into a valuable resource which can be introduced into agriculture with no pollution of the environment and in a way which poses no threat to human health.* However, almost no sanitary system known to man can attain this ideal. He suggests that perhaps a more realistic definition of EcoSan and this refers to *a system that makes use of human excreta and turns it into a valuable resource which can be introduced into agriculture in such a way that both the health risks and risks of polluting the environment are reduced to a minimum.* With this slightly loose definition, a wider range of technical options becomes available to promoters of EcoSan. In practice, this means the inclusion, not only of urine diverting devices, but also very simple and relatively cheap to construct shallow pit latrines, which are similar (if not identical) in their use to the standard pit latrine – where useful trees may be grown or where humus can be formed for later introduction into agriculture.

EcoSan is a sustainable closed-loop system that regards human excreta as a resource to be recycled, rather than as a waste to be disposed of. Esrey *et al.* (1998) argue that the notion that excreta is waste with no useful purpose is a modern misconception. In nature there is no waste as all the products of living things are used as raw materials by others. The misconception that excreta is waste with no useful purpose is at the root of pollution problems resulting from conventional

approaches to sanitation. Excreta are processed until they are free of disease organisms. The nutrients contained in the excreta may be recycled and used for agricultural purposes (Austin and Duncker, 2002).

EcoSan can be viewed as a three-step process: containment, sanitisation and recycling of human excreta. The objective is to protect human health and the environment while reducing the use of water in sanitation systems and recycling nutrients to help reduce the need for artificial fertilizers in agriculture. EcoSan represents a conceptual shift in the relationship between people and the environment (EcoSanRes 2003), and is built on the necessary link between people and soil (Figure 5).

EcoSan systems are designed around true containment of pathogens and provide two ways to render human excreta innocuous: dehydration and decomposition. The preferred method will depend on climate, groundwater tables, amount of space and intended purpose for the sanitized excreta.

Dehydration is the chemical process of destroying pathogens by eliminating moisture from the immediate (containing) environment. Some drying materials, like wood ash, lime and soil are added to cover the fresh deposit. Ash and lime increase the pH. Many microorganisms are adapted to a neutral pH (7). Increasing acidic or alkaline conditions through adding ash or lime will have an inactivating effect. Inactivation is rapid at pH 12 and takes longer at pH 9 (Winblad and Simpson-Hébert, 2004).

While the pH may reach relatively high levels (above 9), in a dehydrating latrine, temperature and moisture content rarely reach levels to have a significant impact. In warm, humid climates achieving the correct moisture content becomes almost impossible. The main factor influencing the level of pathogen reduction in a composting latrine is therefore storage time.

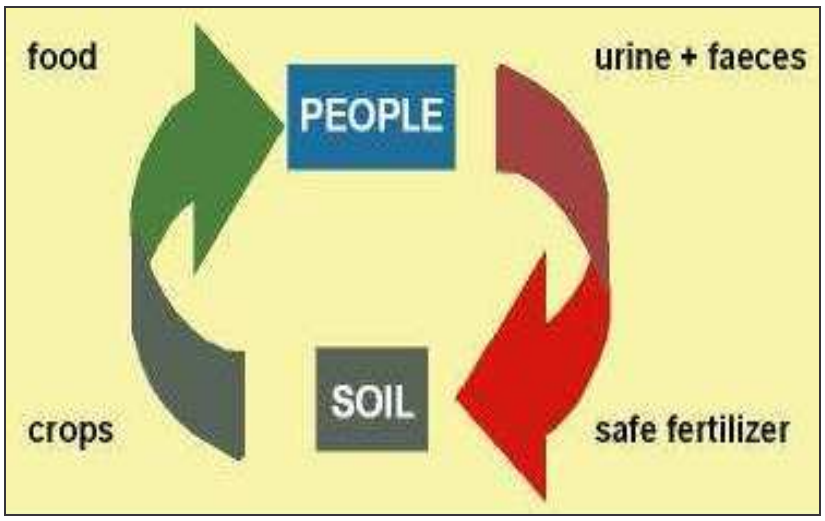

Figure 5: The concept of ecological sanitation

Source: Schonning, C. and Strenstrom, T.A. (2004

2.7.1 Factors influencing pathogen die-off

Pathogens die-off after excretion, as environmental conditions outside the human host are generally not favourable to their survival. Environmental factors that contribute to the die-off of pathogens are listed in the Table 3. Most pathogens are inactivated by the composting process and a composting procedure with a residence time of 3 days at a temperature greater than 55°C results in sanitized compost (Jones and Martin, 2003). The longer the residence time the better. Table 4 shows temperature-time relationship required for the destruction of several pathogens

Table 3: Factors influencing pathogen die-off

Factor	Description
Nutrients	Pathogens living in the gut are not always capable of competing with other organisms outside the body for scarce nutrients
Temperature	Most microorganisms survive at low temperatures (<5 °C) and rapidly die off at high temperatures (>40-50 °C) during composting and/or dehydration
pH	Many microorganisms are adapted to a neutral pH (7). Increasing acidic or alkaline conditions through adding ash or lime will have an inactivating effect.
Dryness	Moist conditions favour the survival of micro-organism. Dry conditions decrease the number of pathogens
Solar radiation/ UV light	The survival time of pathogens will be shorter when they are exposed to sunlight (when excreta are applied to the soil).
Presence of other Organisms	Organisms may affect each other by predation, release substances or competition as it happens when waste water is treated in soil filters or excreta is applied in agriculture
Oxygen	Microbiological activity is dependent on oxygen. Most pathogens are anaerobic and are likely to be out-competed by other organisms in an aerobic environment. For this reason, application of excreta to soil and exposure to ventilation contributes to die-off.
Time	All the above conditions only become relevant in relation to time. In other words, the more time pathogens are exposed to these conditions, the less chance they have of surviving

Source: Schönning and Stenström (2004)

Table 4: Temperature-time relationship required for the destruction of several pathogens

Organism	Time (in minutes) for the destruction of organisms at several temperatures				
	50°C	**55°C**	**60°C**	**65°C**	**70°C**
Bacteria					
Salmonella typhi	-	-	3	-	4
E. coli	-	-	60	-	5
Mycobacterium tuberculosis	-	-	-	-	20
Shigella sp.	60	-	-	-	-
Mycobacterium diphtheriae	-	45	-	-	4
Brucella abortus	-	60	-	3	-
Corynebacterium Diphtheria	-	45	-	-	4
Viruses					
Viruses	-	-	-	-	25
Protozoa					
Entamoeba histolytica cysts	5	-	-	-	-
Helminths					
Ascaris lumbricoides eggs	60	7	-	-	-
Necator americanus	50	-	-	-	-
Taenia saginata	-	-	-	-	5

Source: (Stern, 1974)

2.8 Ecological latrine design

Ecological latrines can be divided into two main types: (i) composting toilets and (ii) dehydrating urine separating toilets.

2.8.1 Composting toilets

These do not separate the faeces and urine, so that both enter the same vault or pit. A handful of a mixture of soil and ash is added to the pit after each use which has the effect of keeping the pit contents relatively dry and aerobic, as opposed to anaerobic and smelly. "Composting" is not technically the correct name as the temperatures never rise high enough to create thermophilic composting conditions. After 12 months of storage the resulting "humanure" can be applied to the land as a fertilizer and soil conditioner. The simplest form of composting latrines is called the Arborloo or 'walking latrine' (Figure 6). The other form of a composting latrine employs a twin pit or vault alternating system – the Fossa Alterna (Figure 6). These two types of composting toilets are described in Section 2.8.1.1 and 2.8.1.2.

2.8.1.1 The Arborloo

This is the compost toilet that eventually sustains the growth of a tree. A shallow pit (1metre depth is recommended) is dug and a concrete slab and easily movable superstructure is placed on top (Figure 6). The family uses the latrine, adding a mixture of soil and ash after each use, until the pit is nearly full – this usually takes between four and nine months. After this, both the slab and superstructure are moved to another pit. A thick layer of soil is added to the full pit and a young tree is planted in the soil. Sometimes tree planting is delayed until the rains begin. The tree grows and utilizes the compost to produce fruit. After a few years the result is an orchard producing fruit with a good economic value.

The Arborloo is the simplest of all EcoSan latrines because it is easy and cheap to construct. Importantly, it requires minimal behavior change in relation to using a traditional pit latrine. A further advantage is that the compost is never physically handled.

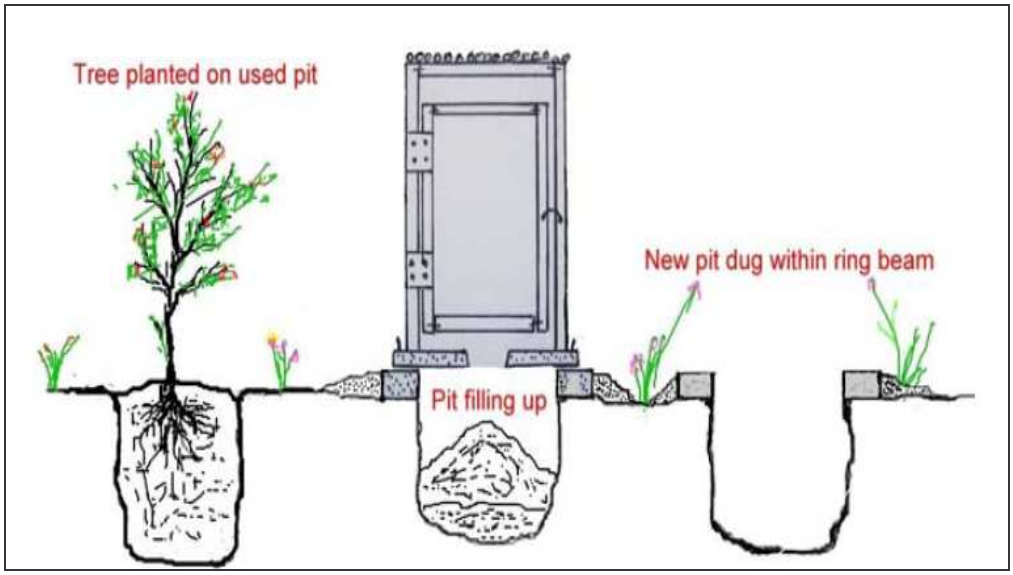

Figure 6: The Arborloo (Adapted from Morgan, 2007)

However, there is a likely problem of people not adding enough soil and ash because they are afraid that the pits may fill up too quickly and this can result in smelly latrines. (Morgan et al. 2007).

World Bank (2007) argued that the Arborloo is the entry point for introducing EcoSan in a community. The simple design, the speed of construction, and the highly observable nature of the results, make the Arborloo an ideal entry point with which to introduce EcoSan into a community. Many families tend to build this type of latrine first, however, it is not regarded as 'permanent'. Over time the users become convinced by the evidence provided by accelerated rates of fruit tree growth

and want to use the fertiliser on their main crops. When this occurs they place a higher value on both the permanence and the appearance of the superstructure and become interested in 'upgrading' to the Fossa alterna (D'Souza, 2005).

The Arborloo and gender

EcoSan has an interesting effect on the gender roles associated with latrine construction. All the non-EcoSan designs promoted on the sanitation ladder require the digging of a 3-metre pit, and this is regarded as being the man's role. If the men are not interested in constructing or using a latrine, even if the women are, then the traditional pit latrine remains unobtainable for the family. However, the Arborloo, with its shallow pit, can easily be dug by women, so this major constraint can effectively be overcome.

During a baseline survey in Embangweni EcoSan project (World Bank, 2007) men and women were asked separately why they did not have a latrine. Men tended to give technical reasons such as a lack of wood or tools, or sandy soils causing pits to collapse. Women were more direct and thought it was more to do with the laziness or unwillingness of their husbands. The survey found that digging a 3-meter deep latrine pit was a well defined man's role, and when the men refused to do this, the women and the family were in effect denied access to any form of sanitation. With the Arborloo, the pit depth is only one meter and the women recognised that digging this was not a difficult task. Many of them dug their own pits then built their own latrines, which meant the constraint of unmotivated and inactive men had effectively been overcome. It could be argued that this is an empowering process for women, but equally it could be argued that it is placing an additional burden onto women's already busy lives. Anecdotal evidence suggests that there can be an interesting knock-on effect: when men see the 'power' of the faeces as a fertiliser, they reconsider their need to use a latrine and 'reclaim' the role of family latrine builder.

2.8.1.2 The Fossa Alterna ("Alternating Pits")

This is the alternating pit compost toilet. It is similar to the Arborloo except two shallow pits (about 1.5 meters deep) are dug next to each other; these are often housed within the same superstructure (Figure 7). The pits are used like a twin pit latrine, i.e. one filling up whilst the other is maturing. When the first pit is full, the latrine slab is moved to the second pit. The first pit is then covered with soil. While the second pit is in use, the contents of the first pit are composting. When the second pit is full, the first pit is emptied of compost and used again. This alternate use of the two pits can continue almost indefinitely.

As with the Arborloo, a dry mixture of soil and ash is added after each use, which assists the aerobic decomposition process and also helps to reduce odours and discourage flies. This differs from the traditional toilet pit, which is saturated, anaerobic and smelly. To ensure sufficient reduction in pathogens the compost should ideally be processed for at least 12 months before it is spread on the land. However, in warmer climates a 6 – 9 month period has been found satisfactory (Smet and Sugden, 2006).

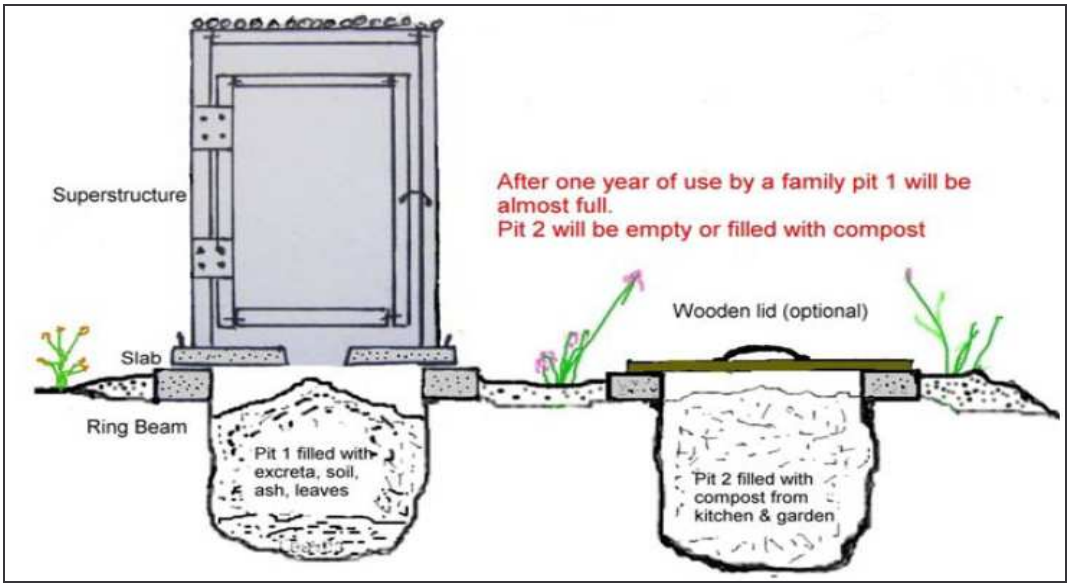

Figure 7: **The Fossa Alterna** (Adapted from Morgan, 2007)

2.8.2 Dehydrating urine separating toilets

The urine and faeces are collected and stored separately by the use of specially designed pedestals and slabs. The urine is collected and stored until it can be used as a fertiliser on plants or crops. The faeces drop into a pit or vault to which a handful of either ash or lime is added. This has the effect of drying the faeces and increasing the pH which has a positive impact on reducing smell (less ammonia emission) and destroying pathogens (GTZ, 2002). After 12 months of storage the resulting "humanure" can be applied to the land. Some form of alternating double or multiple storage system is required to avoid mixing fresh and composted manure. A Skyloo is an EcoSan dehydrating urine-separating toilet.

2.8.2.1 The Skyloo

The Skyloo composting latrine consists of two brick pits, constructed above ground level with a latrine squatting slab and superstructure on top. Human waste drops through a hole into the vaults and ash is thrown on top, increasing alkalinity to a level that kills pathogens. The temperature in the vaults is raised by the sun beating down on metal vault covers which are often painted black to absorb more heat. This heat also kills the pathogens. After several months the first pit is dug out and the fertile compost is used to grow crops. The second pit is then used until it becomes full and the process is repeated. The Skyloo can accommodate separate collection of urine and faeces. To get pure urine, as a person squats on the toilet slab, most of the urine passed can be diverted by a groove and pipe to a connected jerry can (Figure 8) or an irrigation channel and the faeces can fall directly into the vault or container. Separation may, for example, be easily practised in urinals in primary schools (Heinonen-Tanski and van Wijk-Sijbesma, 2004).

Figure 8: The Skyloo with urine diversion toilet in Mombasa, Kenya

Source: **World Bank, 2004**

In section 2.7, the EcoSan approach recognizes that human waste is a valuable resource to be recycled for crop production. Unfortunately this valuable resource is rarely available for use on crops since human faeces are mostly regarded as an unhygienic waste product. Consequently, most latrine pits are simply covered over once the pit is full.

EcoSan latrines are designed in such a way to enable faeces to be effectively and safely utilized. EcoSan is based on three main principles:

1. **Hygienic practice:** It offers a safe sanitation solution that prevents disease and promotes health by successfully and hygienically removing pathogen-rich excreta from the immediate environment.
2. **Environmental soundness:** It reduces contamination of groundwater or it does not use scarce water resources.
3. **Resource preservation:** It creates a valuable resource that can be productively recycled back into the environment. Over time, through proper management and storage, excreta are transformed from a harmful product into a productive asset.

In practice, low-cost compost toilets operate like the traditional pit toilet, but with three fundamental differences:

- A mixture of soil and wood ash is added to the latrine pit after each use to accelerate the composting process. Leaves can also be added. This mix also reduces odours and flies breeding.
- The addition of garbage, plastic and other refuse is cut down to a minimum.
- Pits are shallow – 1.5 meters is the maximum depth.

In Malawi two main designs of composting latrine are used – the Arborloo and the Fossa alterna, described in section 2.8.1. The 'urine diversion' toilet is also promoted but its high cost has precluded its widespread use. Table 5 presents the cost of various ecological latrines.

Table 5: Costs of ecological latrines

Ecological latrine	Cost
Arborloo (*Toilet slab)*	$ 2 - $ 4 (Malawi, Zimbabwe, Ethiopia)
Fossa Alterna (*Construction of total system Including materials and labour)*	$ 20-30 (Mozambique)
Skyloo	$ 40 (Philippines)* $86–$143 (Malawi)

Source: Adapted from NWP, 2006 and Manda, 2009
* Pedestal Only

2.9 Fertiliser value of human excreta

Human excreta are a rich source of inorganic plant nutrients such as nitrogen, phosphorous and potassium, and of organic matter. According to Wolgast (1993), the annual amount of human excreta of one person corresponds to the amount of fertiliser needed to produce 250 kg of cereal which is also the amount of cereal that one person needs to consume per year as illustrated in Table 6. The table is based on an average human production of urine and faeces per year for a Sweden.

Table 6: Fertiliser equivalent of human excreta to produce 250 kg cereals

Fertiliser	**Nutrient**, in Kg			
	500 litres urine	**50 litres faeces**	**Total**	**Required for 250 kg cereals**
Nitrogen (N)	5.6	0.09	5.7	5.6
Phosphorus (P)	0.4	0.19	0.6	0.7
Potassium (K)	1.0	0.17	1.2	1.2
Total N+P+K	**7.0**	**0.45**	**7.5**	**7.5**

Source: Adapted from Drangert, 1998

In reality, the fertiliser potential of human urine is lost during storage and treatment due to nitrogen loss through ammonia volatilization. Again, the nutrient content of human urine depends very much on the person's body weight, climate, water intake and diet (Heinonen-Tanski and van Wijk-Sijbesma, 2004). Faeces are not only a fertiliser. Its organic content serves as a soil conditioner and humus replenisher – an asset not shared by chemical fertilisers (Strauss, 2000). After pathogen destruction through dehydration and/or decomposition, the resulting inoffensive material may be applied to the soil to increase the organic matter content, improve water-holding capacity and increase the availability of nutrients. Humus from the decomposition process also helps to maintain a healthy population of beneficial soil organisms that actually protect plants from soil-borne diseases (Esrey *et al*., 1998).

EcoSan could be described as an old practice revisited. Many cultures have understood the fertiliser value of human excreta (faeces and urine) for agricultural purposes for centuries, and latrine designs based on the concepts of EcoSan have been used in Europe, Asia and parts of Africa for hundreds of years. Those who have ever planted a tree in an abandoned filled pit latrine can be said to have practiced EcoSan. Since in the early Chinese history, human excreta was commonly used in agriculture to complement farm manure in improving soil fertility. Farmers owned 'Outhouses' where they invited visitors to leave behind their 'valuable' excreta. In early Europe, Greek and Roman societies collected human excreta and used it as fertilizer. The Romans found that urine contained high value nutrients and collecting it was a good business. Emperor Vespasian introduced a 'urine tax' along with the proverb *pecunia non olet* (Money does not smell).

In Britain, Queen Victoria used an earth-closet at Windsor Castle, although many types of water-closet were available. Henry Moule in 1840's was the champion of the earth-closet and backed up his belief with a scientific experiment where he persuaded a farmer to fertilise one half of a field with earth from his closet, and the other with an equal weight of superphosphate. Swedes were planted in both halves, and those nurtured with earth manure grew one third bigger than those given only superphosphate. For many years, the earth- and water-closets were rival systems with champions and detractors on both sides.

2.10 Perceptions and attitudes toward human excreta (urine and faces)

This section discusses some of the views, attitudes and perceptions of people across the globe and Malawi towards the use of human excreta for food production. However, the terms perception and attitude are first defined.

2.10.1 Perceptions

People are motivated by and act upon their perceptions rather than any rational thought process. People's behaviour is not motivated by rational needs, but rather by what they 'feel' or 'perceive' their needs/wants to be. Their choice of product to satisfy their needs/wants is influenced by their feelings towards that entity, as well as their perceptions of it and its ability to satisfy their needs/wants. (Duncket *et al.,* 2007).

Perceptions are formed through:

- feelings, beliefs, mental pictures, gut feel;
- the sum total of perceptions of information accumulated over time, including experiences;
- the reality that pertains, although it may not be "true"; and
- change with changing circumstances or information.

Perceptions influence behaviour, guide all behaviour, motivate or demotivate all actions and determine the future success of technologies and/or products. To manage the future of a technology or a product, perceptions have to be managed and applied, so as to adapt the strategy of technology implementation and transfer to the tasks of creating, shifting, changing and managing perceptions (Duncket *et al*., 2007).

2.10.2 Attitudes

An attitude is one's basic 'mind set', one's outlook, how one views things. For example, people with different attitudes will view (perceive) the same situation from quite different perspectives. A particular situation will be seen as a problem to one person and an opportunity to another. It is usually the person who sees that situation as an opportunity that will be able to think of a useful solution to correct the situation.

A positive attitude can see opportunities in a situation where a negative attitude will only see the problems and obstacles. The difference between a positive attitude and a negative attitude can often mean the difference between success and failure of a technology or a product. A positive attitude will transmit positive and friendly signals, whereas a negative attitude repels people (Duncker *et al.,* 2007)

Attitudes and perceptions about health hazards and revulsion to faeces and urine vary between cultures and often people's ideas about urine differ from those about faeces. Tanner (1995) writes that every social group has a social policy for excreting; some codes of conduct which will vary with age, marital status, gender, education, class, religion, locality, employment and physical capacity. However, in their study on problems associated with pit latrines in Blantyre, Malawi, Grimason *et al.,* 2000 found that culture and religion did not influence use of pit latrines.

2.10.3 Global use of human urine

According to Esrey & Anderson (2001), urine has been used as a resource in many parts of the world for centuries. In some societies, excreta (particularly faeces) have for many centuries been considered dirty. Experience has shown that the handling of urine poses far fewer taboos than that of faeces. According to Winblad (1997), urine diluted with water can be used directly in the garden or it can be stored and used at a later date.

2.10.3.1 Europe

Urine was used in Europe in the olden times for household cleaning, softening wool, hardening steel, tanning leather and dyeing clothes. The Greeks and Romans used it to colour their hair, and African farmers used it in fermenting plants to produce dyes (Esrey & Andersson, 2001). Sweden is probably the country with the most advanced system of collection and reuse of human urine, where it is practised by farmers on a large, mechanised scale. In a number of settlements (called ‘eco-villages’) or

apartment blocks in the country the residents have EcoSan systems with urine diversion toilets. The urine from the houses or apartments is collected in large underground tanks, and what the residents do not use themselves is collected by farmers in road tankers and used for fertilizing their crops. The usual practice is to spray it onto the lands while they are being prepared for planting, and then harrow it into the soil before sowing the seed (Austin & Duncker, 2002). It has been found to be a valid substitute for mineral fertilisers in growing cereals, with no negative impact on the crop or the environment (Esrey & Anderson, 2001). The farmer's perception of the use of urine in Sweden is that the more concentrated the urine is the better it is (Stintzing, 2005). Drangert (1998) reported that in Sweden urine was used to smear wounds and, to some extent, drunk as a therapy. Drangert (1998) reported that in the Danish countryside in the 19th century urine was stored and used as a detergent for washing clothes and dyeing.

2.10.3.2 Latin America

In Mexico, fermented urine is recommended as a fertiliser. Before sealing the container to avoid loss of nitrogen, users often add a handful of soil as a catalyst for the fermentation process. According to Ceballos (1997) in a case study of dry sanitation in Morelos, Mexico, fermented urine is diluted before watering plants. For fertilization purposes, users have reported varied dilution ratios of urine to water (from 1:5 to 1:4) (Clark, 2003). Unfermented urine can be sprayed as a fungicide. Indigenous people in south-eastern Mexico claim that the use of urine as a fungicide was a traditional Mayan practice (Clark, 2003).

2.10.3.3 Asia

Esrey and Andersson (2001) indicated that the Chinese pharmaceutical industry used urine to make blood coagulants. They further highlighted anecdotal evidence from several locations that indicated that people preferred vegetables grown with urine fertilization and in China people were willing to pay more for vegetables grown in urine.

In Sri Lanka urine was used for plants such as banana, coconut, vegetables, flowers or fuel wood. In Matale town, the Nandawathi family used urine and wash water to grow chillies, but only used the chillies after drying, not fresh (Calvert *et al.,* 2002).

Getting people in Thailand to accept the application of human urine as a fertiliser was not easy. The main issue was the sociological difficulty, as the common belief is that human excreta are dirty and a pathway for disease transmission (Pinsem & Vinnerås, 2003).

Matsui, (1997, as quoted by Austin & Duncker, 2002: 66) mentioned the fact that farmers in Japan placed buckets at street corners in the towns and villages, collecting free urine from pedestrians and providing a simple public toilet at the same time.

2.10.4 Global use of human faeces

2.10.4.1 Europe

It became popular in rural Sweden to attach the latrine house (with no pit) to the stable, so that human faeces and dung from the stall-fed animals were mixed to make them less repulsive when applied to the fields (Drangert, 1998). In another study, the dehydrated faeces were composted together with household garbage for eight months before the product was used as soil conditioner in the residents' small gardens near the house (Drangert, 1998).

2.10.4.2 Asia

Calvert *et al.,* (2002) mentioned that in Sri Lanka farmers from Bhaktapur have been using fresh faeces instead of composted faeces in vegetable farming since ancient times. The tradition of using fresh faeces still continues but on a reduced scale. Though use of faeces in the field helps to replenish nutrients/organic matter, the health risks associated with handling could negate the benefits of the increased growth.

EcoSan has been practiced for many generations in Nepal in different forms. Farmers have used excreta and urine separately for feeding pigs and for growing crops and vegetables for many years. The average household has "faecophobia", but a few farmers take raw (fresh) excreta from latrines to their vegetable gardens and grow good quality vegetables, which are tasty and highly in demand (Mishra, 2003). In the Sidhipur village, most of the farmers use animal manure and raw human excreta as fertiliser for crops and vegetables. They have been practicing this since ancient days, although it was considered unhygienic by the villagers.

2.10.5 Global use of human excreta (mixture of urine and faeces)

2.10.5.1 Asia

China has a long record of farmers collecting mixed excreta and applying it on their farms (Drangert, 1998). It seemed to be the only civilization that has positively used human excreta as nutrients for agriculture, and even food for pigs, from its very earliest development (Matsui 1997). In the Guangxi province of China urine and faeces are used in fields to grow corn, rice and bamboo (Esrey & Andersson, 2001). The Chinese rely greatly on human excreta (sometimes known as 'night soil') as a fertiliser. Over 90% of the quantity collected is used in agriculture (Reed & Shaw, 2003). Robson (1991 reported that in China's city of Shanghai vacuum trucks collect 8 000 tons of night soil each day from public toilets, septic tanks and night soil dumping stations. During the night the wastes are shipped by river and canal in sealed barges to depots on the outskirts of the city. There the waste is stored from 10 to 30 days in covered tanks, after which it is sold to farmers who applied it to their fields as manure.

Schönning (2001) noted that the recycling of urine and faeces was introduced in Japan in the 12th century. Farmers bought urine and faeces from town dwellers to apply it on their farms (Drangert, 1998). Cash crops such as vegetables and fruits were grown by suburban farmers using human excreta. Owing to Japan's closed policy, the country was not influenced by outbreaks of typhoid, cholera or other communicable diseases (Matsui, 1997).

In India, urine was used as fertiliser after storage, and faecal matter was composted with wastepaper and garden waste and used for soil enrichment. The toilet centre, which generated 200 tons of urine and 100 tons of faeces per year, produced 50 tons of compost, which in turn yielded 50 tons of bananas (Jenssen *et al.,* 2004).

2.10.6 Use of human urine in Africa

2.10.6.1 Tanzania

Urine has been applied as a fertiliser in Majumbasita, Dar Es Salaam, Tanzania. Some of the people divert urine into the shallow pit near a fruit tree or close to their garden (Chaggu & John, 2002). In the Kagera area in Tanzania, urine has been used as an antidote when somebody has inhaled and ingested poison, by giving that person fresh urine to drink. It has also been used as a pesticide to kill banana weevils (Chaggu & John, 2002).

Chaggu (2004) also mentioned that in Bukoba, Tanzania, there had been a tradition of visitors to urinate in the host's home garden, which was much appreciated and considered a gesture of respect. This practice has disappeared with the adoption of modern hygiene.

2.10.6.2 Zimbabwe

Morgan (2003) reported on trials performed on varieties of vegetables and maize using urine diluted with water at a ratio of three parts water to one of urine as a liquid feed. Seedlings were planted in containers (buckets or cement basins) and irrigated with water first, to stabilise them in their new environment, and thereafter with a water/urine mix. This was compared with similar vegetables and maize irrigated with water only. After a specified growing period, the crop was harvested and weighed. The yields of the vegetables and the maize irrigated with the urine/water mix were the highest. The trial revealed the great value of urine when used as a liquid feed for various plants, and particularly for leafy vegetables (lettuce, spinach, and covo – a type of spinach). There is huge potential for urine application as an enhancer of vegetable and crop growth

However, studies on people's attitudes on excreta use have been carried out in urban and rural areas, specifically in the Marondera and Zvishane districts, with interesting findings covering traditional human excreta reuse, attitudes toward crops grown using human excreta, fears, myths and taboos on excreta use. A few respondents said urine had medicinal properties or could be used as a pesticide. Others indicated that urine has traditionally been used as medicine in the treatment of athlete's foot, sore eyes, impotence, burns, runyoka (illness caused by having sex with someone else's wife) and as a love potion (Guzha, 2004).

The findings of the study conducted by Guzha (2001) in Dzivarasekwa extension in Zimbabwe revealed that most of the residents could not use human excreta for growing vegetables as they were uncomfortable eating vegetables they knew had been fertilised from human manure.

2.10.6.3 Botswana

Some families in Paje have used urine for fertilising purposes; some as trials to learn the new concept while others used fresh overnight urine on trees and flowers. However, experience in the village showed that people in general reacted unfavourably towards the use of urine and treated faecal matter as a fertiliser and soil conditioner (Hanke, 2003).Traditionally, urine is something to keep out of one's own terrain. There is also a strong belief that urine and faecal matter are something very dirty. The consideration that it could be very valuable after treatment is quite erroneous in Tswana understanding. On the other hand, there are also superstitious reasons for the negative attitude; for example, a widespread belief in witchcraft, which holds that urine as a substance, could be harmful. Even the fear of spreading HIV/AIDS through the use of urine in the garden was mentioned (Hanke, 2003).

2.10.6.4 Nigeria

Traditions in Nigeria prohibit collection of urine by strangers for fear that the urine may be used against the people through 'black magic' or 'evil spirits' (Sridhar et al., 2005). There is still a phobia of using urine for growing edible crops (Sridhar, et al. 2005 cited Sridhar, 2003). It is felt that urine is a body waste and may have pathogens, and therefore should be disposed of in the conventional way. However, after demonstrations and the resultant yield of crops fertilized with urine, 80 percent of the community showed a willingness to build a urine-diversion toilet on their premises (Sridhar *et al.,* 2005).

2.10.6.5 Kenya

Drangert (2004) reported that urine is used to treat eye disease and athlete's foot as well as persons intoxicated by alcohol.

2.10.7 Use of Human Faeces in Africa

2.10.7.1 Nigeria

A study carried out by the Akinyele local government of Oyo State, Nigeria, indicated that the majority of the respondents (head of farming households) had no toilet systems. It was found that the respondents used the bush and farm lands to defecate. They feel that nothing is wrong with that, as their culture permits it (Nikuru, 2005).

2.10.7.2 Uganda

Windberg *et al.,* (2005) conducted experiments by establishing EcoSan demonstration gardens using sanitized materials. With the resultant harvest, the stigma of the taboo on these materials has reduced greatly and is evidence that materials are better recycled than disposed of.

From the interviews conducted regarding the use of faecal matter, Windberg et al. (2005) revealed the following:

- Knowledge about the agricultural use of faecal material is more widespread than knowledge about the use of urine as fertilizer. Often the urine of animal and human origin is used as insecticide.
- None of the interviewees at household level expressed any doubts about eating food fertilized by nutrients of human origin. However, in-depth interviews suggested that there was a considerable resistance towards this.

2.10.7.4 Zimbabwe

The results of a study conducted in Hatcliffe extension in Harare, Zimbabwe (Guzha, 2001), showed that some community members ate sweet potatoes planted where people used to dispose of their faecal matter, and these did not taste as good as those planted using ordinary manure. This finding was not conclusive, since other factors might have influenced the taste.

Studies on people's attitudes on excreta use have been carried out in both peri-urban and rural areas in Marondera and Zvishavane districts with interesting findings regarding traditional human excreta use, attitudes toward crops grown from human excreta, fears, myths and taboos towards excreta use. Defecating on someone's property is seen as a taboo; faeces should be disposed of as far as possible from the household and should never be tampered with. An enemy can use one's faeces to bewitch one; therefore, individuals should be careful on how and where they dispose of their faecal matter (Guzha, 2004).

2.10.8 Use of human excreta in Africa

2.10.8.1 Mozambique

The possibilities for excreta use were studied in two small towns in the Niassa province of Mozambique. Breslin (2003) quoted Breslin & Dos Santos (2001) on the findings from the sanitation work undertaken by ESTAMOS. He highlighted that ESTAMOS has learned that many families in Niassa, and particularly in places like Mandimba and Lichinga, were already planting trees, pumpkins, and a range of vegetables like tomatoes on abandoned pit latrines. These products were eaten without reservation, although people were reluctant to talk about the practice in public gatherings. The consumption of agricultural products grown on abandoned pit latrines strongly suggests that cultural concerns regarding food grown with human excreta were not grounded on the reality of community practice in Niassa (Breslin & Dos Santos 2001).

Linked to the above is the acceptance of a small number of Arborloos at family agricultural plots in Niassa. Farmers understand that a shallow pit latrine, which will be used for the three or four months that a family lives on their 'machamba' (agricultural field), can be used productively by planting a tree on the pit as the family gets ready to return to its permanent home. The idea of fruit orchards at family machambas is slowly growing in some parts of Niassa. In an environment

where access to agricultural products like soil conditioners and fertilizers is limited, farmers throughout Niassa experiment with, and use, a variety of materials for compost, including organic materials like animal faeces (particularly goat), and at times human excreta. The use of human excreta for agricultural purposes is not widely discussed for a range of cultural reasons, but is evident in a number of places where ESTAMOS and WaterAid are working (Breslin 2003).

ESTAMOS also made use of an agricultural demonstration plot by planting a guava tree in an Arborloo. The results were impressive as the guava plant outgrew older guava plants on the farm within a period of six months. Thereafter, farmers showed interest in the Arborloos as demonstrated by this quote (Breslin, 2003):

"*I now have a latrine (Arborloo) in my machamba. During the agricultural season my family can use this latrine, which is an improvement on our situation in the past. But what is most important is that we can plant a young tree there at the end of each harvest. This means that in the future we will have many fruit trees because we will make a new pit each year and plant a new tree when we are finished for the year*."

Arborloo User, Niassa

Using human compost for agricultural purposes is gaining momentum in Lichinga. The excavated compost has been tested for growing different types of vegetables. On seeing that the compost, which smelled like dirt and did not resemble human excreta at all, one farmer said: "*This is incredible. I was worried about this but now I do not have any fear about the compost. I will tell everyone about this*" (Breslin, 2003). However, few people have said they thought the use of excreta was culturally unacceptable. Instead, many families insisted that it was simply logical.

2.10.8.2 South Africa

Human excreta are generally perceived as dirty and are not used in South Africa. However, human faeces have been used in earlier times for various purposes. Wet faeces have been used to heal wounds. They have also been applied to the skin of a person bitten by a snake, to remove the poison. Women who used cow dung to

plaster the floors also used babies' first urine of the day to wash their hands, prior to working on the cow dung. It is believed that this practice cast a spell to avoid one's hands being handicapped. This is no longer practised, but urine is used to treat eye infections, though on a minimal scale (Duncker & Matsebe, 2004). Babies' urine was used to treat eye infections by the older people; however, this is not practised any more (Austin & Duncker 2002).

In Northern Cape, the general belief is that it is unacceptable to eat vegetables grown in human faeces because they are unclean. Most people had flower gardens and lawns, but still did not want to use excreta in these. The conclusion is that they did not want to be seen using human faeces in their gardens, as handling human faeces was unacceptable (Duncker & Matsebe, 2004).

The findings of a survey conducted in Taung, North West province, showed that users of urine diversion toilets in the area were aware of the value of faeces for agricultural purposes. Some indicated that they would use faeces in their gardens when they emptied the vaults of the toilets, but others were not willing. However, handling of faeces was a problem in most of them (Duncker & Matsebe, 2004). The majority of respondents said that they did not ascribe any cultural values, beliefs or taboos to human faeces or urine. However, there were general feelings that touching or handling excreta, especially faeces, should be avoided. Men and women in general also felt that the handling of excreta was unacceptable, apart from when babies and sick people in the home needed help to manage defecation. In these cases, women were seen as the caretakers and were conditioned to accept these tasks, while the men distanced themselves totally. Both faeces and urine were mainly seen as waste products, even though the users were aware of the fertiliser value of faeces and indicated that they would use it in their gardens. Babies' urine was used to treat eye infections and minor ailments.

The fact that human faeces and urine were regarded as unpleasant by the users was a reflection on the willingness of people to handle human faeces and eventually use it in their gardens. The handling of human faeces was generally not accepted in North West province, both as a general norm, and as a result of conditioning by health and hygiene campaigns. Most respondents were aware of the fertiliser value of faeces and some of urine, but some were only willing to use faeces in their gardens. In most cases, the urine was piped to the soak away that was built alongside the UD toilet, as most users were not aware of the fertiliser value of urine, and were convinced that it would kill plants. The general belief was also that it was unacceptable to eat vegetables that were grown in human faeces because they were unhygienic. The households indicated that they were willing to use the dry faeces in their gardens, but still did not want to eat vegetables grown in it (Duncker & Matsebe, 2004).

In KwaZulu-Natal, most respondents were aware of the fertiliser value of faeces. However, the majority were not willing to use human excreta at all. Those who had no objection to using human excreta were willing to use faeces in their gardens, but not urine. Men and women in general also felt that the handling of excreta was unacceptable, apart from when babies and sick people in the home needed help to manage defecation. In these cases, women were seen as the caretakers and were conditioned to accept these tasks, while the men distanced themselves totally. Some respondents also worried that they could be infected with the HIV/AIDS virus if they handled human excreta (Duncker & Matsebe, 2004).

2.10.9 Use of human excreta in Malawi

As stated in section 2.7, EcoSan can be described as an old habit revisited. The planting of bananas on old, full pit latrines has been a common practice in different parts Malawi for a number of years, both in the rural and peri-urban and urban areas where pit latrines are used (Morgan, 2001). Some farmers have also successfully grown other crops like paw paws, granadillas, tomatoes, pumpkins and a variety of leaf vegetables. Some farmers, practicing urban agriculture in Lilongwe and

Blantyre, collect sewage sludge from the sewage treatment works for fertilization of their plants or gardens.

The use of latrine compost has gained popularity since 2003 (Sugden, 2003; Semu-Banda, 2007; World Bank, 2007). The following quote demonstrates the pride of a farmer advocate of EcoSan in northern Malawi.

"My family and I use the type of latrine where we are able to add ashes to our excreta every time we visit the toilet, and this in turn ends up speeding decomposition. The decomposed product is mixed with soil after about six months, and that makes a very effective fertilizer. I no longer spend money on chemical fertilizers, and my annual maize and fruit yields have doubled since I started using fertilizer produced from human excreta.," ..... Patrick Moyo, interview with International Press Service News (Semu-Banda, 2007)

Following the success of reuse of human excreta in EcoSan projects, communities in six of the 28 districts in Malawi have now made the switch from chemical fertilisers (Semu-Banda, 2007). However, there is dearth of literature on use of urine and cultural views regarding reuse of human excreta in Malawi. Hence, the present study. Section 2.11 highlights some of the cultural views towards human excreta elsewhere.

2.11 Cultural views regarding human excreta

Attitudes and perceptions about health hazards, and people's revulsion from faeces and urine, vary between cultures, and often people's attitudes towards urine differ from those to faeces (Drangert et al., 1997). Drangert *et al,.* (1997) quoted Tanner (1995) indicating that every social group has a social policy for excreting; some norms of conduct will vary with age, marital status, sex, education, class, religion, locality, employment and physical capacity. Drangert *et al.,* (1997) noted Hanafi (1995) stating that a Koranic edict considers urine to be a spiritual pollutant, and

Islamic custom demands that Muslims minimize contact with human excreta. They also mentioned that urine has been shown to have a disinfectant property.

Drangert *et al.,* (1997) reported that faeces are perceived quite differently and are regarded as offensive and unpleasant to handle. They also indicated that both professionals and laymen have strong opinions that adult faeces are hazardous to health because they may contain a variety of pathogens. He also noted that Tanner and Wisjen (1993) said that faeces may carry a definite cultural meaning – for example, that one's faeces can be a medium for revenge and therefore must not be seen by others, or that the faeces of certain kin must not be mixed. An example is the baseline KAP (knowledge, attitudes and practices) survey conducted by the Mvuramanzi Trust in the densely populated informal settlements near Harare, which showed that urine has been used for medicinal purpose in the treatment of earache, athlete's foot and bed wetting. It has also been used as an important ingredient in the preparation of love potions (Guzha, 2001).

A study conducted in Mozambique showed that many people in Lichinga believe in various forms of witchcraft. One common way to bewitch a family is to place 'medicine' in someone's toilet. This is a cause for concern among those who intend to use the transformed excreta for agricultural purposes. Although it is rarely talked about, many seem to fear the insertion of 'bad medicine' in their latrines by an angry visitor (Breslin, 2003).

A study in peri-urban Eldoret in Kenya indicated that 10 percent of the respondents thought it unsafe to throw children's faeces into the latrine, as it (children's stools) should not be mixed with those of adults. Children's faeces should be hidden because of the danger of a witch picking up the stool of a particular child, and faeces left in a shallow latrine can be picked up by people with ill will (Drangert *et al.,* 1997). Cow dung seems to be less offensive than human faeces. It became a popular practice in Sweden to attach a latrine house (without a pit) to the stable, so that human faeces and dung from the stall-fed animals were mixed to make them less

repulsive when applied to the fields. A similar practice was conducted among Tallensi farmers in Sweden using human faeces and animal manure as fertiliser. Another common way to get rid of human faeces is to let pigs and dogs eat the faeces and produce their own faeces, which are not regarded as repulsive as human faeces (Drangert *et al.,* 1997).

Aesthetic aspects such as smell and appearance of human excreta play a role in acceptance as well as rejection of a sanitation system as well as for avoidance. Perceptions of human excreta (urine and faeces) differ. There is a common view that smell from faeces is more pungent than that of urine. However, both faeces and urine smell. Some people in Manyatta, Kenya, feared that *"the tomatoes smell like faeces and taste like urine"* if fertilised with excreta (Drangert, 2004).

Another comment from a study done in Addis Ababa puts smell into a social context:

"We thought that all toilets smell, so we thought that even the EcoSan would smell. The smell you feel just now is not from my EcoSan toilet. It is from my neighbour's latrine. We share our coffee time and many other happy occasions. But, I wish I could do something not to share this horrible smell for the rest of my life. If I mention this to my neighbour, we will only lose the good friendship we have, so I think I will have to live with it." (Drangert, 2004)

This shows smell could be a strong deterrent in adopting a sanitation system. However, in EcoSan toilets, the addition of ash after using the toilet usually reduces the smell to minimal levels.

Views on the appearance of urine are more complex than faeces. It was reported in Addis Ababa that menstrual blood influences behaviour, and *"in connection with using urine as fertiliser there is often suspicion of transmitting diseases like bilharzia and HIV-Aids."* Furthermore, some residents in Majumba Sita wondered whether EcoSan toilets meant them *"to be playing with menstrual blood produced by women in their time."* (Drangert, 2004).

There seems to be a general societal norm that touching or handling excreta should be avoided. Yet, circumstances force societies or households to deal with excreta in concrete ways. Ethnic groups like the Teso in Kenya, Bhangis in India and Bacha in South Africa are traditionally sought after to carry out sanitation jobs. One example of residents' attitudes of such occupations in Stockholm is that *"it is greatly appreciated! Although…my dad always said that if I did not study well I would end up as a garbage man!"* In Addis Ababa most residents dislike the task and would never do it if they could find another job (Drangert, 2004).

Apart from sanitary occupations, babies and sick people in the home need help to manage defecation. Women are said to be conditioned to accept the task: *"it is seen as nature´s conditioning since toddlers cannot clean themselves, and so someone has to do it for them."* (Drangert, 2004). There is a general view that babies' faeces are considered less offensive than adult faeces. Some argue that this is because of the food eaten. There is a variety of views, from little difference between the two to the extreme that child faeces is viewed as clean. *"Adults' faeces are viewed as repulsive so no one would like to handle them unless forced by circumstances, for example, in cases of sickness."* (Drangert, 2004). However, there is a more relaxed view of child faeces: *"the fact is that culture does not have any negative views about babies' shit. It is viewed as clean and of no problem, so water from nappies could as well be poured in the garden (most times) or in the toilet."* (Drangert, 2004)

The National Sanitation Policy in Malawi acknowledges that hygiene behaviour is poor in rural areas, with the majority of people not using soap and water to wash hands after defecation, handling children's faeces and soiled nappies, or prior to preparing or eating food (GOM, 2006c).

Another aspect illuminated by Drangert (2004) is how human excreta compare with cow dung. This information may add to the understanding of perceptions and norms. Cow dung enjoys a special position in that people have no or few reservations to touch or use it. Also, there seems to be a positive connection between the cow and cow dung, whereas pigs are considered dirty for religious reasons or because of their scavenging habit. It is common for hens to scavenge on human excreta. Drangert (2004) reported that scavenging does not influence people's perception of the scavenger. It is believed that once faeces are inside, the body system of the hen has a way of making it useful and cannot affect people who eat hens after they are killed and cooked.

2.12 Conclusion

This chapter has shown that cultural beliefs vary so widely in different parts of the world that it is not possible to assume that any of the practices that have evolved in relation to human excreta use elsewhere can be readily applied to Malawi.

Research in social sciences has shown that knowledge on a topic may increase; people may even change attitudes, but that the step to improved behaviour and practices depend on a complex set of social and psychological factors. Hubrey introduced the BASNEF model for understanding behaviour in health communication: Beliefs, Attitudes, Subjective Norms and Enabling Factors (Hubrey, 1993). Hence, socio-cultural aspects of EcoSan were investigated in this study to gain an in-depth understanding of why communities were reluctant to build Arborloos.

CHAPTER 3 METHODOLOGY

3.1 Introduction

This chapter describes the research methodology that was used in undertaking this study. It outlines the study design, study area, study population, sampling, data collection, ethical considerations and data analysis. It also discusses the limitations of the data collection methods used and how these were dealt with in this survey.

3.2 Study design

The methodological approach for this research was based on the KAP (knowledge-attitudes-practices) model that was used in a study by the World Health Organization (WHO) in 1978. This model theorizes that increase in knowledge influences attitudes which will then lead to positive changes in behaviour. In simple terms, a KAP study provides an insight as to what people know about certain things (knowledge), how they feel (attitudes), as well as any preconceived ideas that they may have and also how they behave (practice).

The KAP model was employed in order to understand the topic from the perspectives of the population involved since they are able to verbally express their personal feelings, opinions and experiences. This qualitative approach has been found to be effective in obtaining specific information about the social values, opinions, behaviours and emotions of particular populations (Mack *et al.,* 2005). The method concentrates on small group discussions or individual discussions with two-way communication in exchanging information about attitudes and behaviour. Qualitative research is grounded in a philosophical position, which is broadly "interpretivist" in the sense that it is concerned about how the social world is interpreted, understood, experienced or produced (Mason, 1996).

3.3 Study area

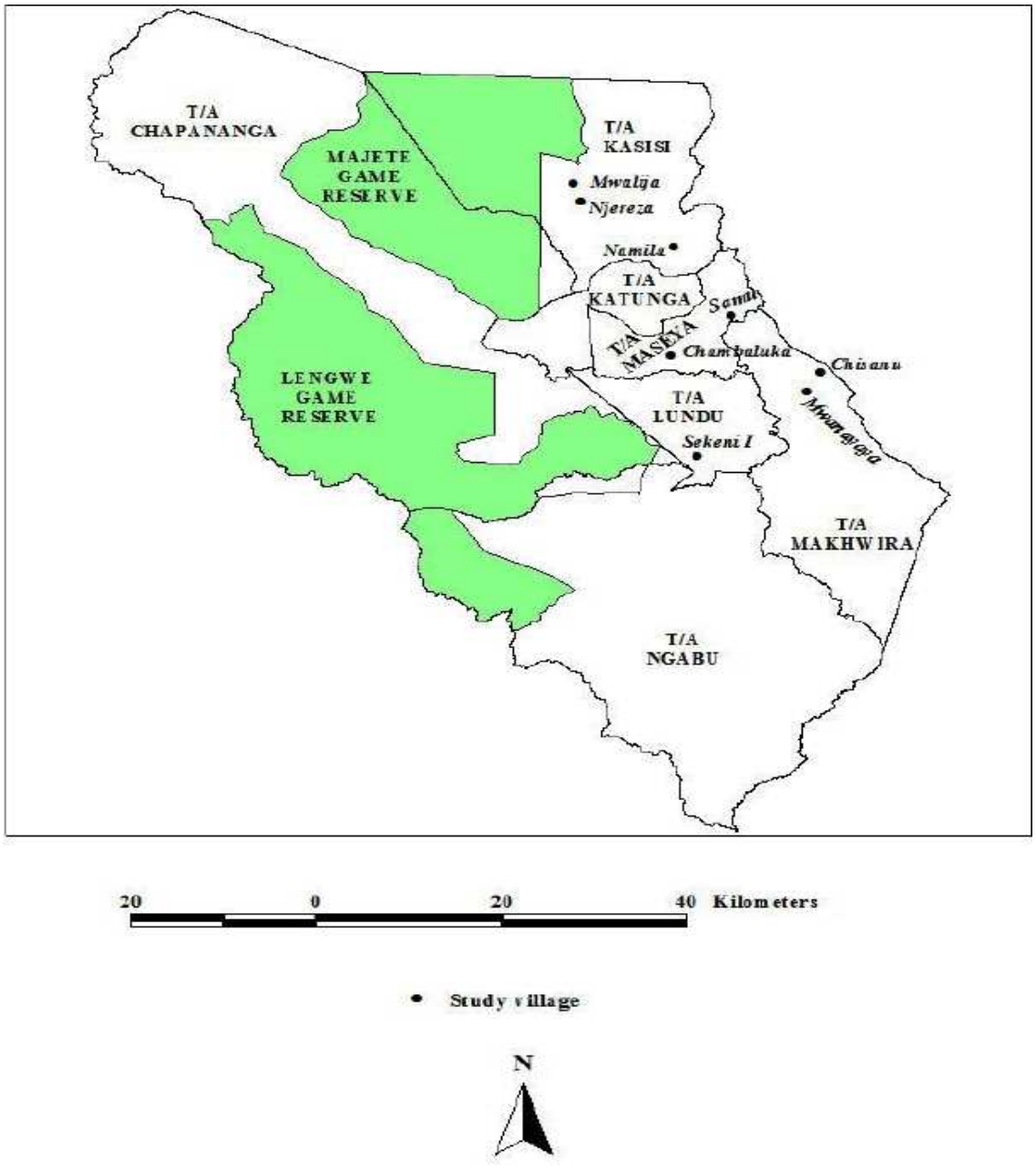

Figure 8: Map of Chikhwawa District showing the study Villages

The household survey was carried out in eight villages in Chikhwawa district shown in (see Table 6). Chikhwawa is one of the two southern most districts in Malawi and lies in the Lower Shire River Valley (Figure 1). It is located 50 km (30 miles) south of Blantyre, the commercial capital of Malawi. The district covers an area of 4755 km.² and has a population of 438,895 (GOM, 2008), which is about 3.4% of the national population. With a total number of 98,035 households, the average household size is 4.5, which is slightly above the national figure of 4.4 (GOM, 2008). The district is divided into seven Traditional Authorities (TA's) and four Sub-Traditional Authorities (STA's). As indicated in section 1.6.1.1, each TA and STA is subdivided into villages. Each village is composed of a number of households.

Chikhwawa is one of the poorest districts in Malawi and is virtually dependent on government and Non–Governmental Organizations (NGOs). It is estimated that one in every three people in the district lives in dire poverty (ultra poor) (GOM, 2005). Agriculture provides the major source of livelihood for the district. Major income comes from small holder farming. Maize, sorghum, rice, and cotton are all grown using almost entirely rain fed agriculture. The district also has common livestock like chicken, goats, cattle, pigs, sheep, doves, and ducks which is a source of protein along with fish from the Shire River.

The district has ten soil groups out of a total of thirteen soil groups in Malawi, indicating a great variety of soils in the district. According to the FAO classification (FAO, 1988), most of the upland soils are cambrisols or luvisols and under undisturbed woodlands and grasslands phaeozems may also be found. The soils in the lowlands are more variable and classified predominantly as luvisols, fluvisols, vertisols and gleysols (ambisols). Most of these soils are slightly acidic to neutral. The neutral status of most cultivatable soils means low widespread deficiencies of phosphorous and nitrogen (GOM, 2006b). Thus, the use of EcoSan products (faeces + urine) is a great opportunity to improve the soil properties for agricultural productivity in the study area.

The people of Chikhwawa are traditionally Sena people, or Mang'anja. The minority tribes include the Ngoni's and Nyungwe's. The predominant languages spoken in the district are Chichewa**,** Chisena and Chimang'anja**.**

3.4 Study population

The study population was households in four villages under the SCHI namely: Namila, Mwanayaya, Mwalija and Sekeni as shown in Figure 8. For purposes of comparison, Chambuluka, Chisanu, Njereza and Samu villages under Water for People Malawi were randomly recruited into the study - making a total of eight villages.

3.5 Sampling

3.5.1 Sample size

In order to determine the required sample size for the survey, both an online Raosoft Sample Size Calculator (http://www.raosoft.com/samplesize) and formula were used. A sample size of 377 households was required (Appendix 3). The required household survey sample size depends on chosen values for margin of error, confidence level and the response distribution. The margin of error (also known as confidence interval) is the amount of error that can be tolerated. If a margin of error of 5% is selected, and 50% answer yes, you can assume between 45 – 55% to be correct. The confidence level is how sure you are of something being correct. Expressed as a percentage, it represents how often the true percentage of the population who would pick an answer lies within the confidence interval (Raosoft, 2004, Creative Research Systems, 2006). In the calculation of the sample size for this survey, a margin of error of 5%, a confidence level of 95% and the response distribution of 50% were chosen. However, Younis (2006) recommended that household survey sample sizes in water and sanitation projects need not be more than 500. Furthermore, surveys should not be used as the single means of data collection, but rather as part of a toolset of different survey instruments collecting

different types of data. If other complimentary data collection processes are carried out, the sample size need not be larger than 400 (Younis, 2006). Thus, a total number of 400 households were surveyed in this study. Each village contributed a sample of households proportional to its size. Table 6 shows the distribution of households visited in each study village.

Table 6: Number of households surveyed by study village

Study village	Agency	No. of households	Proportion of Households (%)	Number of households surveyed
Chambuluka	WfP	256	11.7	47
Chisanu	WfP	74	3.3	13
Namila	SCHI	269	12.3	49
Njereza	WfP	231	10.5	42
Mwalija	SCHI	320	14.6	58
Mwanayaya	SCHI	310	14.1	57
Samu	WfP	125	5.7	23
Sekeni	SCHI	608	27.7	111
Total		**2,193**		**400**

3.6 Data collection

Data collection was carried out by the author and three experienced data collectors from the district. The data collectors have previously been involved with data collection in baseline surveys conducted by the SCHI. Both quantitative and qualitative methods were used in order to allow for triangulation of results.

A household questionnaire (Appendix 1) was administered to 400 households. Focus Group Discussions (FGDs) were conducted with separate male and female groups in all the eight survey villages (see Table 7). Observations on the state of repair and hygienic conditions of existing pit latrines were also made.

Table 7: Composition of FGD participants by sex

Village		Men	Women	Total
Chambuluka	FGD 1	10	0	10
	FGD 2	0	10	10
Chisanu	FGD 3	10	0	10
	FGD 4	0	10	10
Mwalija	FGD 5	10	0	10
	FGD 6	0	10	10
Mwanayaya	FGD 7	10	0	10
	FGD 8	0	10	10
	FGD 9	6	4	10
Namila	FGD 10	10	0	10
	FGD 11	0	10	10
Njereza	FGD 12	10	0	10
	FGD 13	0	10	10
Samu	FGD 14	10	0	10
	FGD 15	0	10	10
Sekeni	FGD 16	10	0	10
	FGD 17	0	10	10
Total		**86**	**84**	**170**

In each study village, 2 FGDs were conducted with both men and women groups but in separate groups for each sex of participants to allow for a more relaxed discussion among participants of the same sex. In Mwanayaya village, the community had tried to use urine as a fertilizer for their maize plot. Therefore, a third FGD was held with members of the VHC and WPC involved to learn their experiences.

3.6.1 Household survey

A household questionnaire was devised based on the KAP model (Section 3.2) to collect quantitative and qualitative data. Casley & Kumar (1988) described questionnaire surveys as 'almost indispensable' in the monitoring and evaluating of rural development projects and when used for baseline data collection, the authors add that data yielded from such surveys can 'help improve the design of the project considerably'. However, Pratt & Loizos (1992) suggest that although such surveys can be highly useful for gathering certain types of information, they can be inappropriate for gathering sensitive and personal data, either when the interviewer is a stranger or a member of the community who can not be trusted. Robson (1993), also mentions the view that 'the findings are seen as a product of largely uninvolved respondents whose answers owe more to some unknown mixture of politeness, boredom and a desire to be seen in a good light than to their true feelings, beliefs or behaviour'. Furthermore, when surveying households about sensitive and possibly shame-inducing topics such as defecation, entirely honest answers may not always come out (Robson 1993). These limitations of the questionnaire prompted this study to also use Focus Group Discussions (FGDs) to collect additional information on people's perceptions, norms, attitudes and beliefs regarding the EcoSan concept in the study area.

3.6.1.1 Selection of households

The Random Walk sampling procedure was used to select households for the survey in each village. This method involves randomly choosing a starting point and a direction within the target area and then interviewing the nearest household to that random starting point. After the first household has been surveyed, the surveyor continues in the same direction asking every subsequent N^{th} household on the route (where no inhabitant can be reached at the N^{th} household, the following household is interviewed). This continues until the quota is met (or no more households exist in that route). The higher the value of N, the better as the random walk covers a large

geographical path. This method of sampling is advantageous as it requires little preparation and is easy to carry out. As no households are pre-selected for sampling, no time is wasted 'looking' for the households from which to carry out the household survey (as may be the case in a pre-selected cluster sample). Furthermore, random walk sampling can be carried out without the requirement of any form of map, or information relating to households in the area, and can cover a large section of the study area representative of the different elements members making up the survey population.

In each study village, permission from the Village Headman (VH) was sought to conduct interviews in the village. Upon obtaining consent, the interview team requested the VH to direct them to the centre of the village. From here, the author randomly selected the direction of the interview. The first house was chosen at random by the interviewer. Selection of the next house was achieved by locating the nearest front door to the present house, and counting the necessary interval (this was pre-determined by dividing the total number of households in a village by its sample size). Thus after the first house, the *Nth* house was visited. This random nature of selecting a subsequent house decreased the risk of simply choosing an adjacent house. In addition, this maximized the selection of houses off the main village paths. At each household, the interviewer asked to speak to the head of the household. The purpose of the interview was explained and with his/her consent the interview was conducted. If the head of the household was absent, then the most senior member of the household present was interviewed. In the absence of both the head of household and an adult person or refusal to participate, the interviewer moved to the next house. Due to time and logistical restraints it was not possible to return to same house at a future date.

3.6.2 Focus Group Discussions (FGDs)

FGDs have been found to be very useful when identifying beliefs, attitudes and behaviours about sanitation (Duncker *et al.,* 2007). The open-ended nature of questions provide an opportunity for clarification of responses, probing and observing the norms in the community. The participatory nature of the FGDs allows for a more in-depth data collection when compared to the use of the standard questionnaire which *"reduces the highly contigent nature of situation-sensitive behaviour to bits and pieces of disconnected information, stripped of the essential context"* (Mishler, 1986).

FGDs involve discussions with the community where a group of people deemed particularly relevant to the topic under study are invited. The major strengths of FGDs are that information can be rapidly drawn from a wider number of people; group participation can reduce individual inhibitions which may exist and in some instances information obtained from a group can be more reliable than information obtained from an individual (Casley and Kumar 1988). However, Casley and Kumar (1988) warn that there can be dominance of certain individuals in discussions, peoples' reluctance to express their true opinions in the company of others and a greater susceptibility to interviewer bias. To overcome this problem, Pratt & Loizos (1992) suggest collective and individual opinions should be noted and advise on interviewing mainly homogenous groups as different social status', standings, genders etc. may result in some group members not voicing their opinions due to feelings of discomfort, inhibition, fear, respect or uncertainty. Consequently, this study conducted FGDs with separate groups of men and women. A topic guide (Appendix 2) was developed to guide the facilitator during the FGDs.

3.6.3 Pre-testing

The questionnaire (Appendix 1) was translated into the national language, Chichewa, to facilitate communication between the researchers and interviewees and, more importantly, to promote responses from the latter. The questionnaire was then pre-tested in one of the villages located neither in the catchment area of SCHI nor that of Water for People. Due to time constraints, the final version of the questionnaire was not back translated into English. This is an important research aspect in order to ensure that the meaning of the questions is not lost due to translation. Information from the pre-test was used to refine the topic guides for the FGDs (Appendix 2).

3.7 Quality assurance mechanisms

Multiple data collection methods were employed to gather a wide scope of views on the subject and to achieve triangulation. The methods included a household questionnaire, FGDs and an observational checklist. More in-depth information was gathered through the FGDs which served as a means of "checks and balances". This ensured that information about community perceptions, attitudes and beliefs and other sensitive issues were not omitted from the study. Furthermore, the author attended the interview sessions to assess interview practices; check all completed questionnaires for errors; and general quality control.

3.8 Ethical considerations

The protocol was determined to be a programme evaluation, not subject to human subject review by the National Health Sciences Research Committee and University of Malawi ethics committee. In addition, no names were recorded during the interviews and FGDs. Consent was sought prior to interviews and discussions. Participation was voluntary and thus respondents were free to withdraw at anytime if they felt like doing so. Respondents were informed on how the data will be used to improve sanitation in the district. Respondents were also assured that neither answer was right nor wrong. No judgement was passed on the respondent's views.

3.9 Data analysis

Data entry was completed in Microsoft Access. Data was double-entered and validated prior to analysis. Records showing errors were re-entered and checked manually to produce the final data set for analysis. Analysis was done using Epi Info 2002 (Statcalc) and STATA 9.0. Cross tabulations were used to describe the sample; determine the difference between two groups and explore relationships between two variables. Chi Square test was used to statistically test the significance of the relationships between two variables. In interpreting the results, any relationship at $p<0.05$ was taken to be significant. If the P-value is 0.05, there is a 95% probability that (1) the results did not occur by chance; (2) the null hypothesis is false; and (3) there really is a difference between the groups. The prevalence ratio (PR), instead of the odds ratio (OR) was also calculated as a way of comparing whether the probability of a certain event occurring is the same for two groups.

The PR was more appropriate to use than the OR as all the eight villages surveyed were exposed to the intervention (were implementing the EcoSan programme). Odds ratio is more appropriate in case-control studies. In this survey, there were no control villages. In interpreting the results, a PR of 1 implies that the event is equally likely in both groups and a PR greater than 1 implies that the event is more likely in the first group than the second group. If the PR less than 1, it implies that the event is less likely in the first group than the second group. Finally, the difference between proportions was tested using the 95% Confidence Interval (CI) calculated using the Confidence Interval Analysis (CIA) software version 1.2.

Qualitative data from FGD recordings were transcribed verbatim. Analysis of the data was iterative and manually done. Content analysis was used to summarize the narrative data. The data was given codes basing on significant statements which were then isolated into themes or patterns being explored in the study. Similar codes were combined and significant quotes were noted and are reported in the findings.

CHAPTER 4 RESULTS

4.1 Introduction

This chapter presents research findings of a household survey whose aim was to explore the various socio-cultural aspects of EcoSan in Chikhwawa District. However, in order to comprehend fully the context in which a new sanitation technology can be accepted or adopted in a community, it is essential to understand the norms, attitudes and perceptions toward the existing sanitation systems at household level. Therefore, this chapter first presents findings on availability, use and characteristics of household latrines. In general, the findings are presented according to the main themes drawn out of the findings in relation to the research objectives. The first section of this chapter describes the background characteristics of the respondents who were sampled in the household survey.

4.2 Background characteristics of the respondents

A total of 400 respondents were interviewed. Of these; 31% (n=123) were male and 69% females (n= 277). Sixty-eight percent were from SCHI villages (n = 271) and 32% from WfP villages (n = 129).

4.2.1 Age and gender

The age and sex of respondents is presented in Table 8. Households sampled during the survey consisted mostly of members between the ages of 21 and 40 years (66%), the majority of whom were females (n = 196/277; 71%).

Table 8: Age and sex of respondents

Age group (years)	Sex		Total *n* (%)
	Female *n* (%)	Male *n* (%)	
20 or less	27 (10)	2 (2)	29 (7)
21 - 40	196 (71)	70 (57)	266 (66)
41 - 60	43 (15)	32 (26)	75 (18)
≥ 61	11 (4)	19 (15)	39 (9)
Total	277 (69)	123 (31)	400 (100)

The age range of the respondents was 77 years, a minimum of 13 years, a maximum of 90 years and a median of 31 years as shown in Table 9.

Table 9: Median age of respondents, size of households and users per latrine

Variable	Median	Mean	Std. Dev.	Min	Max
Age	31	35.15	14.29	13	90
Number persons per household	4	4.32	1.72	1	11
Number of users per latrine	7	7.68	5.39	1	42

The gender split of the respondents in the questionnaire household survey was 69% female and 31% male (Table 8). This was due to the fact that, when the research was conducted, the female household members were more readily available during the day (being at home) while the male household members were away from the homes reportedly working in the fields or doing some piece jobs.

4.2.2 Marital status

Figure 9 presents the marital status of the sampled respondents. Eighty-three percent of the them were married, 8% were single (never married before), 5% were widowed and the rest were either divorced or separated.

4.2.3 Ethnicity

The Mang'anja formed 67% of the sample while the Sena were 22%. The other respondents belonged to minor ethnic groups - Chewa, Ngoni, Lomwe, Yao, Nkhota, Tumbuka, Tonga and Zulu as shown in Figure 10.

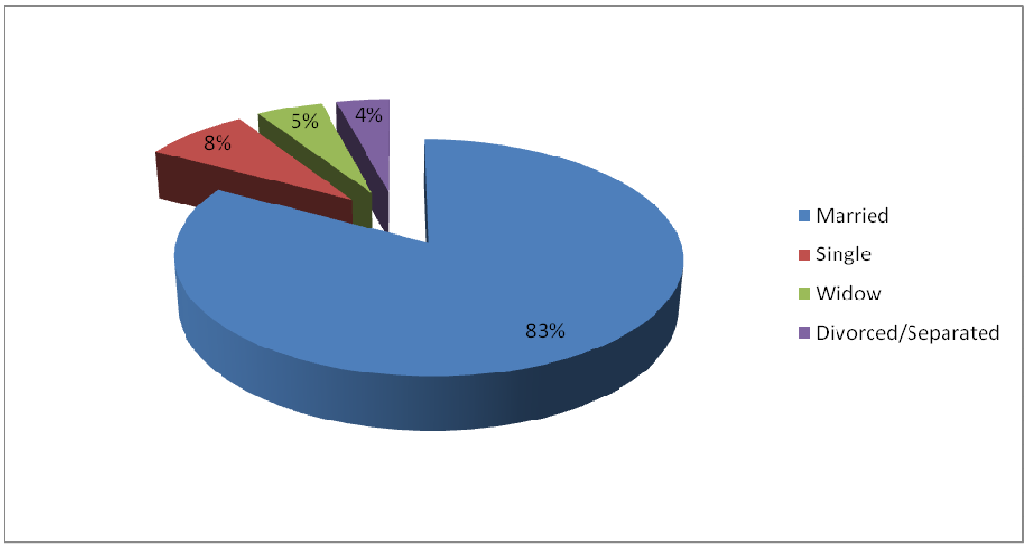

Figure 9 : Respondent's marital status

4.2.4 Religion

In terms of religious affiliations, 90% of those interviewed were Christians, 2% were Muslims and 8% did not follow any religion.

4.2.5 Income

4.2.5.1 Source of income

The monthly sources of household income are presented in Figure 11. Results show that the majority of the income of the households consisted of subsistence farming (37%), piece jobs - providing both skilled and unskilled labour (33%) and small-scale trade or businesses (27%). Employment as a source of household income accounted for only 2% of the households. One percent of the households rely on children sending them money every month.

Among female-headed households (n= 56), the major source of income was subsistence farming (45%); small-scale businesses (23%); unskilled labour (14%); piece jobs (11%) and children sending them money (5%). Only one female headed house had employment as a source of income (2%).

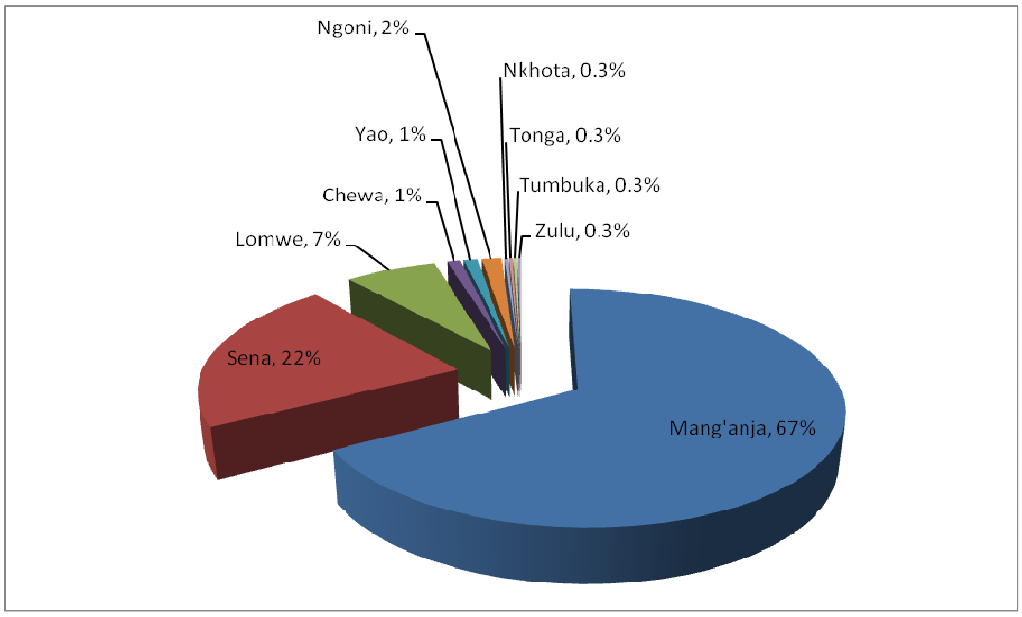

Figure 10: Proportion of respondents according to ethnic group

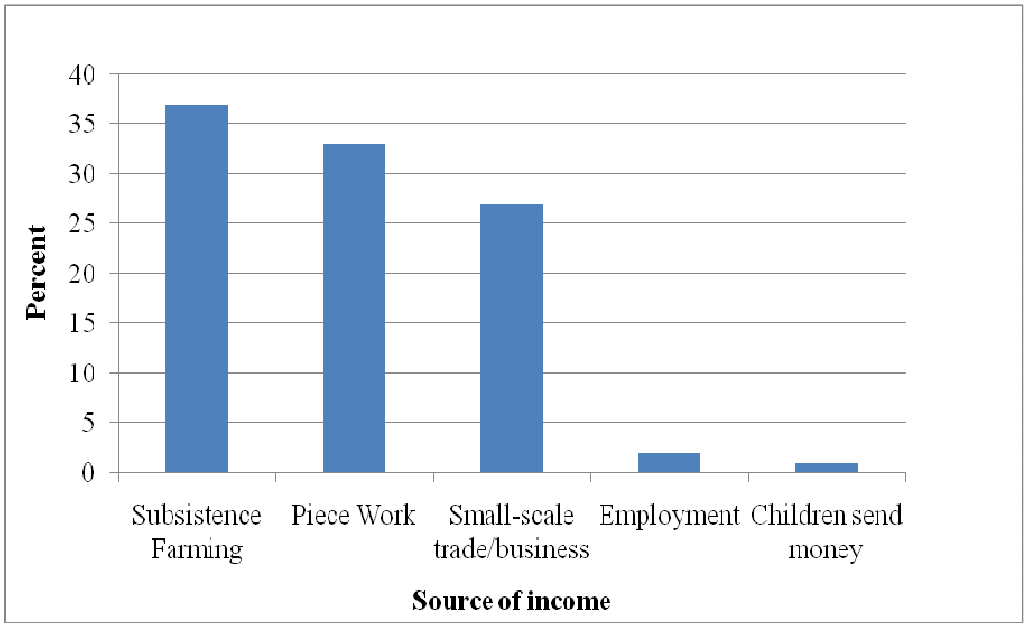

Figure 11: Percentage distribution of sources of household income

4.2.5.2 Average income

All the households that were interviewed had some source of income. Figure 12 indicates that only 20% of all households had an average monthly income of above MK5, 000 per month (at least USD 1/day). The majority of them were male-headed households (n= 81; 96%). Respondents were asked to indicate whether their income was regular and dependable. Only 47% indicated having a regular and dependable household income.

4.2.5.3 Decision making on expenditure of household income

Husbands were reported as the main decision makers on expenditure of household income (59%). Twenty-three percent of expenditure on household income was decided upon jointly by husband and wife.

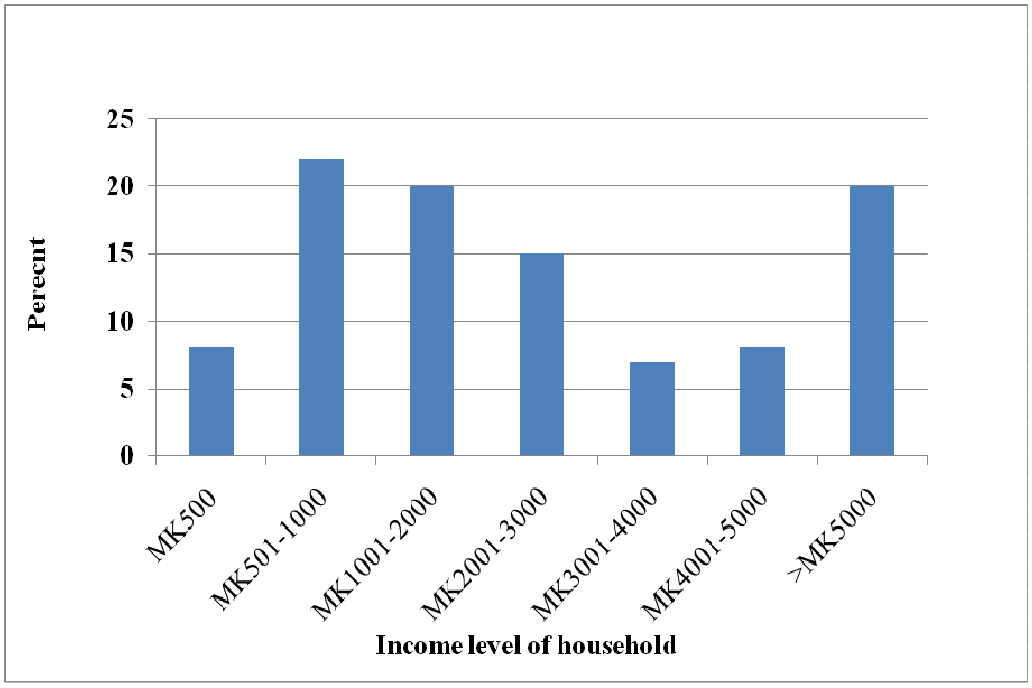

Figure 12: Income level of households

4.2.6 Education

The level of education of respondents was varied as presented in Table 10. In general, 66% of the people interviewed had been to school. Fifty-five per cent had been educated to primary school level and 11% to secondary level. An equal proportion of male and female respondents had attended primary level of education. Overall, of those who had attended the primary level of education, only 38% (n =84) were literate, 32% (n =71) partially literate (could read only parts of the sentence) and 30% (n = 65) completely illiterate. The majority of these (70%) were aged between 21 – 55 years. Thirty-four percent of the respondents had not received any formal education at all. Of these, three in five were below 40 years (n = 84; 61%) and the majority of them were females (n = 106; 77%).

Table 10: Respondent's highest level of school attended by sex category

Highest level of school	Sex		Total *n (%)*
	Male *n* (%)	**Female** *n* (%)	
None	32 (26)	106 (38)	138 (34.5)
Primary	68 (55)	152 (55)	220 (55.0)
Secondary	23 (19)	19 (7)	42 (10.5)
Total	**123 (31)**	**277 (69)**	**400 (100)**

4.3 Household characteristics

Information about the composition of households by sex of the household head and household size is presented in Table 11. The data show that 86 percent of households in which the interviews took place were male-headed while the rest were female-headed (14%). The number of residents who lived in each household varied. Seventy-eight percent of households contained between one and five people. The rest (22%) had six or more people. The mean number of residents per household was 4.2 (Range 2 – 11; S.D. 1.72).

Table 11: Percent distribution of households by sex of head of household and by household size (July – August, 2008)

Characteristic	Frequency	Percent
Sex of head of household		
Male	344	86
Female	56	14
Total	**400**	**100**
Number of usual members		
1	21	5
2	40	10
3	79	20
4	92	23
5	80	20
6	46	12
7	34	9
8	5	1
9+	3	1
Total	**400**	**100**
Mean size	4.2	

4.4 Household sanitation situation

Respondents were asked to indicate whether or not a household had any form of latrine for defecation. Among those respondents who said they had a latrine, a physical inspection of the existing latrine was conducted soon after the interview for purposes of triangulation of their responses and also to determine the characteristics of the latrine. Fifty-four percent of all households sampled (n = 216) were observed to have a functioning latrine[3]. The rest (n= 184; 46%) had no pit latrines.

[3] A "functioning" latrine was defined as one which is used for its intended purpose (defecation only) because it had not collapsed or been filled in.

4.4.1 Household latrines and their characteristics

A variety of latrines were used by the households as shown in Table 12. Ninety four percent of the households used traditional pit latrines (without and with San Plats); 81% of these with mud floors, 17% with San Plats and 2% with cement screed. Twelve households (4%) had constructed the Arborloos – all with a San Plat. A single household had a VIP latrine.

Table 12: Type of latrine and floor structure

Latrine Type	Floor Structure			Total *n* (%)
	San Plat *n (%)*	Cement Screed *n* (%)	Mud *n* (%)	
Traditional Pit Latrine	34 (17)	5 (2)	164 (81)	**203** (94)
Arborloo	12 (100)	0 (0)	0 (0)	**12** (5.5)
VIP	0 (0)	1 (100)	0 (0)	**1** (0.5)
Total	**46** (21)	**6** (3)	**164** (76)	**216** (100)

Twenty-one percent of all households were reported to have San Plats. Four households reported that their San Plats were broken before they could be installed. Of those who did not have San Plats, 1% already had another latrine with cement floor; 40% had no money to buy; 34% claimed there were no stocks left at the village headman's house for sale; 5% were expecting to receive them for free from the VHC; 4% did not know what a San Plat is; 6% thought San Plats were for those who construct new pit latrine and they had old latrines in use and 10% expected their landlords to buy as they were living on rented premises.

Table 13 shows the wall structure of existing latrines. The main material used in the construction of walls was unburnt bricks (49%), fired bricks (38%) and pole and mud (5%). In addition to these, a wide range of other miscellaneous building materials were used such as hessian sacking (5%), plastic sheets (2%), reeds (1%) and old corrugated iron sheets (0.5%).

Table 13: Type of latrine and wall structure

Latrine Type	Wall Structure							Total
	Fired Brick *n* (%)	Unburnt Brick *n* (%)	Pole / Mud *n* (%)	Plastic Sheet *n* (%)	Sack Screen *n* (%)	Iron Sheet *n* (%)	Reeds *n* (%)	**n (%)**
Traditional	**80** (39.)	**101** (50)	**8** (4)	**2** (1)	**10** (5)	**1** (0.5)	**1** (0.5)	**203 (94.0)**
Arborloo	**2** (17)	**4** (33)	**2** (17)	**2** (17)	**1** (8)	**0** (0)	**1** (8)	**12 (5.5)**
VIP	**1** (100.)	**0** (0)	**0** (0)	**0** (0)	**0** (0.)	**0** (0)	**0** (0)	**1 (0.5)**
Total	**83 (38)**	**105 (49)**	**10 (5)**	**4 (2)**	**11 (5)**	**1 (0.5)**	**2 (1)**	**216 (100)**

Latrines were roofed using different types of roof covering materials as shown in Table 15. The majority of pit latrines (59%) had thatch roofs, 11% corrugated iron sheet and 3% plastic sheet. Twenty-seven per cent of the pit latrines had no roof at all.

Table 14: Type of latrine and roof structure

Latrine Type	Roof Structure				Total
	Iron sheet n (%)	Plastic sheet n (%)	Thatch Grass n (%)	None n (%)	**n (%)**
Traditional latrine	**22** (11)	**6** (3)	**121** (60)	**54** (27)	**203** (94.0)
Arborloo	**0** (0)	**0** (0)	**7** (58)	**5** (42)	**12** (5.5)
VIP	**1** (100)	**0** (0)	**0** (0)	**0** (0)	**1** (0.5)
Total	**23** (11)	**6** (3)	**128** (59)	**59** (27)	**216** (100.0)

Table 15 shows the various construction materials for latrine doors. Results show that almost half of the latrines (46%) had no doors. Only 10% of the latrines had wooden doors. The rest had makeshift doors made of sack (21%), reeds (17%), old corrugated iron sheet (3%) and thatch (3%).

Table 15: **Type of latrine and door structure**

	Door material						
Latrine Type	Thatch *n* (%)	Reed *n* (%)	Sack *n* (%)	Wood *n* (%)	Old Iron Sheet *n* (%)	None *n* (%)	**Total *n* (%)**
Traditional latrine	**5** (3)	**34** (17)	**40** (20)	**21** (10)	**7** (3)	**96** (47)	**203** (94.0)
Arborloo	**1** (8)	**2** (17)	**6** (50)	**0** (0)	**0** (0)	**3** (25)	**12** (5.5)
VIP	**0** (0)	**0** (0)	**0** (0)	**1** (100)	**0** (0)	**0** (0)	**1** (0.5)
Total	**6** (3)	**36** (17)	**46** (21)	**22** (10)	**7** (3)	**99** (46)	**216** (100)

Results show that the traditional pit latrines are preferred to composting latrines as illustrated by the following quotes:

" I was advised to build an Arborloo which is shallow and easy to dig but I opted to build a deep traditional pit latrine so that we could use it for a longer period. We are many in this family"

Male FGD Participant, Sekeni Village

"We like the traditional pit latrine because we can use it for a number of years if it does not collapse during rains and flooding"

Female FGD participant, Mwalija Villages

4.4.2 Respondent and household characteristics by latrine status

Table 17 summarises the respondent and household characteristics by latrine status. According to the results, age and sex of respondent and the number of persons living in a household did not influence ownership of a pit latrine at the household. However, respondents who had attained formal education were 2.10 times more likely to have a pit latrine than those who had never been to school (PR: 2.10; 95% CI: 1.35 to 3.26; $\chi^2 = 12.15$; $\mathbf{p} < 0.0004896$). Those in marriage were 2.44 more likely to have a pit latrine than those who were not married (i.e. single, divorced, widowed) during the survey (PR: 2.44; 95% CI: 1.37 to 4.36; $\chi 2 = 10.71$; $p<0.0010671$). The respondent's occupation was also an important factor contributing to possession of a pit latrine. Those employed and skilled labourers were 5.54 times more likely to own a pit latrine than those who were not (PR: 5.54; 95% CI: 2.22 to 16.49; $\chi^2 = 17.19$; $p< 0.0000337$). Those with average monthly income of more than MK5,000 were 3.80 times more likely to construct a pit latrine than those earned less MK5,000 or less (PR: 3.80; 95% CI: 2.08-6.98; $\chi^2 = 23.12$; $p< 0.0000015$). If the head of the household was male, that household was 2.38 times more likely to have a pit latrine than if female (PR: 2.38; 95% CI: 1.28 – 4.47; $\chi^2 = 8.77$; $p<0.0030703$).

Table 17: Summary of respondent and household characteristics by latrine status

Variable	Latrine present *n* (%)	Latrine absent *n* (%)	Total *n* (%)	PR	95% CI	χ^2	p-value
Age							
40 or less	160 (54)	135 (46)	295 (74)	1.04	0.65 - 1.66	0.03	0.8731922
> 40	56 (53)	49 (47)	105 (26)	0.96	0.60 - 1.54		
Sex of respondent							
Female	150 (54)	127 (46)	277 (69)	1.02	0.65 - 1.60	0.01	0.9272475
Male	66 (54)	57 (46)	123 (31)	0.98	0.63 - 1.54		
Level of education							
Primary/Secondary	158 (60)	104 (40)	262 (66)	2.10	1.35 - 3.26	12.15	0.0004896
No education	58 (42)	80 (58)	138 (34%)	0.48	0.31 - 0.74		
Marital status							
Married	192 (58)	141(42)	333 (83)	2.44	1.37-4.36	10.71	0.0010671
Unmarried	24 (36)	43 (64)	67 (17)	0.41	0.23-0.73		
Source of income							
Skilled labour/employed	34 (85)	6 (15)	40 (10)	5.54	2.22-16.49	17.19	0.0000337
Unskilled labour/unemployed	182 (51)	178 (49)	360 (90)	0.18	0.06- 0.45		
Monthly average income							
MK5000 or less	153 (48)	166 (52)	319 (80)	0.26	0.52-0.73	23.12	
>MK5000	63 (78)	18 (22)	81 (20)	3.80	2.08-6.98	23.12	0.0000015
Religion							
Religious (Christian/Muslim)	207 (56)	163 (44)	370 (92)	2.96	1.25-7.19	7.52	0.0060999
No religion	9 (30)	21 (70)	30 (8)	0.34	0.14-0.80		
Head of household							
Male	196 (60)	148 (40)	344 (86)	2.38	1.28 – 4.47	8.77	0.0030703
Female	20 (36)	36 (64)	56 (14)	0.42	0.22 – 0.78		
Size of household							
5 persons and less	163 (52)	149 (48)	312 (78)	0.72	0.43-1.20	1.76	0.1844630
> 5 persons	53 (60)	35 (40)	88 (22)	1.38	0.83-2.30		
Agency							
SCHI	156 (58)	115 (42)	271 (68)	1.56	1.0-2.43	4.30	0.0381490
WfP	60 (47)	69 (53)	129 (32)	0.64	0.41-1.00		

In comparison, there were proportionately more pit latrines in villages that had been reached by any of SCHI sanitation efforts (58%) compared to 47% of WFP villages (95% CI: 37.7 to 55.5%).

Overall, results show that 46% (n = 184) of households surveyed did not have a latrine of any kind. Of these, 96% told the interviewer that they think a latrine is important. Responding to a question on where members of their household defecate, 48% claimed they make use of their neighbour's latrine and 52% openly said they use the bush.

Of all villages studied, Mwalija had the highest proportion of households using the bush (71%), seconded by Mwanayaya (62%) – both villages are under the SCHI programme.

Table 18: Households that have no latrine, Think latrine is important, and What they currently use for a latrine by village

	Households that have no latrine (%)	**Of households that have no latrine**		
		Think latrine is important (%)	Use neighbour's latrine (%)	Use bush (%)
All Villages	**46**	**96**	**48**	**52**
Chambuluka	48	100	87	13
Chisanu	71	75	60	40
Mwalija	58	91	29	71
Mwanayaya	55	100	38	62
Namila	13	92	46	54
Njereza	49	100	38	62
Samu	18	100	75	25
Sekeni	24	96	60	40

Common defecation practices were explored with both men and women groups. The majority of the participants in the FGDs indicated that most people in their villages defecate in the bush than in the latrine. This practice appears to be a well established norm in the area as demonstrated by the following quotes:

" Here as long as the bush is around, we can not stop defecating in the bush. ….you know it's so simple and quick to defecate in the bush (kunya sukutenga nthawi bola utule mtolo)" ……Male FGD participant – Chambuluka Village.

"Sometimes we take a bicycle just to make other members of the household think you are on a long journey when in fact you are simply going to the bush to defecate" ……..Male FGD participant – Mwalija Village.

"When I smell someone's faeces in the latrine, I feel dizzy and fail to defecate"
Female FGD participant, Chambuluka Village

" The smell in the latrine makes me feel like vomiting"
Female FGD participant – Njereza Village

" I can not use a pit latrine because I do not like the smell. Also I am afraid of the snakes which hide in the latrine. I am speaking from experience. I once found a snake in the pit latrine waiting for me" …….Male FGD participant, Mwalija Village

The possibility of achieving open defecation free (ODF) villages was further explored in the focus groups. Most participants felt this would only be possible if the village chief could order every household to build and use a pit latrine and that those who will be found/seen still using the bush must be charged and fined. To make this approach workable, participants suggested the introduction of secret men/women on sanitation to oversee compliance with the village chief's order. It was further said those also caught using their neighbour's latrines should be equally fined. However, the village chief will have to be role model as expressed in this quote:

"Here it will be very difficult to have an ODF village because the village chief himself does not have a pit latrine. He is not setting a good example"

Male FGD participant – Mwalija Village

4.4.3 Latrine construction

4.4.3.1 Gender roles regarding the construction of latrines at household level

The survey explored gender roles with respect to the construction of latrines at household level. Table 19 shows who constructed the household latrine.

Table 19: Who the latrine builders are

Latrine builder	Frequency	Percent
Men	191	88
Women	4	2
Other (landlords)	21	10
Total	**216**	**100**

Of the 216 latrines, 88% were reported to have been built by men. Of these, 64% were built by husbands, 15% by hired masons and 9% by hired masons. Of those latrines that were built by women, three (1.5%) were built by widowed/divorced women and one by a daughter (0.5%). Ten percent of the latrines were reportedly built by landlords. The survey did not ask for the sex of the landlord.

While men were responsible for digging and building the latrine, the woman's roles were to collect water for making bricks; smearing the floor and wall; sweeping/cleaning the latrine everyday and finding grass for thatching the roof. However, some male participant in the focus groups lamented over doing what they felt was a woman's job as illustrated in the following quotes:

"It not always true that it is a woman's job to find grass for thatching the roof of a latrine. In this village men too cut grass for roofing pit latrines"

Male FGD Participant, Mwalija Village

"There are some clever women who would leave everything to a man, including cutting of grass thatch and even smearing the floor"

Male FGD Participant – Chambuluka Village

On the other hand, one woman participant had this to say about the men:

"These days of gender equality both the husband and wife can decide to build a latrine. But some men are lazy, so as a wife you have to keep on reminding your husband about it. If you are lucky, he will listen to you and build the latrine. Otherwise you are told off to go and get married to husband who can build you a latrine"……..Female Participant – Chisanu Village

4.4.3.2 Decision making dynamics on construction of latrines

Respondents were asked to indicate who decided on the construction of the present household latrine. Of the 216 latrines constructed, 50% were reported to have been decided upon by household members, 27% by husbands, 5% by wives and 3% each by landlords and single, divorced or widowed men and women..

Members of the Village Health Committee (VHC[4]) and Health Surveillance Assistants (HSAs [5]) were reported to have influenced the construction of 11% and 1% of the latrines, respectively. The majority of participants in FGDs held the view that both man and woman can decide to build a latrine

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[4] A group of selected villagers who volunteer to take a lead role in promoting the general health of their village. They work hand in hand with the HSA.

[5] This is the lowest cadre of health personnel under the Environmental Health Services Section of Malawi's Ministry of Health. The HSA is the point of contact between the formal health service delivery system and the community. HSAs work in the community in various aspects of environmental health. However, their job description is such that they implement activities on a wider range of health services such as reproductive health, maternal and child health, and other health related areas. Annex 4 provides a historical background of the origin of HSAs. The HSAs undergo 8-week training before they are deployed in various communities.

4.4.3.3 Problems associated with construction of pit latrines

Among household respondents without pit latrines (n = 184), 56% were lazy to construct pit latrines, 24% had experienced pit latrine collapse during the rains and were therefore discouraged, 7% were female-headed households and had no one to dig pit latrines for them, 7% felt beliefs/customs/taboos were a deterrent factor, 3% claimed they had no space where to dig pit latrines. Another 3% said they had no building materials. Figure 14 presents the problems associated with the construction of pit latrines in the area.

4.5 Usage of pit latrines

In households with pit latrines (n = 216), respondents were asked to mention what motivated them to have a pit latrine and for how long they have used the current latrine. The study also sought respondent's views on whether or not it is an acceptable norm for (a) men and women and (b) children and adults to share one pit latrine.

4.5.1 Drivers/motivation for pit latrine use

Among households with pit latrines, prevention of diarrhoeal diseases (69.7%), privacy (20.6%), convenience (6.1%) and prestige (3.6%) were mentioned as motivational factors for the use of latrine

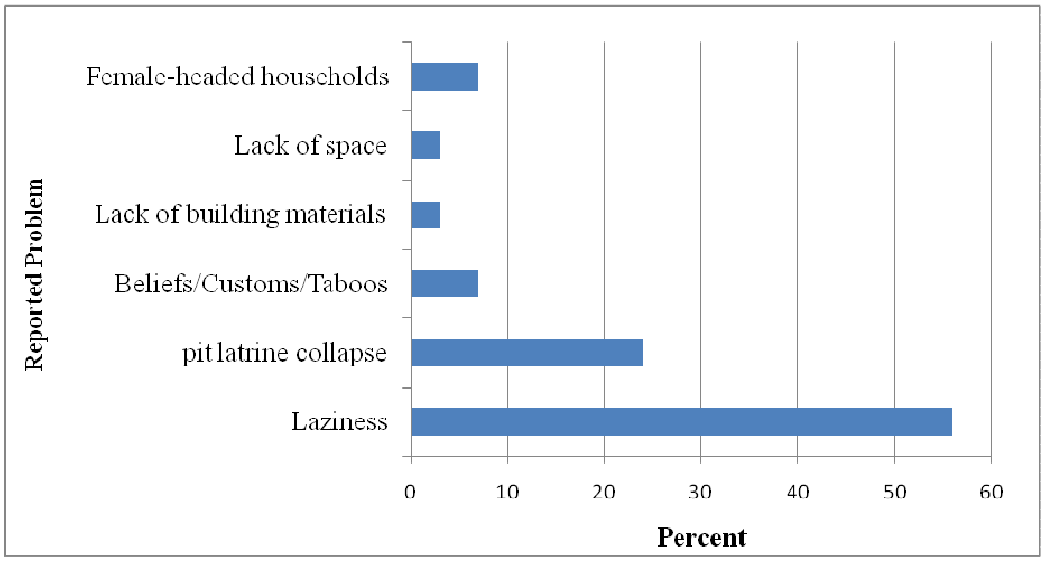

Figure 14: Reported problems associated with the construction of pit latrines

4.5.2 Life span of pit latrines and number of users per latrine

Almost half of the latrines constructed (49%) had been in use for at least a year, 27% between 1 and 2 years, 19% between 2 and 3 years and 5% had been used for more than 3 years. The number of persons using one pit latrine ranged from 1 – 42 people, with a median number of 7 persons (SD: 5.4). The highest latrine-person ratio was recorded in Sekeni village. This village is located in a peri-urban area where most households live in rented houses.

4.5.3 Shared use between men and women

Sixty-four percent of respondents with pit latrines were of the view that men and women should not use the same pit latrine. The major reason given was the shame that follows after people of opposite sex meet in the latrine and see each other's private parts, especially when one is not someone's spouse. Upon visual inspection of the latrines, it was observed that most latrines did not have lockable doors to ensure total privacy. Almost half (46%) of the latrines had no doors at all and

another 44% had make shift doors: 21% had a sack screen, 17% reed doors, 3% grass thatch doors and 3% old corrugated iron sheet (Table 15) . The norm is to knock the sides of the wall and wait for a response from one inside the toilet (usually in form of a forced cough). However, to avoid being found in the latrine, one respondent had this to say:

"When I go to the latrine, I hang my skirt or chitenje[6] on the door to indicate that the latrine is occupied"

Female Respondent, Mwanayaya Village

Sharing was not seen as a problem if a man finds his own wife and vice-versa in the latrine. Other reasons mentioned were that the pit latrines become unhygienic because women throw in their menstrual pads (1%) and fear of being raped (1%). To illustrate this fear, one respondent had this to say:

"Sometimes a man whom you had previously refused to love would deliberately follow you to the latrine and just enters without knocking so that he has a view of your nakedness …....and he just says sorry … sorry… I did not know there is someone inside"

Female Respondent, Namila Village

In the focus groups, some male participants felt there was no problem for men and women to share one latrine save for the lack doors while some expressed their strong reservations on the use of the same latrine by a woman who has just delivered a baby (*M'bvade*). Culturally, she is regarded as unclean.

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[6] A piece of cloth usually 2-metre long worn by women around the waist

"We do not share the same latrine with an M'bvade for we would suffer from severe backache".

Male FGD Participants – Sekeni and Mwalija Villagea

4.5.4 Shared use between children and adults

Sixty-eight of the respondents said it was not acceptable for children and adults to use the same latrine. This is what one male participant in the FGDs said:

"The way our latrines are built, there is no door which you can lock once you are inside.. The norm is that you knock the wall before you enter. But a child can not always remember to knock and s/he finds you naked defecating. S/he then runs away and tells her/his friends that s/he found you in the latrine… sometimes even describing how your private parts look like. It is very shameful when you come out of the latrine. There is no respect in sharing the latrine with children".

Male FGD Participant – Chambuluka Village
Female FGD Participant – Mwalija Village

Thirty percent of the respondents claimed children make the latrines filthy as they often defecate on the floor. Three respondents feared there would be transmission of diseases between adults and children while one respondent feared children would fall into the pit.

4.5.5 Use of handwashing facilities

Only 6% of the households had hand washing facilities located next to their latrines. Of those who did not have hand washing facilities, 34% said they did not know how to make them; 29% said handwashing facilities were unhygienic; 26% claimed they were used to washing hands at the house (bath shelter) after visiting the toilet; 10% reported that their handwashing facilities were either removed or vandalized by children and animals (cattle and goats) and 1% reported that their handwashing facility was broken.

These two quotes demonstrate how some respondents felt about hand washing facilities:

"We do not wash hands at the pit latrine. We are not Muslim"

Female Respondent, Sekeni Village

"It is a waste of time washing hands at the latrine"

Female Respondent, Mwanayaya Village

4.6 Composting latrines

4.6.1 Proportion of households with composting latrines

Section 4.4.1 shows that only 6 % of all households surveyed had constructed composting latrines – all were the Arborloo type. Of these, 75% were built in male headed households and 25% in female-headed household. The Arboloos were significantly higher in male-headed households than female-headed household [95% CI: 7.2% to 52.4%]. A similar observation was made in respondents who were married (75%) against those that were unmarried (25%) [95%CI: 7.2 to 52.4%]. Arborloos were also significantly higher among respondents who had ever attended formal education (68.8%) than those who had not (31.3%) [95% CI: 11.0 to 58.7%]. With respect to EcoSan implementing agencies, 37.5% of the Arboloos were built in SCHI villages and 62.5% in WFP villages. This difference in proportions was not significant (95% CI: 35.4 to 84.8%). Further analysis of data shows that households in SCHI villages were less likely to own a composting latrine than their counterparts in WFP villages (PR = 0.23; 95% CI: 0.05 to 0.87; p <0.0096052) as shown in Table 20. This could be attributed to good sensitization of the community in SCHI villages. This is what one respondent in WfP villages had to say:

"Water for People came here to construct a Fossa Alterna at the chief's house but they did not teach us how faeces are used as fertiliser"

Male FGD Participant, Chambuluka Village

Table 20: Ownership of Arborloo by implementing agency

Agency	Arborloo present *n* (%)	No Arborloo *n* (%)	Total *n* (%)
SCHI	4(6.5)	267 (93.5)	271 (100)
WfP	8 (1.4)	121(98.6)	129 (100)
Total	12 (3)	388 (97)	400 (100)

PR: 4.75; 95% CI= 1.24-21.88; $\chi^2 = 7.49$; p<0.0101006

Table 21 shows that male respondents were more likely to own an Arboloo than female respondents (PR: 4.75; 95%CI: 1.24 – 21.88; p<0.0101006)

Table 21: Sex and ownership of Arborloo

Respondent's Sex	Arborloo present *n* (%)	No Arborloo *n* (%)	Total *n* (%)
Male	8 (6.5)	115 (93.5)	123 (100)
Female	4 (1.4)	273 (98.6)	277 (100)
Total	12 (3)	388 (97)	400 (100)

PR: 4.75; 95% CI= 1.24-21.88; $\chi^2 = 7.49$; p<0.0101006

Those with composting latrines (n=12) were asked why they had chosen to build the Arborloo. Two major reasons cited for their choice were that the Arborloo is easy to build (not too deep to dig the pit) and their desire to plant fruit trees. It is felt that Arborloo will gain popularity in the near future. In loose sandy collapsible soils, the Arborloo appears to be an alternative solution. This is what some participants in the focus groups had to say about the Arborloo:

"People are beginning to like the Arborloo because it is easy to dig. Even a woman can dig." ……. Female FGD Participant, Njereza Village

"Here our soil is very loose making our unlined latrines collapse every rainy season. Now I have decided to build an Arborloo with a woven basket to prevent the sides of the pit from collapsing" ……Male FGD Participant – Mwalija Village

4.6.2 Proportion of households who had ever seen composting latrines

Thirty-two percent of all households surveyed had ever seen composting latrines. Of these, 86% had seen the Arborloo, 10% Fossa Alterna and 4% Skyloo. The majority of the composting latrines (95%) were seen in their respective villages, 2% at primary schools and 2% elsewhere outside the district. Of the composting latrines that were seen in the village, 10% were seen at the Village Headman's house and only 6% in the yards of households belonging to VHC members. No one mentioned having seen a composting latrine at the HSA's household.

The majority of those who had seen composting latrines had not built them. They prefer traditional pit latrines to Arborloos because the former can be used for longer time before they become full and a new one is required to be constructed. Lack of san plats was another reason claimed by the respondents for not having constructed an Arborloo.

4.7 Nutrition

4.7.1 Gardens

Not all the households visited had domestic gardens and fruit trees. Fifty-seven percent had exclusively maize gardens, 27% had both maize and other crop gardens such as rice, sorghum, millet, cotton, and 16% did not have any form of garden. The main reason provided by these respondents was that they were renting houses in the village or had just relocated to the village.

4.7.2 Use of fertiliser

A minority of households (10%) had used some kind of chemical fertiliser in their maize fields and other crop gardens. Only 16% had ever received subsidized fertiliser from government. Husbands (94%) were mentioned as decision makers to authorize expenditure on chemical fertilisers.

Fifteen percent of households had used organic fertiliser which mainly consisted of animal manure (cow dung) that was obtained from their own animals. Scarcity of animal manure due to lack of own animal kraals *(khola),* perception that the soil is already fertile and therefore there was no need to use fertiliser and transportation problems of cow dung as most of the fields were far away from home were some of the cited reasons by those that had never used animal manure.

In order to understand the culture of applying compost in their crop fields, existing composting practices were explored with men and women groups. The majority of the participants had no experience with the use of compost in their gardens. However, only participants in Njereza Village reported that they had been taught by Extension Workers from the Ministry of Agriculture and Food Security on how to make grass and cow dung compost called "*Chimatilo*"

4.8 Knowledge, attitudes and perceptions toward EcoSan

The general awareness of the ecological sanitation concept was explored with both respondents in the questionnaire survey and participants in the FGDs. Besides soliciting the respondent's perceptions and attitudes toward EcoSan, the survey sought information on the traditional beliefs and uses of human excreta (faeces and urine) and their knowledge of the EcoSan concept (i.e. recycling of human excreta for crop production). In this regard, the respondent's experiences with use of old abandoned/full pit latrine sites and grey water from bath shelters were explored.

4.8.1 Uses of abandoned full pit latrine sites

One of the traditional ways of practicing EcoSan is to plant a fruit tree or grow vegetables at abandoned full latrine pits. During the survey, 84% indicated that they did not use their abandoned full latrine sites, 11% had planted fruit trees or vegetables and 5% used the site as a refuse dumping place.

4.8.2 Uses of grey water from bath shelters

Of all households surveyed, 71% had bath shelters. Of those who had no bath shelters, 44% were either lazy or had no one to build them the bath shelter; 29% told the interviewer that their bath shelters had collapsed due to heavy rains or winds and termite attack; 15% said they were too busy with other household chores; 7% claimed they were using their neighbour's bath shelters and 5% were used to bathing at the river.

With respect to the use of grey water, 95% discharged it to waste and 4% reported to used it for growing fruit trees or vegetables. One respondent indicated that grey water from bath shelters was drinking water for ducks and pigs.

4.8.3 Uses of human excreta

Traditional uses of human excreta (faeces and urine) were explored in order to understand the community perceptions, attitudes and beliefs toward ecological sanitation. Cultural meanings were attached to both human faeces and urine.

4.8.4 Uses of human faeces

It came out very clear in most FGDs that faeces are widely used as medicine and for witchcraft. Below are what some participants said faeces were being used for:

"When you have a rotten tooth, you apply a portion of your own faeces onto it and it just disintegrates with no pain"

Male and Female FGD Participants, Sekeni Village

"When a baby produces green stools (a condition known as Liliwo), a mother puts some of her child's green stool in a lump of nsima and swallows it and her child's stops defecating the green stools. Sometimes the lump of nsima is dipped in okra (therere) for ease of swallowing. Remember it must be the mother of the sick baby to eat the green stool with nsima and no one else"

Female FGD Participants, Njereza, Mwalija, Chisanu and Chambuluka Villages

Human faeces were also reported to be used in witchcraft but details were not provided. Witchcraft is evil and mentioning how faeces are used to bewitch someone would have meant the one saying so is a witch himself or herself.

"If a baby develops a widening fontanelle (liwombo), the mother goes to the place where she had previously defecated in the bush to collect part of her decaying faeces or soil and apply it on her child's fontanelle and the child gets well. If she defecates in the latrine, she will lose the all important medicine for her child's illness"

Female FGD Participant, Chisanu Village

4.8.5 Uses of human urine

The majority of participants in focus groups attached a cultural meaning to human urine – namely when one is bruised on the foot s/he can urinate on the fresh wound as urine is believed to have disinfectant properties. Urine is used as both eye drops (*kuchapa m'maso*) and ear drops. It was also said the first few drops of urine in the morning (when one has just woken up from sleep) is used to light kerosene lamps. Urinating over someone who is in coma would help him to wake up. Also, human urine was reported to be an excellent lotion for clearing spots and pimples on the skin.

4.8.6 Awareness of the fertiliser value of human excreta

Overall, 56% of all respondents interviewed were aware that human excreta could be used as an organic fertiliser. However, proportionately, male household members (67%) were significantly more aware of the fertiliser value in human excreta than their female counterparts (50%) [95% CI: 44.3 – 56.1]. Furthermore, male household members were 2.06 times more likely to be aware of the fertiliser value in human excreta than female household members as shown in Table 22.

Table 22: Awareness of the fertiliser value in human excreta by sex category

Sex of respondent	Aware of the fertiliser value in human excreta *n* (%)	Not aware of the fertiliser value in human excreta *n* (%)	Total
Male	83 (67)	40 (33)	123 (100)
Female	139 (50)	138 (50)	277(100)
Total	222 (55.5)	178 (44.5)	400 (100)

PR: 2.06; 95% CI =1.29-3.30; $\chi 2 = 10.32$; $p<0.0013152$

With regard to level of education, those who had attained formal education were 1.5 times more likely to be aware of the fertiliser value in human excreta than those who had not been to any school (Table 23).

Table 23: Awareness of the fertiliser value in human excreta by level of education

Level of education	Aware of the fertiliser value in human excreta *n* (%)	Not aware of the fertiliser value in human excreta *n* (%)	Total *n* (%)
Educated (*primary/secondary*)	155 (59.2)	107 (40.8)	**262** (100)
None	67 (48.6)	71 (51.4)	**138** (100)
Total	222 (55.5)	178 (44.5)	400 (100)

PR: 1.54; 95% CI=0.99-2.37; $\chi 2 = 0.26$; $p<0.0423870$

After the interviewer had told male FGD participants that human excreta are fertiliser, this is what one of the participants remarked:

"Oh …. I did not know that I have fertiliser in my body"

Male FGD Participant, Namila Village

4.8.7 Willingness to use human excreta as crop fertiliser

Table 24 presents the respondent's religion and willingness to accept using human excreta for food production. Overall, 71% of respondents said they would be willing to use human excreta for crop production. However, the respondent's religion had no influence on their willingness to accept to use human excreta for food production ($p<0.0892001$).

Table 24: Religion and willingness to accept to use human excreta as crop fertiliser

Religion	Accept use of human excreta as fertiliser *n* (%)	Do not accept use of human excreta as fertiliser *n* (%)	Total *n* (%)
Christianity/ Muslim	256 (69)	113 (31)	369 (92)
No Religion	26 (84)	5 (16)	31 (8)
Total	282 (70.5)	118 (29.5)	400 (100)

PR: 0.44; 95% CI =0.13-1.20; $\chi^2 = 2.89$; p<0.0892001

Results also show that the respondent's level of education had an influence on one's willingness to accept to use human excreta for crop production (Table 25). Those that had attained formal education were 2.09 times more likely to accept to use human excreta for crop production (PR: 2.06; $\chi^2 = 10.86$; p<0.0009813)

Table 25: Education and willingness to accept to use human excreta as crop fertiliser

Level of education	Accept use of human excreta as fertiliser *n* (%)	Do not accept use of human excreta as fertiliser *n* (%)	Total *n* (%)
Educated (*primary /secondary*)	199 (75.9)	63 (24.1)	262 (100)
None	83 (60.1)	55 (39.9)	138 (1000)
Total	282 (70.5)	118 (29.5)	400 (100)

PR: 2.09; 95% CI=1.31-3.34; $\chi^2 = 10.86$; p<0.0009813

4.8.7.1 Willingness to use human faeces as crop fertiliser

Seventy-one percent of respondents (n= 282) were willing to use human faeces for crop production. Of those who were not willing (n = 118), the majority (61%) claimed they had no knowledge on how to apply it in the field; 32% thought it was unhygienic and therefore a health hazard to use it and 7% said it was news for them to hear that it can be used as crop fertiliser. Table 26 shows the reported reasons for non-willingness to use human faeces as fertiliser.

Regarding lack of knowledge on use of human faeces, one participant during the FGD had this frustration to say:

"Water for People came here to construct a Fossa Alterna at the chief's house but they did not teach us how faeces are used as fertiliser"

Male FGD Participant, Chambuluka Village

Some of those who had reservations for the use of human faeces held a scientific view about the safety of the compost material. Generally, the main reason behind their unwillingness to use human excreta was "*faecophobia"* as illustrated by these quotes:

"Compost from pit latrines is unhygienic to handle. Those people who use human excreta as fertiliser are playing with their lives. They will soon catch cholera. They must stop doing so immediately".

Male respondent, Namila

" It is extreme madness for someone to use human excreta as crop fertiliser. I can not eat my own body wastes"

Male respondent, Namila

Table 26: Reported reasons for unwillingness to use human excreta as crop fertiliser

Reason	Frequency	Percent
Do not know to use it	72	61
It is unhygienic/health hazard	38	32
Have never heard/seen it being used	8	7
Total	**118**	**100**

4.8.7.2 Willingness to use human urine as crop fertiliser

Similary, 71% of the respondents were willing to use either human urine in their gardens. However, among those who were not willing to use human urine as fertiliser (n = 118), 59% did not know how to use it, 31% felt urine was unhygienic to handle or a health hazard and 10% had never heard or seen urine being used as crop fertiliser. Table 27 presents the reported reasons for the respondent's unwillingness to use human urine as crop fertiliser.

Table 27: Reported reasons for unwilling to use human urine as crop fertiliser (n=118)

Reason	Frequency	Percent
Do not know to use it	70	59
It is unhygienic/health hazard	36	31
Have never heard/seen it being used	12	10
Total	**118**	**100**

4.8.7.2. 1 Experiences with the use of human urine as crop fertiliser

Members of the VHC in Mwanayaya village have had experiences with the use of human urine in growing maize. Findings from a focus group discussion held with the VHC members revealed that they were satisfied with the fertiliser effect of urine. This is what one participant in the FGD had to say:

"At first people thought we had gone mad collecting urine every day and storing it at the village headman's house in readiness of application in our maize plot. However, when they saw how green and healthy the maize had grown after the application of urine, they started coming to us asking how we applied the urine"

VHC Member, Mwanayaya Village

However, participants in the focus group voiced some challenges in collection and storage of urine and later its application in the field. The VHC members were provided with white 5-Litre containers for collection of urine at household level. When full, these containers were transferred to a 200-Litre drum at the village headman's house. With respect to collection and application of urine in the garden, there were some concerns voiced by the participants:

"When taking the white urine container to the village headman's house, people were keen to see the colour of our urine, particularly from us women. We women also had a problem to funnel our urine into the mouth of the 5-Litre containers"

Female VHC Member, Mwanayaya Village

"We did not have gloves when applying urine in our maize garden. We felt very uncomfortable handling urine with bear hands. Also, urine was highly inflammable and without gloves and something to mask our faces, we were not protected from the burning sensation of the urine".

Female VHC Member, Mwanayaya Village

4.8.7.2.2 Willingness to sell human urine

Willingness to sell urine was explored with participants in FGDs. The majority of the participants said that people would not be willing to sell to other people because urine is believed to be used for witchcraft. This quote demonstrates the people's fear regarding the sale of urine to other people.

"Traditionally, we the Mang'anja people can not sell our urine to someone for fear of being bewitched"

Male FGD Participant, Samu Village

However, a few participants felt it was possible to sell only when urine was from a group of people rather than from an individual for fear of the same. They said they could sell their urine at MK250 per litre (about US$ 1.8 or £1) . This is what one participant in the focus group had to say.

"If there could be a buyer, we can sell our urine at MK250 per litre".

Male VHC Member, Mwanayaya Village

4.8.8 Willingness to consume food grown in human faeces

Ninety-two percent of all the respondents were willing to eat food that can be grown in human faeces. Those who were not willing to eat food grown in human faeces (n = 31) 66% thought it was unhygienic and some were afraid of contracting diseases (34%), particularly cholera and dysentery.

Table 28 shows that those families who said they would accept to eat food grown in human faeces were 10.03 times more likely to use human faeces in their gardens than those who would not accept.

Table 28: Those who would accept to use human faeces and eat food grown in human faeces

Variable	Willing to eat food grown in human faeces *n* (%)	Not willing to eat food grown in human faeces *n* (%)	Total *n* (%)
Accept to use human faeces	275(75)	94 (25)	369 (100)
Not accept to use human faeces	7 (23)	24(77)	31(100)
Total	282 (70.5)	118 (29.5)	400 (100)

PR: 10.03; 95%CI: 4.00 – 28.29; χ^2 = 37.10; p<0.0000000

Survey results show that level of education (Table 29) [p<0.6077043] and religion had no influence on eating food grown in human faeces (Table 30) [p<0.0892001]

Table 29: Level of education and willingness to eat crops grown in human faeces

Level of education	Willing to eat food grown in human excreta *n* (%)	Not willing to eat food grown in human excreta *n* (%)	Total *n* (%)
Educated (primary / secondary)	243 (92.7)	19 (7.3)	262 (100)
None	126 (91.3)	12 (8.7)	138 (100)
Total	369 (92.2)	31 (7.8)	400 (100)

PR: 1.02; 95% CI=0.96-1.08; χ^2 = 0.26; p<0.6077043

Table 30: Religion and willingness to eat crops grown in human faeces or urine

Religion	Willing to eat food grown in human faeces or urine *n* (%)	Not Willing to eat food grown neither in human faeces nor urine *n* (%)	Total *n* (%)
Christianity/ Muslim	342 (93)	27 (7)	369 (100)
No Religion	27 (87)	4 (13)	31 (100)
Total	369 (92)	31 (8)	400 (100)

PR: 0.44; 95% CI =0.13-1.20; $\chi^2 = 2.89$; p<0.0892001

4.8.9 Willingness to consume of food grown in human urine

Ninety-three percent of all the respondents (n = 370) were willing to eat food that was cultivated using human urine. Those who were not willing to eat food grown in human urine (n = 30), 60% thought it was unhygienic; 34% said were afraid of contracting diseases particularly bilharzia and 7% said food grown in urine taste salty (Table 31).

Table 31: Reasons for unwillingness to eat crops grown in human urine (n =30)

Reason	Frequency	Percent
Urine is unhygienic	18	60
Will contract diseases e.g. bilharzia	10	33
Food will taste salty	2	7
Total	**30**	**100**

Table 32 shows that those families who said they would be prepared to eat food grown in human urine were 15.66 times more likely to use human urine to fertilise their gardens than those who would not accept it.

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Table 32: Those who would accept to use human urine and eat food grown in human urine

Variable	Willing to eat food grown in human urine *n* (%)	Not willing to eat food grown in human urine *n* (%)	Total *n* (%)
Accept to use human urine	277(75)	92 (25)	369 (100)
Not accept to use human urine	5 (16)	26(84)	31(100)
Total	282 (70.5)	118 (29.5)	400 (100)

PR: 15.66; 95%CI: 5.66 – 53.31; $\chi^2 = 47.77$; p<0.0000000

Survey results show that level of education (Table 33 [p<0.6077043] and religion had no influence on one's acceptance to eat food grown in human urine (Table 30) [p<0.0892001]

Table 33: Level of education and willingness to eat crops grown in human urine

Level of education	Willing to eat food grown in human urine *n* (%)	Not willing to eat food grown in human urine *n* (%)	Total *n* (%)
Educated (primary/secondary)	242 (92)	20 (8)	262 (100)
None	127 (92)	11 (8)	138 (100)
Total	369 (92.2)	31 (7.8)	400 (100)

PR: 1.05; 95% CI=0.45-2.38; $\chi^2 = 0.01$; p<0.9044997

Table 34: Those who would accept to use human excreta and eat food grown in human excreta

Variable	Willing to eat food grown in human excreta *n* (%)	Not willing to eat food grown in human excreta *n* (%)	Total *n* (%)
Accept to use human excreta	275(75)	94(25)	369 (100)
Not accept to use human excreta	7 (23)	24(77)	31(100)
Total	282 (70.5)	118 (29.5)	400 (100)

PR: 10.03; 95%CI: 4.00- 28.29; $\chi^2 = 37.10$; p<0.0000000

Table 34 shows that those families who said would accept to eat food grown in human excreta (both faeces and urine) were 10.03 times more likely to use human excreta in their gardens than those who would not accept (PR: 10.03; 95%CI: 4.00-28.29; $\chi^2 = 37.10$; p<0.0000000)

4.9 Change of attitude

The respondents were asked what they thought could change people's minds towards using human excreta as fertilizer and soil conditioners in their gardens. The majority of participants cited training on use of human excreta (58%) followed by use of demonstration gardens (24%). The respondent's opinions are summarized in Table 35.

Table 35: What respondents thought could change people's mind toward increased use of human excreta for crop production

Opinion	Frequency	Percent
Training on use of human excreta	233	58
Demonstration garden	95	24
High cost of chemical fertilisers	29	7
Community sensitization meetings	5	1
No opinion	39	10
Total	**400**	**100**

CHAPTER 5 DISCUSSION AND CONCLUSION

5.1 Introduction

The aim of this project was to determine possible social-cultural reasons for the low uptake of ecological sanitation 6 months after a subsidized EcoSan programme initiated by SCHI and WFP in Chikwawa District in Southern Malawi. The study was conducted in eight selected rural villages in Chikwawa District, and the area can be regarded as representative of rural communities in Malawi. The respondents who were interviewed included people of various ages. Both male and female respondents were interviewed although it was preferable to interview the heads of households, since they often are responsible for decision making in many aspects affecting their household, including sanitation.

5.2 Household latrines

5.2.1 Latrine ownership and use

- ***Just over half of all the households had functional latrines***

This study found that 54% of the all households had a functional latrine of one kind or form. This coverage of pit latrine is close to what is known to be available in target communities of the SCHI, where pit latrine ownership averaged 48 percent with the other community as low as 14 percent (Morse *et. al.,* 2008). The district figures on pit latrine coverage are equally not encouraging and well below the Millennium Development Goal of 74 percent by 2015 (UN 2000). It is estimated that only 42 % of the households or less have pit latrines (GOM, 2006b). This means that over 50 % the population within the district has no sanitary facilities. This study found that in households without pit latrines, 52% were making use of the privacy of the bush and the remaining claimed to use of their neighbour's latrine.

Use of a neighbour's latrine might not have been a true response given the embarrassing nature of the question. Diallo *et.al*. (2007) interpreted use of a neigbour's latrine as a desire to own a latrine or just a curiosity to experiment latrine use. During the survey, it was not determined how often use of a neigbour's latrine occurs. However, it appears this is mostly practiced by households without latrines and have someone visiting them and would like to use a latrine or if one's latrine has collapsed and has no where to go whilst waiting to build another one. Under these circumstances, permission to use a neighbour's latrine is sought from the latrine owner. However, "illegal" use of neighbour's latrine was mentioned to happen at night and when one has diarrhoea and the bushes are far. This problem is aggravated by the fact that most of the latrines in the area have no doors (87%); which would ensure privacy for the users and also lock out those who abuse their neigbour's latrine.

- ***There are gender roles in latrine construction***

This study found that most household latrines (88%) were constructed by men. Women were responsible for cleaning (sweeping the floor) and smearing the floors and wall. Digging a 3-meter deep latrine pit appears to be a well defined man's role, and when a man refuses to do this, both woman and the family are in effect denied access to any form of sanitation. s. These findings are similar to other studies conducted in the country in Blantyre and Embangweni (Grimason *et. al.,* 2000; World Bank, 2007) and in Niger (Diallo *et.al.* 2007). This gender specific role puts female-headed households (single/divorced/separated/widowed) at a disadvantage. The Arborloo can address this problem as it is shallow to dig compared with other latrines. In other EcoSan impact areas in the country, more women have testified to have easily dug the pit and built the Arborloo themselves (World Bank, 2007). However, in this study, the Arborloos were significantly higher in male-headed households than in female-headed households and among married household members (section 4.6.1).

5.2.2 Motivation for latrines and disincentives

- ***Health benefits were the major motivating factor for using latrines***

Motivating factors for latrines may be physical, legal, economic, health and socio-cultural (Drangert, 2004). In this study, the major motivating factors perceived by respondents for constructing the latrine were related to health and socio-cultural factors. The appealing factors mentioned were the prevention of diarrhoeal diseases, privacy, convenience and prestige (section 4.5.1). Major restraining factors were laziness of husbands, loose collapsible soils and customs/beliefs. Loose collapsible soil shortens the life span of latrines. People are demotivated to build latrines every year. An Arborloo is one possible solution as it is shallow and a locally made small woven basket strengthens the sides of the pit (Figure 2).

- ***Defecation in the bush appears to be a well established norm in the district***

The majority of participants in the focus groups felt more people were using the bush than the latrine for defecation. With this background, they felt their villages were far from being ODF villages (ODF is used here to mean no dig and bury). The practice of defecating in the bush appears to be a well established norm (section 4.4.2) feared to have been passed from one generation to another. It is of concern that one in two people continue to use the bush in 2009. The HSAs (then known as Cholera Assistants) have been promoting improved sanitation in village communities since the first recorded Cholera outbreak in Malawi in 1973. Each village included in this survey has an HSA assigned to it. The HSA's sanitation efforts are thinly seen on the ground. Perhaps village leaders themselves should set a good example for their subjects to follow. However, it is disappointing that in Mwalija, where seven in ten people use the bush, the village chief was reported to have no latrine (section 4.4.2). Furthermore, it was to the disbelief of the interviewers that sometimes a bicycle is purportedly used when one goes the bush to defecate.

For any sanitation improvement to be worthwhile and long-lasting, people's behaviours must change. People do not normally change practices they have always followed unless they are convinced there is a good reason to do so. Of course, the threat of fines by chiefs as suggested in section 4.4.2 might appear to be a good idea, the old habits would re-emerge once the threats are removed.

- ***Socio-cultural factors appear to promote open defecation in the villages***

Level of education, marital status, income, religion of respondents and male headship of household (section 4.2) and have been shown to influence ownership of traditional pit latrines in the study area. However, these social factors did not influence ownership of the Arborloo. Also, age and size of household did influence neither ownership of traditional pit latrine nor the Arborloo.

Cultural factors have been shown to influence the construction and use of latrines in rural areas of Malawi. Grimason *et.al,* (2000) report that in Nsanje (another district forming the Lower Shire Valley with Chikwawa), females during menstruation and after child birth (*Mabvade* – meaning unclean women) are prohibited from sharing latrines with men. It is believed that males may suffer from severe backache (section 4.5.3) and develop elephantiasis or lymphocele, if they accidentally tread or squat where an *M'bvade* (singular of Ma'bvade) has defecated or urinated. It is argued that defecating in the bush is taken as the easiest way of keeping the sexes apart. People also use the bush to enjoy the scenery and breathe the smell of the vegetation while defecating (section 4.5.3). This finding is also shared by Drangert, (2004). Furthermore, Grimason et. al., (2000) reported that the traditional religion called M'bona actively discourages people to excavate deep pits for the latrines. It is believed that M'bona may come in the form of a snake, and should it fall into the pit untold disasters will fall on the village concerned. As a result, most people do not construct latrines. In contrast, M'bona was not mentioned to be a discouraging factor dissuading people from constructing latrines in this study.

5.2.3 Latrine types and use

- ***The traditional pit latrine is the commonest household latrine***

The survey results show that most households with latrines (94%) are making use of the traditional pit latrines. This was expected because of its relative cheapness and simple construction. In this study, four in five households had an average income of less than US$ 1/day. With high levels of poverty, a traditional pit latrine will remain a latrine of choice in the developing world. The majority of materials used in the construction of the floors, walls , roofs and doors were mud (81%), unburnt brick (40%) and grass thatch (59%); respectively. Almost nine in ten pit latrines offered little or no privacy at all with no doors. The norm is that you knock on the sides of the walls before you enter into the pit latrine. However, this is not always practical with children. They can not remember to do this every time they visit the latrine. With this background, almost seven in ten respondents (68%) objected to sharing of latrines between adults and children. Where it is not avoidable, some female users have gone to the extent of hanging their skirts or chitenje on the door to indicate occupancy of the latrine. Given the poverty levels in the district, perhaps the use of cloth doors could offer alternative privacy to wooden doors. The structural defects of latrines highlighted in this study are consistent with other studies done in the country (Grimason et al., 2000; Mtingula et al., 2008). In their studies, they observed that most latrines were built of unburnt bricks had neither a roof nor door. Cloth door or sacks hung between two door posts were used by some households to provide a degree of privacy and were often used as a means of hand drying after latrine use. They further suggested that where cloth doors are used, it is important that such cloths are washed and changed on a regular basis to reduce the potential for the transmission of faecal-oral disease.

➢ ***Very few latrines have hand-washing facilities***

It has been shown that hand-washing after defecation is an important hygienic practice and method for breaking the mode of transmission of enteric and other pathogens (Daniels et. al., 1990). In this study, however, only one in seventeen households had hand washing facilities next to their latrines. The majority of the respondents claimed the norm is to wash hands at the household after being to the toilet. This may not reflect what really happens in their daily lives. Grimason *et.al.,* (2000) argue that when no facilities are readily available at the latrine to remind users to wash hands after visiting the toilet, the element of forgetfulness will undoubtedly play a role in the proportion of people that do so. One household felt washing hands at the toilet site was a Muslim norm. Whilst an adult person may recognize the need to wash hands following defecation when he sees a hand washing facility next to the latrine, children may not see the need for such a facility. In this study, 10% of the hand-washing facilities fixed at the latrines were reported to have been vandalized by children.

5.3 Knowledge, norm, attitudes and perceptions towards EcoSan

5.3.1 Experiences with the use of human excreta, grey water and other compost

➢ ***Old abandoned filled latrines and grey water have rarely been used for planting fruit trees and vegetables***

EcoSan is an old practice but revisited. Those who have ever planted a fruit tree on an old abandoned full traditional pit latrine could be said to be practicing EcoSan. However, this study found that only 11% of all households questioned had planted fruit trees or vegetables on their abandoned filled traditional latrine sites. These sites were either abandoned or used as household refuse dumping places. This study also found that 95% of grey water from bath shelters was merely discharged to waste. Only one in twenty-five households had ever discharged grey water to a fruit tree or vegetables planted next to soak away pits of their bath shelters.

- ***Animal manure and agricultural compost have rarely been used in the gardens***

This study found that only 15% of households had experiences with the use and application of animal manure (cow dung) in their gardens. None of the households surveyed had ever used latrine compost and therefore could describe its physical appearance. How human excreta compare with cow dung is important information that may add to the understanding of people's perceptions and norms toward EcoSan. Drangert (2004) reported that people have no or few reservations to touch or use cow dung. In this study, a majority of the respondents had no experiences with the use of cow dung and compost in their gardens.

- ***There are numerous traditional uses of human excreta***

This study has shown that most excreta in the villages concerned are disposed of without intentional reuse. However, the study revealed that there are some important ways that faeces and urine are being gainfully utilized. Human faeces were found to be traditionally used for medical and witchcraft purposes similar to other reports (Grimason *et.al.* 2000; Drangert, 2004; Duncker *et.al.* 2007). As medicine, faeces were reported to be used for treating green diarrhoea and widening fontanelles (*liwombo*) in babies. It remains to be proved how this works. The production of green stools is known to be an associated symptom of many infectious pathogenic microbes including bacteria such as *Salmonella* and parasitic protozoa such as *Giardia*. Cryptosporidium is a common parasitic protozoa responsible for diarrhoea infection in children in Malawi, contributing up to 10% of diarrhoea in children under the age of five years (Morse *et al.,* 2008). In a study on the epidemiology of Cryptosporodiosis in Chikhwawa district, they found that 80 percent of Cryptosporodioisis occurs in children 0-24 months of age.

Green stools (also known as starvation stools) can also be caused by being on a liquid diet for a few days (*http://www.wrongdiagnosis.com/symptoms/green_stool/causes.htm).* Use of the mother's faeces for application on a child's fontanelle could discourage use of latrines. If the mother defecates in the latrine, she will not be able to collect it back for this purpose. Consumption of human faeces to treat one's tooth ache and baby's green diarrhoea is a health hazard that requires strong hygiene education action. Human faeces are also believed to be used in sorcery and black magic. However, it was not possible to get more information on how faeces are used as issues to do with witchcraft are traditionally kept as a secret. It remains uncertain which ingredients in the faeces are used by sorcerers.

Human urine is reported to have a variety of uses. In this study, it was claimed that urine has antiseptic properties and is used to clean or smear fresh wounds or bruises, treat both eye and ear infections, clear skin spots and pimples. The disinfection properties of urine could originate from the salts excreted in the urine. Urine consists of water, carrying in solution the body's waste products such as urea, uric acid, creatinine, organic acids, and also other solutes such as Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, the body fluid concentrations of which are regulated by the kidneys. It was also astonishingly claimed that the first urine in the morning could be used in kerosene lamps. Guzha (2004) reported that urine is used to treat athlete's foot, sore eyes, impotence, burns, runyoka (illness caused by having sex with someone else's wife) and as a love portion. In Kagera in Tanzania, urine has been used as an antidote when someone has inhaled and ingested poison, by giving that person fresh urine to drink. It has also been used to kill banana weevils (Chaggu and John, 2002). Other similar traditional uses of human faeces and urine have been reported in Europe, Asia and Africa (Dranget, 2004; Dunker *et al*. 2007).

5.3.2 Awareness of the fertiliser value in human excreta

- ***Just over two fifth of all respondents were aware of the fertiliser value of human excreta***

The study found that use of chemical fertiliser was very minimal, stemming from the high costs of the fertiliser given the rampant poverty levels among the respondents and the belief that the soils are still fertile. This low use of chemical fertiliser is a good point for promoting EcoSan. However, only two in five respondents were aware of the fertiliser value of human excreta. Although more men (67%) than women (50%) were aware of the fertiliser value of human excreta, the difference is not significant (95% CI: 27.3% to 69.5%). Duncker et.al. (2007) found that more women were aware of the fertiliser value in human excreta than men. The latter often regard sanitation issues as a women's issue. In Botswana, there is a strong belief that human excreta are something very dirty. The consideration that it could be very valuable after treatment is quite erroneous in Twsana understanding (Hanke, 2003).

5.3.3 Composting latrines

- ***The Arborloo is less popular than the traditional pit latrine***

This study found that the most commonly known/seen of composting latrines is the Arborloo (86%). However, only a few households (6%) had built the Arborloo. The majority of them preferred a traditional pit latrine to an Arborloo because the former is deeper and can therefore be used for a longer period. This is understandable given the fact that most husbands in the area were reportedly as lazy latrine builders. Furthermore, choosing an Arborloo entails that one has to dig a new pit twice in a year. It takes 4 – 6 months for an Arborloo to fill up. On this basis, an Arborloo is viewed as a temporary sanitation solution.

Incentives for the adoption of improved latrines are usually related to increased prestige, comfort and convenience. In the case of EcoSan at Embangweni the main driver for a household to change from a traditional pit latrine to an ecological latrine was the financial benefit that came from utilizing pit compost and not having to buy fertilizer (D'Souza 2005). Therefore the value of compost is the attribute that the promoters stress most during the marketing of EcoSan latrines. Unfortunately, no one in this study had ever harvested fruits from the use of construction of an Arborloo. At the time of the survey, only one household of those with an Arborloo had just planted a young fruit tree.

5.3.4 Willingness to use human excreta as crop fertiliser

- ***Both positive and negative attitudes toward the use of human excreta exist in the community***

About seven in ten households were willing to use human excreta as a crop fertiliser. This was common to both the use of human faeces and urine in their gardens. The main reasons provided by those who expressed their reservation towards the use of human excreta in their gardens were that using excreta was "unhygienic to handle", perceived to be a "health hazard", is "unheard of" and in a few instances, crops grown in human excreta would "probably have a salty taste". These reasons are common in "faecophobic" cultures (Duncker et.al. 2007) and the community under study was no exception. The fact that those who expressed willingness to utilize urine and faeces were in the majority is encouraging and lays the foundation for the potential acceptance and utilization of human excreta as a natural, low cost alternative to commercial fertilisers for food production in rural areas such as Chikhwawa. Fear about the re-use of urine in the gardens was mainly for health reasons. Those who expressed concern felt the practice would promote the spread of diseases such as bilharzia.

Aesthetic aspects such as smell and appearance of human excreta play a role in acceptance or rejection and avoidance of a sanitation system (Drangert, 2004). In this study, women who had used urine in their maize garden were not comfortable with white containers that were used for collection of urine. Those who were not participating in urine collection were keen to see the colour of the urine provided by the women. There appears to be a connection between the appearance of excreta and the person's health status. People were suspicious of red urine as it would be an indicator of bilharzia infection or menstruation in women. Drangert (2004) reported a similar observation in Addis Ababa where menstrual blood influences behavior during urine collection, and in connection with using urine as fertiliser, there is often suspicion of transmitting diseases like bilharzias.

In section 5.3.1, human faeces and urine are reported to be used in witchcraft. With this background, people may refuse to sell urine for use by others for agricultural purposes. In this survey, some respondents expressed willingness to sell their urine should somebody want to buy from them. However, they were quick to point out that this would only be possible if urine was collected from a group of individuals and not an individual. If urine were from the latter, it was feared that the urine could be used to bewitch that person. Their willingness to sell could also indicate an awareness of the economic benefits of recycling human excreta among those who do not believe in witchcraft. In Nigeria, traditions prohibit collection of urine by strangers for fear that the urine may be used against the people through "black magic" or "evil spirits" (Sridhar *et al.,* 2005).

5.3.6 Willingness to eat crops grown in human excreta

- ***Both positive and negative attitudes toward consumption of crops grown in human excreta exist in the community***

The majority of respondents expressed a willingness to consume crops that had been cultivated from gardens that utilized both faeces and faeces. Some participants in the focus groups recounted how many times they have defecated and urinated on crops like pumpkins and cucumbers whilst gardening in the field and have eaten those crops. However, some wondered how pathogens from the latrine compost would migrate from the soil through the plant stem and still be alive in the fruit that is eventually eaten. These sentiments were a positive indicator and injected some scientific sense into other people's mind regarding the safety of EcoSan. However, human excreta were regarded as unhygienic and unsafe among those that expressed their reservations to eat crops grown in human excreta. Hygiene education and awareness campaigns are required to change this attitude. In this study, some respondents also feared that crops grown in human excreta would taste salty. Similarly, a study conducted in Zimbabwe showed that some community members ate sweet potatoes planted where people used to dispose of their faecal matter, and these did not taste as good as those planted using ordinary manure. However, this finding was not conclusive, since other factors might have influenced the taste (Guzha, 2001).

5.4 Change of attitude

Although EcoSan could be described as an old practice but revisited, to some people it still looks a very foreign idea. Respondents in this study were of the opinion that community training on use of human excreta as fertiliser coupled with demonstration gardens could trigger change in people's attitudes and perception regarding the use human excreta for food production. Some people have a culture of "wait and see" and the use of demonstration plots could change such attitudes.

Especially, if it could be demonstrated that the fertilizing effect of human excreta has a beneficial effect and can be seen 'with their own eyes' rather than just being informed about its potential by EcoSan promoters. Even the Agriculture extension worker who visited a demonstration plot in Mwanayaya village was very cynical of it too. Demonstration gardens have been shown to interest farmers change their attitudes and adopt the EcoSan concept (Breslin, 2003). In Uganda, Windberg *et al.,* (2005) conducted experiments by establishing demonstration gardens using sanitized human excreta. With the resultant harvest, the stigma of the taboo on use of excreta had reduced greatly and was evidence that excreta is better recycled than disposed of. However, seeing human excreta as a resource takes some time, good explanation, patience and persistence (Wegelin-Schuringa and Ikumi, 1997).

5.5 Conclusions

The objective of the present study was to explore social-cultural aspects that influence acceptance and non-acceptance of EcoSan in a rural district of Chikhwawa in Southern Malawi. The specific objective was to investigate why the shift from the traditional latrine to an Arborloo was slow despite a heavily subsidized sanitation programme. Simpson-Herbert (2007) argues that the cost in building an Arborloo is mainly in the slab — about $4 — as compared to $60 for a traditional pit latrine and $100 for a VIP latrine. The SCHI subsidized the cost of the slab for the Arborloo to as low as $0.20. In his study, Manda (2009) also observed that the adoption of EcoSan toilets has been slow in Malawi.

Based on the analysis of the results of the present survey, the following socio-cultural factors have an influence on the slow uptake of Arborloo in the study area.

1. Age and sex of respondents and the size of the household did not influence ownership of a household latrine.

2. Level of education, marital status, level of household income, occupation, headship of household influenced possession of a household latrine. Those that were educated, were married, had an income of more than MK5, 000/month, were employed providing skilled labour and male-headed households were more likely to own household latrines than those who were not.

3. Although income was found to influence ownership of latrines, it remains a socio-economic puzzle as to why people did not accept to build the Arborloos at $0.20 only. Hence their reluctance to shift from traditional latrines to composing latrines might indeed have been due to cultural reasons.

4. Traditional pit latrines were preferred to the Arborloo as the latter was regarded as a temporary sanitation facility that required to be replaced quite often.

5. Open defecation (in the bush) appears to be a well established norm in the study area. Traditional beliefs deter the shared use of latrines between men and pregnant/postnatal women. For example, men are not supposed to share same pit latrine with a woman who is menstruating, pregnant or who has just delivered (*M'bvade*) for fear of developing severe backache.

6. Sanitation is regarded as a man's job. Most of the household latrines (88%) were built by men. When a man refuses to build the latrine, both the woman and family are in effect denied access to any form of sanitation.

7. The shared use of latrines by men and women is a taboo in the area. It was reported that if a man shares the same latrine with a woman who has just delivered (M'bvade), he risks developing a severe backache.

8. Desire to curb the spread of diseases was reported a major motivating factor for building household latrines other than for privacy, convenience and prestige.

9. Laziness of men was the major reason cited for lack of household latrines. Other reasons included loose collapsible soils and no one available to build latrines in female headed households.

10. Almost half the household latrine had no doors; hence compromise the issue of privacy making people to seek the privacy of the bush.

11. Most household latrines (94%) lack a hand-washing facility. The importance of hand washing after using the toilet may not be well understood in this community.

12. Few households (6%) have shifted from the Traditional pit latrines to the Arborloo. However, ownership of Arborloos was significantly higher among those who had attained formal education; those who were married and in male-headed households. Marital status and headship of households emphasize the earlier view of sanitation being a man's job.

13. One of the traditional ways of practicing EcoSan is to plant a fruit tree or grow vegetables on abandoned full pit latrine sites or at the end of drainage of grey water from bath shelters. Only a few (11%) are aware of this EcoSan practice.

14. Human excreta has a variety of uses, mainly for medicinal and witchcraft purposes. Details of the latter were hard to get from the respondents as it is difficult to prove how witchcraft works.

15. Almost half of the respondents were aware of the fertiliser value of human excreta. Male respondent's were significantly more aware of this their female counterparts. Also, the respondent's level of education had an influence both on one's awareness of the fertiliser value of human excreta

and willingness to use human excreta for crop production and eating of crops grown in human excreta. Religion was not found as a factor influencing the use of human excreta for crop production.

16. The majority of household members did not know how to use human excreta as crop fertiliser. To them, the idea looked very new and foreign. Some were of the view that human excreta were unhygienic to handle (faecophobia) and also a health hazard.

17. Sell of urine is culturally not acceptable. People feared that one's urine could be used for witchcraft. However, some expressed willingness to sell urine if only it was collected from a group rather than from an individual.

18. Those who said would accept to eat crops grown in human excreta, were more likely also to use it in their gardens ($p<0.0000000$). But it remains to be seen if they can actually do so.

19. Level of education had no influence on acceptance to eat food grown in human faeces ($p<0.6077043$) and eat crops grown in human urine ($p<0.9044997$). Also, religion did not influence acceptance to eat crops grown in both faeces and urine ($p<0.0892001$).

20. A strong training component on use of human excreta for crop production coupled with demonstration garden could change people's perceptions and attitudes toward the EcoSan concept in rural Malawi.

5.6 Recommendations

Based on the results of this survey, the following recommendations are being proposed:

1. There is need for a detailed anthropological study to understand the decision of households to install a latrine in rural Malawi in order to explain why the EcoSan concept is still low despite efforts by the Ministry of Health and NGO aid organizations working in the district.

2. Prior to implementation of any EcoSan project, promoters should conduct awareness campaigns to break any cultural barriers and change people's prejudices and attitudes regarding use of human excreta for crop production. Furthermore, EcoSan promoters should demonstrate use of human excreta (through demonstration plots) to show the beneficial aspects of using latrine compost and urine in crop production.

4. In line with the national sanitation policy, Government should play a major role in widely promoting the technology through various media.

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Appendix 1

Questionnaire for Household Survey

INFORMED CONSENT

Hello. My name is **X** and I am working with the Scotland Chikwawa Health Initiative. We are conducting a household survey on sanitation in some villages in Chikwawa district. Your household has been randomly selected to be asked the questions in this survey. We would very much appreciate your participation in this survey.

I would like to ask you some questions related to pit latrines. This information will help the initiative and other stakeholders to improve the coverage of pit latrines in the district. Whatever information you provide will be kept strictly confidential and will not be shown to other persons.

Participation in this survey is voluntary. You can withdraw at any time or you can choose not to answer any individual question or all of the questions. However, we hope that you will participate in this survey since your views are important.

At this time, do you want to ask me anything about the survey? May I begin the interview now?

RESPONDENT AGREES TO BE INTERVIEWED .....1 RESPONDENT NOT AGREE TO BE INTERVIEWED ..... 2 >>>> END

SECTION: 1 RESPONDENT'S BACKGROUND

Name of interviewer: **Dzina la wofunsa** | Date: **Tsiku** **Day Month Year** ……../……../ 2008

Village: **Mudzi** | Questionnaire No: **Nambala ya pepala la mafunso:**

NO	QUESTIONS AND FILTERS	CODING CATEGORIES	GO TO
01	First, I would like to ask you about you and your household. Age **Zaka**	_____ years	
02	Sex **Mwamuna kapena Mkazi**	Male 1 Female 2	
03	Marital status **Banja**	Married 1 Unmarried 2 Widowed 3 Divorced 4 Separated 5	
04	Ethnicity **Mtundu**	Sena 1 Mang'anja 2 Other_____ 9 (specify) 9	
05	Religion **Chipembezo**	Catholic 1 CCAP 2 Anglican 3 Seventh Day Adventist./Baptist 4 Other Christian 5 Muslim 6 No Religion 7 Other_____ 9 (specify) 9	

NO	QUESTIONS AND FILTERS	CODING CATEGORIES	GO TO
06	Head of household **Kodi mutu wabanja ndi ndani?**	Male **(ndi mwamuna)** 1 Female **(ndi mkazi)** 2 Child **(ndi mwana)** 3 Grandchild **(ndi mzukulu)** 4 Grandparent **(ndi gogo)** 5 Other_____ 9 (specify) 9	
07	Number of people living in the household by age and gender **Nambala ya anthu okhala m'nyumba muno (zaka zawo komanso ngati ndi amuna kepena akazi)**	0-5 yrs **M** **F** 6-14 yrs **M** **F** 14-21 yrs **M** **F** 22-55 yrs **M** **F** > 55 yrs **M** **F**	
08	"What is your main source of income and livelihood?" **Kodi ndalama ndi zina zofunika pa moyo wanu numadzipeza bwanji?**	Nil 1 Unskilled labour 2 Skilled labour 3 Small trade / business 4 Fishing 5 Subsistence farming 6 Other _____ 9 (specify) 9	
09	What is your average income per month? **Kodi mumapeza ndalama zokwana zingati pa mwezi?**	MK500 1 MK501 –Mk1000 2 MK1001-MK2000 3 MK2001-MK3000 4 MK3001-MK4000 5 MK4001-MK5000 6 > MK5000 7	
10	Is your household income usually regular and dependable? **Kodi kapezedwe ka ndalama m'banja mwanu nkokhazikika ndi kodalirika?**	Yes 1 Possibly 2 Uncertain 3 No 4 *Narative*:_____ _____ _____	
11	Who mainly decides how the money you earn will be used? **Kodi ndi ndani m'nyumba muno amene amalamulira kagwiritsidwe ka ndalama zimene mwapeza?**	Respondent 1 Partner 2 Jointly 3	
12	What is the highest level of school you attended: primary, secondary, or higher? **Maphunziro**	Primary 1 Secondary 2 Higher 3 None 9 8	
13	What is the highest (class/form/year) you completed at that level? **Kodi munalekeza kalasi / folomu yanji?**	Class /Form ☐☐	
14	**CHECK 12:** PRIMARY ☐ SECONDARY OR HIGHER ☐ → **Q16** ↓ **Q15**		

NO	QUESTIONS AND FILTERS	CODING CATEGORIES	GO TO
15	Now I would like you to read this sentence for me. **Mundiwerengera ziganizo izi** SHOW THE SENTENCE TO RESPONDENT. If respondent can not read the whole sentence, PROBE: Can you read part of the sentence to me?	Cannot read at all 1 Able to read only parts of sentence 2 Able to read whole sentence 3	

Sentences for literacy test (Q 12)

Abusa akuwerenga baibulo
Madzi ndi moyo
Chimbudzi cha manyowa

SECTION: 2 HOUSEHOLD SANITATION SITUATION
(Zimbudzi, Bafa ndi Chikho chosambira m'manja)

NO	QUESTIONS AND FILTERS	CODING CATEGORIES	GO TO
	Now I would like to ask you some questions about sanitation situation at your household.		
16	Do you have a pit latrine? **Kodi muli ndi chimbudzi?**	**(Use Checklist after Interview)** Yes 1 No 2	**Q29**
17	What type is it? **Nanga ndi cha mtundu wanji?**	Ordinary pit latrine 1 Ordinary pit with San Plat 2 Compost – Arborloo 3 VIP 4 Other compost: _____ 99 (specify)	
18	Who built the latrine? **Kodi anamanga chimbudzi chanu ndi ndani?**	_____	
19	Who decided on the type of pit latrine you have? **Kodi ndi ndani pakhomo pano amene analamula kuti pakhale chimbudzi?**	Respondent 1 Household members 2 Village Health Committee 3 Water Point Committee 4 Health Surveillance Assistant 5 Others: _____ 99 (specify)	
20	Did the household have a choice of a pit latrine system? **Kodi pali mtundu wina ya chimbudzi umene mukanasanka?**	Yes 1 No 2	**Q22**
21	If yes, what were the choices? **Ngati inde, ndi mtundu wanji?**	_____	
22	For how long has the household been using the pit latrine? **Kodi mwakhala mukugwiritsa ntchito chimbudzi chanuchi kwa nthawi yayitali bwanji?**	1-6 months 1 7 -12 months 2 1-2 years 3 2-3 years 4 More than 3 years 5	
23	How many people use the pit latrine ? **Kodi ndi anthu angati amene amagwiritsa ntchito chimbudzi chanu?**	☐☐	

NO	QUESTIONS AND FILTERS	CODING CATEGORIES		GO TO
24	Should men and women use the same pit latrine? **Kodi ndizobvomerezeka amuna ndi akazi kugwiritsa ntchito chimbudzi chimodzi?**	Yes No	1 2	**Q26**
25	Why Not? **Chifukwa chiyani?** _____ _____ _____			
26	Should adults and children use the same pit latrine? **Kodi ndizobvomerezeka akulu ndi ana kugwiritsa ntchito chimbudzi chimodzi?**	Yes No	1 2	**Q28**
27	Why Not? **Chifukwa chiyani?** _____ _____ _____			
28	Many different factors can motivate a household to have a pit latrine. **Pali zifukwa zosiyanasiyana zomwe zingapangitse kuti khomo pakhale chimbudzi** What motivated you to have a pit latrine? **Kodi ndi chiyani chimene chinakupangitsani kuti mukhale ndi chimbudzi?**	Privacy Status/Prestige Convenience Prevent diarrhoeal diseases Safety Persuaded by NGO Other:_____ (specify)	1 2 3 4 5 6 99	**Q36** **Q36** **Q36** **Q36** **Q36** **Q36** **Q36**
29	Many different factors can prevent a household from having a pit latrine. **Pali zifukwa zosiyanasiyana zomwe zingapangitse kuti pa khomo pasakhale chimbudzi.** Why don't you have a pit latrine? **Kodi ndi chifukwa chiyani mulibe chimbudzi?** _____			
30	Where do members of your household defecate? **Nanga inu ndi anthu ena pa banja pano mumatani mukafuna kuchita chimbudzi?**	Bush Use other household's pit latrine Others: _____ (Specify)	1 2 3	**Q32** **Q31** **Q32**
31	Do you use it for defaecation only? **Kodi mumachigwiritsa ntchito pokhapokha mukafuna kuchita chimbudzi?**	Yes No	1 2	
32	Are there any traditions regarding use of pit latrines? **Kodi pali miyambo yanji yokhuzana ndi kagwiritsidwe ka zimbudzi?**	Yes No	1 2	 **Q34**
33	What are they? **Miyambo yake ndi yotani?** _____ _____ _____ _____			

	_____ _____			
34	Do you think it is important to have and use a pit latrine? **Mumaganizo mwanu, kodi ndikofunika kukhala ndiponso kuchigwiritsa ntchito chimbudzi?**	Yes No	1 2	**Q36**
35	Why? **Chifukwa chiyani.** _____			
36	What do you do with abandoned full latrine pits? **Kodi pamalo pamene panali chimbudzi chakale mumatanipo?** _____			
37	What problems do people face in digging pit latrines in this village? **Kodi ndi mabvuto otani amene anthu m'mudzi muno amakumana nawo kuti asakhale ndi zimbudzi?**	Pits collapse due to loose soils Lack of building materials Laziness Beliefs/Customs/Taboos Other _____ (specify)	1 2 3 4 99	
38	Do you have a San Plat? **Kodi muli ndi Sanipulati?**	Yes No	1 2	**Q40**
39	Why not? **Chifukwa chiyani?** _____			
40	Do you have a handwashing facility near your latrine? **Kodi muli ndi chikho chosamba m'manja pafupi ndi chimbudzi chanu?**	Yes No	1 2	**Q42**
41	Do you use it? **Kodi mumagwiritsa ncthito chikho cha madzi osamba m'manja pafupi ndi chimbudzi chanu?**	Yes No	1 2	**Q43**
42	Why not?. **Chifukwa chiyani?** _____			
43	Do you have a bath shelter? **Kodi muli ndi bafa?**	Yes No	1 2	**Q45**
44	Why not?. **Chifukwa chiyani?** _____			
45	What do you do with water from bathing? **Kodi mumatani ndi madzi ochokera ku bafa?** _____			
46	What type of garden do you have? **Kodi muli ndi munda wamtundu wanji?**	Vegetable Fruit Maize Rice None Other:_____ (specify)	1 2 3 4 98 99	**Q51**
47	Do you apply fertilizer to your crops each year? **Kodi mumathira feteleza muzolima zanu chaka chiri chonse?**	Yes No	1 2	**Q50**
48	Who decides about money to be spent on fertilizer? **Kodi ndani amalamula kuti ndalama mugulire feteleza?**	Respondent Husband Wife Other: _____ (specify)	1 2 3 99	

49	Have you ever received fertilizer subsidy? **Kodi munalandirapo feteleza otsika mtengo?**	Yes No	1 2	
50	What do you apply to your crops **Ngati feteleza mulibe, mumagwiritsa ntchito chiyani?**	Animal manure Nothing	1 2	

SECTION: 3 KNOWLEDGE AND PERCEPTIONS ABOUT ECOLOGICAL SANITATION

NO	QUESTIONS AND FILTERS	CODING CATEGORIES		GO TO
	Now I would like to ask you some questions about ecological sanitation. This is about recycling human excreta (faeces & urine) for agricultural production.			
51	Do you have a composting pit latrine? **Kodi muli ndi chimbudzi cha manyowa?**	Yes No	1 2	 **Q58**
52	What type do you have? **Ndi chamtundu wanji?**	Arborloo Fossa Alterna Skyloo	1 2 3	
53	Why did you choose that type? **Chifukwa chiyani munasankha chimbudzi cha manyowa cha mtundu umenewo?** _____			
54	Has it ever filled up? **Kodi chinayamba chazadza?**	Yes No	1 2	 **Q62**
55	Have you used the contents? **Nanga manyowa ake munagwiritsa ntchito pa ulimi?**	Yes No	1 2	 **Q62**
56	What for? **Ntchito yanji?** _____			
57	What was the outcome of crops grown with latrine compost? **Nanga zokolola zake zinali zotani?** _____			**Q61**
58	Have you ever seen a composting latrine **Kodi munachiwonapo chimbudzi cha manyowa?**	Yes No	1 2	 **Q65**
59	What type have you seen? **Munawona chimbudzi cha mtundu wanji?**	Arborloo Fossa Alterna Skyloo	1 2 3	
60	Where did you see it? **Munachiwona kuti?**			
61	Why have you not built it then? **Nanga ndi chifukwa chiyani mulibe chimbudzi cha manyowa?** _____			
62	Have you ever used animal manure (cow dung) in the field? **Kodi munagwiritsapo ntchito manyowa a ng'ombe?**	Yes No	1 2	 **Q.64**
63	What is the difference between compost from a latrine and cow dung? **Kodi kusiyana kwa manyowa a mchimbudzi ndi ndowe za ng'ombe ndi chiyani?** _____			
64	Why not? **Chifukwa chiyani?** _____			

65	What cultural meanings are attached to human faeces ? **Kodi pa chikhalidwe chanu pali ziletso, zikhulupiliro ndi ntchito zotani zokhuzana ndi chimbudzi cha munthu?** *Taboos*: _____ **Ziletso zokhuzana ndi chimbudzi cha munthu** _____ *Religion*: _____ **Zikhulupiliro za chimbudzi pa Chipembezo** _____ *Witchcraft:* _____ **Ntchito za chimbudzi cha munthu pa Ufiti** _____ *Medicine:* _____ **Ntchito za chimbudzi pa Mankhwala** _____ *Disease*: _____ **Zikhulupiliro za chimbudzi pa Matenda** _____ *Other, specify*: _____ **Zina (fotokozani)**	
66	What cultural meanings are attached to human urine ? **Kodi pa chikhalidwe chanu pali ziletso, zikhulupiliro ndi ntchito zotani zokhuzana ndi mikozo?** *Taboos*: _____ **Ziletso zokhuzana ndi chimbudzi cha munthu** _____ *Religion*: _____ **Zikhulupiliro za mikozo pa Chipembezo** _____ *Witchcraft:* _____ **Ntchito za mikozo pa Ufiti** _____ *Medicine:* _____ **Ntchito za mikozo pa Mankhwala** _____ *Disease*: _____ **Zikhulupiliro za mikozo pa Matenda** _____ *Other, specify*: _____ **Zina (fotokozani)**	

NO	QUESTIONS AND FILTERS	CODING CATEGORIES			GO TO
67	Are you aware of the fertilizer value of human faeces and urine **Kodi mukudziwa kuti chimbudzi cha munthu komanso mikozo ndi feteleza?**		Faeces Yes Faeces No Urine Yes Urine No	1 2 1 2	**Q68** **Q73** **Q68** **Q73**
68	Have you used faeces or urine as fertilizer? **Kodi munagwiritsapo chimbudzi cha munthu kapena mikozo ngati feteleza pa ulimi wanu?**		Yes No	1 2	 **Q73**
69	What did you use it for? **Nanga munagwiritsapo ntchito fetelezayu pa ulimi wanji?** _____				
70	What were the outcomes? **Nanga zokolola zake zinali bwanji?** _____				
71	Would you use it again? **Kodi mupitiliza kugwiritsa ntchito feteleza amaneyu?**		Yes No	1 2	 **Q72**
72	Why not? **Chifukwa chiyani?** _____				
73	But do/will you accept to use human faeces and urine to fertilize your gardens? **Koma mutha kugwiritsa ntchito chimbuzi cha munthu kapena mikoza ngati feteleza?**	Faeces Urine Faeces and urine	**Yes** **No** **Yes** **No** **Yes** **No**	1 2 1 2 1 2	**Q75** **Q75** **Q75**
74	Why not? Faeces:_____ **Chifukwa chiyani simungagwiritse ntchito manyowa a m'chimbudzi?** Urine: _____ **Chifukwa chiyani simungagwiritse ntchito mikozo ngati feteleza?** Faeces and urine: _____ **Chifukwa chiyani simungagwiritse ntchito manyowa a m'chimbudzi limodzi ndi mikozo?**				
75	Do/will members of your household eat food that has been grown using human faeces as fertilizer? **Kodi mungadye zakudya zimene zilimidwa pogwiritsa ntchito chimbudzi cha munthu ngati feteleza?**		Yes No	1 2	**Q77**
76	Why not? **Chifukwa chiyani?** _____				
77	Do/will members of your household eat food that has been grown using human urine as fertilizer? **Kodi mungadye zakudya zimene zilimidwa pogwiritsa ntchito mikozo ya munthu ngati feteleza?**		Yes No	1 2	**Q79**

NO	QUESTIONS AND FILTERS	CODING CATEGORIES		GO TO
79	Do/will members of your household eat food that has been grown using both human faeces and urine as fertilizer? **Kodi mungadye zakudya zolimidwa pogwiritsa ntchito feteleza wa chimbudzi cha munthu kuphatikizana ndi mikozo?**	Yes No	1 2	**Q82**
80	Why not? **Chifukwa chiyani?** _____ _____			
81	In your opinion, what do you think of people who grow and eat crops using human faeces or urine as a fertilizer? **Kodi maganizo anu ndi otani mukamamva kuti pali anthu ena amane amalima ndi kudya mbeu zolimidwa ndi feteleza wa m'chimbudzi cha manyowa kapena mikozo?** _____ _____			
82	Where there is open defecation, it is common to see some food animals and hens scavenging human faeces. **Ngati anthu alibe zimbudzi, amachita chimbudzi pena pali ponse ndipo timawona ziweto kapena nkhuku zikudya chimbudzicho.** When such a hen is slaughtered for food, for example, what feelings do you have when eating it? **Ngati chiweto kapena nkhuku yimeneyo yaphedwa ngati ndiwo, mukamadya ndiwozo mumaganiza chiyani?** _____			
83	In your opinion, what will change people's minds to start using human faeces for growing food? **Mumaganizo anu, ndi chiyani chimene chingapangitse kuti anthu ayambe kugwiritsa ntchito manyowa a m'chimbudiz kapena mikozo m'malo mwa feteleza wogula ku sitolo?** _____ _____			

This concludes our interview for today.

I thank you very much for your time and cooperation.

Appendix 2

Topic Guide for FGDs

Kafukufuku wofuna kudziwa zifukwa zimene zimapangitsa mabanja kukhala kapena kusakhala ndi chimbudzi pakhomo komanso kumva zomwe anthu akudziwa ndi maganizo awo pa feteleza ochokera mchimbudzi cha munthu

Mawu Oyamba

Moni nonse

Ine dzina langa ndine XXX ndipo ndikugwira ntchito yakafukufuku ndi project ya Sikotelande-Chikwawa yomwe yikugwira ntchito limodzi ndi ofesi ya dokotala wa mkulu wa ntchito za umoyo ndi chipatala mboma lino la Chikwawa.

Kafukufuku yemwe anachitika mmbuyomu anaonetsa kuti mabanja ambiri alibe zimbudzi kaya ndi zakale komanso za manyowa. Pachifukwachi takuitanani nonse kuti tizagawane maganizo osiyanasiyana wokhuza zifukwa zomwe mabanja sakhalira ndi zimbuzi. Cholinga chathu tikufuna kupititsa patsogolo chiwerengero cha zimbudzi wamba ndi za manyowa komanso kugwiritsa ntchito mikozo ngati feteleza pa ulimi wawo.

Ine ndizapereka mutu wankhani ndipo inu muzapereka maganizo anu. Choncho ndikupemphani kuti nonse mukhale omasuka chifukwa zones zomwe tikambirane pano zikhala zachinsinsi zodziwa inu nokha basi. Polemba zotsatira zakafukufukuyu, sitidzalemba dzina la munthu aliyense amene wapeleka maganizo ake kapenanso amene mungamuthcule pazokambirana zathuzi.

Palibe yankho lokhoza kapena lolakwika chifukwa yankho lirilonse ndilofunika zedi kwa ifeyo. Ngati mukuwona kuti mzanu wapereka nfundo yomwe inu mukuganizira mwina, mukhoza kupereka maganizo anu. Mulinso ndi ufulu wofunsa mafunso okhudzana ndi zolinga zakafukufuku ameneyu tikhata zokambirana zathu.

Muli ndi ufulu kuvomera kapena kukana kutenga nawo mbali muzokambirana zathuzi zomwe zingatitengere ola limodzi kapenso ndi theka lake. Kodi inu muli osangalatsidwa kutenga nawo mbali muzokambiranazi?

TOPIC 1. HOUSEHOLD PIT LATRINE – Availability, Use and Maintenance

Objective 1: *To explore norms, values and drivers of pit latrines at household level.*

Where do people go when they want to defecate?

- Describe the common defecation practices in the community? What factors influence one's choice of where to defecate? (Explore any beliefs (cultural or religious), attitudes that may affect choice of defecation place)

- Explore how common open defecation is. Why does the community tolerate it? Is it a norm? Do they think it is good or not good for the general wellbeing of the community? Explore their views on achieving zero open defecation.

What are the norms, values and drivers for pit latrine construction and use?

- What are the pit latrine options in use the village? Explore why such options are being used? Any preferences for a type of pit latrine?

- What value is attached to a pit latrine at household level? Explore their values in priority order.

- Who identifies the need for a pit latrine at household level? Who decides that it should be built? Are there gendered tasks related to pit latrine construction? Explain why.

- Explore common reasons why a household would not have a pit latrine?

- What would influence a household to have a pit latrine?

- Explore practices on the use of a pit latrine at household level? Explore any objections on shared use of latrine: men and women; adults and children, healthy and ill members of the family.

- For those in the group who have pit latrines, explore what they like most and like least of their latrines.

TOPIC 2. ECOLOGICAL PIT LATRINES (Zimbudzi Za Manyowa)

Objective 2: *To explore community knowledge and perceptions of using human faeces and urine for agricultural production.*

What do they know and do not know about the EcoSan concept?

- What composting practices exist in the village? Explore their previous experiences with the growing banana plants on abandoned latrine pits.
- Explore their awareness of the ecosan concept (recycling human faeces and urine for growing crops) - Arborloo, Fossa Alterna, Skyloo?
  Probe if they are aware of the fertilizer value of faeces and urine.
- Explore what they think is there a difference between cow dung and humus from a compost toilet?
- Explore any taboos and beliefs (cultural or religious) attached to human faeces and urine?
- Explore any traditional uses of faeces and urine (medicinal, witchcraft, etc?
- Explore if they think there is any difference between adult and children's faeces?
- Explore their willingness to adopt composting toilets and use of urine fertiliser.
- Would it be acceptable to sell humanure (composted human faeces) or urine to someone? If not, explore why?
- Are there objections to eating crops grown using faeces or urine as a fertilizer? If yes, explore the fears they have.
- Pigs and hens do scavenge human faeces. If they are slaughtered for food, do people eat them with some reservations or not. If not, does this change their perception of eating crops grown using faeces and urine as a fertilizer in any way?
- Explore cultural factors that would influence the acceptance or rejection of using human faeces and urine as fertilizers in the village.

This concludes our discussion for today.
I thank you very much for your time and cooperation.

Appendix 3

Sample Size Calculation

Required sample size

The required sample size was calculated based on the estimated proportion of households with pit latrines. Calculation of sample size was done using procedure outlined below:

Required information:

Primary outcome variable, which was households with pit latrines. According to Chikwawa district HMIS, 2002, as outlined in the district profile, 2006, there are 86,737 households in the district of which only 36,430 (42%) have pit latrines for faecal disposal (GOM, 2006).

Desired width of 95% confidence interval = 10% (i.e. +/- 5%, or 25% to 35%) . The formula for the sample size for estimation of a single proportion was as follows: -

$$n = 15.4 * p * (1-p)/W^2$$

Where n = the required sample size

p = the expected proportion - here 0.42

W = width of confidence interval - here 0.10

Inserting the required information into the formula gives: -

$$n = 15.4 * 0.42 * (0.58)/ 0.10^2$$

$$= 375$$

A sample of 375 households was required to obtain a 95% confidence interval of +/- 5% around prevalence estimate of 42%. To allow for an expected 95% response rate to the questionnaire, a total of 377 households were required to be interviewed.

Annex 4

Historical Background of Health Surveillance Assistants (HSAs)

Malawi was hit by an outbreak of smallpox in the period before the early 1960s, a situation to which the Ministry of Health (MOH) responded by recruiting a cadre of temporary staff whom it called "Smallpox Vaccinators" specifically to deal with the outbreak. Just as smallpox was almost obliterated (in 1973), there was a cholera outbreak in the country particularly in the Southern District of Nsanje. Village Health Committees (VHCs) were established in all the villages to deal with the outbreak comprising untrained volunteer individuals from within the various villages. There was therefore a need to employ Cholera Assistants who would train the various VHC as well as helping in the actual control and preventive measures against further spread of the outbreak. Thus, the Smallpox Vaccinators were deployed to Nsanje, from where they were redeployed to do similar work in other districts of the country because the outbreak had spread throughout the country. Other Cholera Assistants were recruited as well.

The recurring cholera outbreaks were put to rest around the early 1980's. The MOH then wanted cease their recruitment because it was thought that there was going to be no further requirements for their services. However, the preventive section of the Ministry successfully negotiated for their retention, under a new mandate of "surveying" factors and behaviours that put people's health at risk and providing primary assistance before referring sick people to health facilities, hence the name "Health Surveillance Assistants".