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**SURVEY AND RECOMMENDATIONS ON ZAMBIAN DRY SANITATION
IMPROVEMENT PROGRAMME**

Supervisor
Comissioned by
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Toni Paju Survey and recommendations on Zambian dry sanitation
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ABSTRACT

The theme of the study is diffusion of dry toilet innovation in the social system of Kaloko area, Zambia. The study is implemented in the Zambian dry sanitation improvement programme, which is run by the Global Dry Toilet Association of Finland. The project aims at promoting ecological sanitation through the use of dry toilets. The aim of the study is to find out if there is a relationship between the level of knowledge that people have on dry toilets, and the adoption of dry toilet use in the communities around the project area. The work is being done to find out why there are many people around the project area, who are reluctant to use dry toilets even though they would have significant advantages in comparison with the current sanitation system. The information for the study was gathered by interviewing people in the project communities, and conducting key informant interviews.

The study was implemented using a questionnaire of both quantitative and qualitative questions. The questionnaire was based on the theory of diffusion of innovations. The analysis method was deductive analysis, meaning that the results were looked through the framework set up in the theory chapter. The results were also compared to three other studies made in the field of innovation diffusion research.

The obtained results proved that there is a significant positive statistical correlation between the level of education on dry toilets, and the attitude towards dry toilets. It was shown that knowledge reduces uncertainty around dry toilets, takes away space from beliefs, and therefore results in more positive attitude towards the dry toilet concept.

Based on the results, suggestions were made to guide the project forward. These results can help the Global Dry Toilet Association of Finland and also other organizations working with similar projects, to develop new strategies for their projects, and therefore achieve wider acceptance of the innovation. The results are applicable to projects in developing countries, to achieve better results when introducing new innovations.

Suggestions for further studies were to find out whether the adoption rate of the innovation takes off after the people have observed the results, and what would a more cost-efficient dry toilet model be like to enable even the poorest farmer access to dry toilet fertilizer.

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TIIVISTELMÄ

Tutkimuksen aihe on innovaatioidiffuusio sosiaalisessa järjestelmässä Kalokossa, Sambiassa. Tutkimus toteutetaan Käymäläseura Huussi ry:n projektissa nimeltä Sambian kuivasanitaation kehittäminen. Kyseisen projektin tavoite on ekologisen sanitaation edistäminen rakentamalla kuivakäymälöitä. Tutkimuksen tarkoitus on selvittää onko ihmisten kuivakäymälätietämyksen ja heidän kuivakäymäläasenteidensa välillä riippuvuutta. Lähtökohta tälle tutkimukselle on se, että projektialueella on paljon ihmisiä jotka eivät suostu osallistumaan projektiin toimijan, tai kuivakäymälän käyttäjän ominaisuudessa, vaikka kuivakäymälät ovat huomattavasti kehittyneempi ratkaisu kuin tällä hetkellä käytössä olevat kuoppakäymälät. Tutkimus toteutettiin haastattelemalla ihmisiä projektialueella, sekä tekemällä muutama avainhenkilöhaastattelu.

Tutkimuksessa käytetty kyselylomake koostui sekä kvantitatiivisista että kvalitatiivisista kysymyksistä. Kyseinen lomake perustui innovaatioidiffuusioteoriaan. Analysointimetodi oli deduktiivinen analyysi, joka tarkoittaa sitä, että saatuja tuloksia tarkasteltiin tutkimuksen teoriakehyksen läpi. Tulosten analyysin jälkeen suoritettiin vertailua kolmeen kehitysmaassa tehdyn innovaatioidiffuusio tutkimukseen.

Saadut tulokset todistivat että ihmisten kuivakäymälätietouden ja heidän kuivakäymäläasenteidensa välillä on selkeä positiivinen tilastollinen riippuvuus. Kuivakäymälätieto siis vähentää epävarmuutta kuivakäymälöiden tiimoilta, ja saa tilaa uskomuksilta, jotka ovat tärkein kuivakäymäläasenteisiin tällä hetkellä vaikuttava seikka.

Tulosten perusteella voitiin tehdä suosituksia projektin eteenpäin viemiseksi. Nämä suositukset voivat ohjata projektia saavuttamaan laajempaa kuivakäymälöiden hyväksyntää projektialueella. Tuloksia voi soveltaa myös muihin kehitysmaihin sijoittuviin innovaatioiden edistämiprojekteihin.

Jatkossa olisi mielenkiintoista tutkia miten asenteet kuivakäymälöitä kohtaan muuttuvat kun ihmiset havaitsevat niiden tuomat edut. Toinen mielenkiintoinen tutkimuskohde olisi kehittää edullisempi malli kuivakäymälälle, jotta köyhimmätkin maanviljelijät saisivat mahdollisuuden omaan kuivakäymälään ja siitä saatavaan lannoitteeseen.

FOREWORD

I would like to express my sincere gratitude for the people who have helped me during this research. These people include the residents of Kaloko area, who were willing to fill the questionnaire, and participate in the interviews. Mr. Lewis Jere and Kaloko Trust who offered me a place to stay for the period of field research, and the facilities for working. The project coordinator Sari Huuhtanen, who gave me a chance to do my final thesis in the project. Ms. Katambo, the project coordinator in Zambia, for assisting in arranging the interviews. Jonathan Bwalya and Isaac Chisenga for fixing my bicycle for the interviewing trips. The staff in Environmental Engineering –program in Tampere University of Applied Sciences, especially Eeva-Liisa Viskari and Marjukka Dyer. Maa- ja Vesiteknikan tuki ry, for funding my study. Special thanks goes to Mr. Chiambi, a teacher of Luansobe basic school, for working as my interpreter during the interview trips, and Antti Hannila for keeping me company during the three month field research phase.

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LIST OF ABBREVIATIONS

ZASP	Dry sanitation improvement programme for Zambia
GDTF	Global Dry Toilet Association of Finland
SWOT	Strengths, weaknesses, opportunities, and threats
SPSS	Computer program used for statistical analysis, originally statistical package for social sciences

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1 INTRODUCTION

1.1 The background and purpose of the research

In the beginning of 2006, a project was launched by the Global Dry Toilet Association of Finland (GDTF) in Masaiti District, Copperbelt province, Zambia, to improve the sanitation of the area. The project area is presented in Figure 1. The project plan is to do this by constructing dry toilets, and educating people on good hygiene and sanitation. The area consists of 8 communities, and about 10 000 people live there. There is a chief who governs the whole project area and each of the village has a headman, who communicate with the chief on a regular basis, and on various issues. Kaloko Trust, which is the local project partner, works at Kaloko, which is situated in the middle of the project area. The communities surround Kaloko, where there are school, health centre, market, and a church. Even though some of the surrounding communities have for example their own schools, people from each community visit Kaloko on a daily basis. Most of the people in the area are farmers, and get their living from agriculture. The starting point for the project was the poor sanitation situation of the area. The people don't have proper toilet facilities, and open defecation is a common practise. This is a serious health risk, because the faecal bacteria can reach ground water reserves through leaching, or surface water reserves through surface runoff, and therefore reduce the availability of clean water. Another concern was the rise in artificial fertilizer prices. This trend may cause troubles for the farmers in the area, since they are dependent on artificial fertilizers. The deep poverty levels in the area make it difficult for the people to improve the sanitation situation by them selves, even though they are motivated on doing so. Strong cultural beliefs are linked to dry toilets, and especially to the practice of using human excreta for fertilizing purposes.

The aspects that were of greatest importance in the Dry Sanitation improvement programme for Zambia (ZASP), were to improve the hygiene situation, and

provide free fertilizer from the dry toilet waste for the farmers. The project began by mapping the level of knowledge on good hygiene and sanitation in the area. This was done through an interview study. The first phase of the project, for collecting background information, lasted the year 2006. In the year 2007, the second phase of the project, for constructing dry toilets in the area took part. In 2007 sanitation clubs were also formed in the project area. Each village in the project area has its own sanitation club. The clubs are basically about spreading information on dry toilets. The sanitation clubs are a way for the local people to get involved with the project, and the project management works closely with the sanitation clubs, with issues such as building the dry toilets for example. The sanitation clubs are open to anyone who is interested in the project.



Figure 1. The project area in the Copperbelt province (Mutamba 2007, 9)

The need for this research study comes from the fact that many of the people in the project area prefer pit latrines to dry toilets, despite the clear advantages of dry toilets in relation to pit latrines. The aim of this study was to find out, if there is a relationship between how much people know about dry toilets, and what their attitude towards dry toilets is. Recommendations for improvement actions were made based on the findings of this study.

The main reference book for the research is the Diffusion of innovations by E.M. Rogers (2003). It is right to say that the particular book is one of the most important books in the field of innovation diffusion research. In the reference material, many different factors which affect the diffusion of innovation can be identified. The aim was to compare the results to the theory, and find out which of these factors were the most important, and if there are some other factors which affect the diffusion of the innovation as well. Another interesting point of view was to look at the results in comparison to other innovation diffusion studies made in developing countries.

1.2 Initial hypothesis and the research problems

The initial hypothesis was that there is a positive statistical relationship between how much the people in the project area know about dry toilets, and their acceptance of the concept. In other words, people who have factual knowledge about dry toilets tend to accept and use the dry toilets more readily, than people who do not have much information on them. This hypothesis is based on the idea presented in the theory of innovation diffusion that the whole process is about reducing uncertainty. When a person has factual knowledge about an innovation he is more confident of the consequences of adopting the innovation. Knowledge also takes away space from beliefs, which affect the attitudes towards dry toilets. (Rogers 2003, 14)

I wanted to look at the advantage of the dry toilets as experienced by the potential adopters, rather than the objective advantage. The reason for picking this point of view comes from the criticism of innovation diffusion study that suggests that the

researchers often side with the change agencies and accept the innovation to possess absolute advantage value. (Rogers 2003, 105-117)

The main problems in the research are what is the difference in attitude towards dry toilets between the people who attended the hygiene and sanitation trainings, and the people who did not, and what factors affect the acceptance of the dry toilet concept the most. Other important research problems are, how the people have found out about dry toilets, and does that affect their opinion.

1.3 Research methods and schedule

The study was carried out using theory of innovation diffusion. Point was to find out which factors affect peoples attitudes the most, when introducing ecological sanitation through such a culturally contradictory innovation as dry toilets. The data for the research was collected from 6 communities, using a questionnaire (see Appendix 1) which had both quantitative and qualitative section. Also key informant interviews were used. Studying the key factors which affect the acceptance of dry toilets in the communities, can help build up strategies for further innovation promotion. The total number of interviewees was 51.

The questionnaire was divided into three different parts, according to the theoretical background. The questions in the first part, mapped how people felt about the innovation itself, the second part was about the communication channels in the area, and the third part was about the social system. Also questions about the image of ZASP were asked.

The target persons for the key informant interviews were the assistant project coordinator Ms. Katambo, the writer of the mid-term report Mr. Mutamba, the director of the Zambian associate, Kaloko Trust Mr. Jere, and two headmen in the project area communities. The questionnaire study was filled out during one-on-one interviews. Target group of the one-on-one interviews were the people living in the project area communities. The prerequisite for the people participating in the interviews was that they had been at least in some way involved with the dry toilet project. The interviewees can be divided in to four different groups,

depending on if they took part in the hygiene and sanitation trainings, or if they are sanitation club members. The prerequisite for the people who were neither sanitation club members, nor took part in the hygiene and sanitation trainings, was that they had at least heard of dry toilets.

The analysis method was deductive analysis. It means that the results were looked through the theoretical framework set up in chapter 4. Cross-tabulations were used to help analysing the results. The results were presented also in simple frequency tables and graphs. SPSS was used for the cross-tabulations and drawing the graphs.

The whole research including background work and reporting was carried out during a six month period, between December 2007 and May 2008. During the December 2007 and January 2008 the literature and reference material was gathered. I also studied the material about the ZASP project. Questionnaire was prepared at the end of January. In the beginning of February I arrived at the project site, and began with key informant interviews. From the middle of February until the end of the month the interviews were carried out, and data gathered. The reporting phase lasted from early March until late May because of limited access to reference material at the project site. The project coordinator of ZASP was informed of the progress on a regular basis through e-mail. And a meeting with the project coordinator was arranged in March to discuss the progress of the research.

2 CONVENTIONAL AND ECOLOGICAL SANITATION

2.1 Conventional sanitation and ecological sanitation

In the ZASP case, the pit latrines represent conventional sanitation, and the dry toilets represent ecological sanitation. There are fundamental differences between the philosophies of these two. Conventional sanitation is based on drop-and-store philosophy. After the pit latrine is full, you cover the hole and forget about it. This kind of philosophy does not consider the intentional reuse of the dry toilet waste. Pit latrines can also be referred to as dry toilets because they do not need water to operate, but this does not make them ecological. I shall use the word dry toilet in this study referring to the toilet models built by ZASP. (SIDA 1998, 3)

Ecological sanitation has a more systematic approach, and it is based on the idea of recycling everything that can be recycled. This includes water, energy and nutrients for example. The philosophy behind it is “sanitize-and-recycle”. This kind of philosophy is basically about preventing the problems that conventional sanitation has, rather than trying to control them. Important difference between conventional and ecological sanitation is that in conventional sanitation the resources that human waste contains are wasted, and therefore it is an open system. Ecological sanitation is a closed system, where everything is reused. A proper sanitation system should meet the following criteria, it should prevent diseases, protect the environment, be affordable, be acceptable, and be simple. The dry toilets which are being built to the project site do not meet all of the above mentioned criteria yet, but they are a good start for developing the sanitation situation in the area. Even though the innovation in this study is dry toilets, it is still important to remember that the idea behind the dry toilets is ecological sanitation. Therefore it is a question of implementing ecological sanitation through dry toilets. However, I shall concentrate on the acceptance of the dry toilet concept, rather than on the acceptance of ecological sanitation. (SIDA 1998, 4-6)

2.2 Dry toilets

The operational principle of dry toilets is simple. As said before a toilet which does not use water is a dry toilet, even if it did not separate urine and faeces. In figure 2 you can see a picture of one of the project dry toilets. The toilet facilities are constructed so, that the actual toilet is elevated about a meter above the ground level. In the toilet, there is a platform which has separate holes for urine and faeces. The faeces are directed to a container below, where they will be stored in a sealed compartment. The urine is separated in to a container, which in this case is a 20 litre canister. In the canister, the urine will be stored for three months, before used as a fertilizer. The faecal matter will be stored for longer to ensure it has decomposed, and there are no faecal bacteria present in the mass when it is used as soil improvement material. There are two toilet sections inside the toilet, and only one is in use at a time. When the compartment for the faecal matter in the first section is filled, the other toilet section is taken in to use. This way the faecal matter in the first section has time to decompose before it is emptied, and used as soil improvement material.



Figure 2. Dry toilet at Kasamwa community

2.3 Pit latrines

Pit latrines, which can be seen in figure 3, are the most common current practice in the project area at the moment. The operational principle of pit latrines is simple. A hole is dug in the ground, usually ranging from 1,5 to 6 metres deep. Toilet facilities are usually constructed above the hole, depending on how long the pit latrine is intended to be operational. Most of the shallower pit latrines are not covered with anything. After the hole has been filled with faeces, it is covered and left as such. If there are toilet facilities constructed over the pit, they are dismantled after the hole has been filled, and used as construction material somewhere else. Open defecation is also a common practice. The mentioned practices provide circumstances, where faecal bacteria and nitrates can contaminate ground water reserves through leaching. Also flies spread faecal bacteria from faeces to food.



Figure 3. Covered pit latrines at Chisapa community

2.4 Comparative SWOT-analysis between dry toilets and pit latrines

There are many essential differences between pit latrines and dry toilets. Pit latrines are cheaper, they are faster and easier to build than the dry toilets, and they are a traditional way. However, they attract flies, have bad odours, they can cause diarrhoeal epidemics by contaminating ground water reserves, and they can not be built everywhere. The risk of contamination of ground water reserves comes from rainwater flooding in to the pit. The faecal bacteria can reach ground water reserves through leaching, or be transported directly to surface water reserves. Important weakness is also that they can not be built for example on rocky ground, or to places where the ground water table is high.

Dry toilets provide efficient fertilizer, prevent pollution of water reserves, they do not have bad odours nor attract flies, and they can be used for a long time. However, they do cross cultural and traditional boundaries, and are relatively expensive at the moment. Even though dry toilets would have remarkable advantages to the people in the communities in many different ways, they still carry the burden which originates from the faecal related cultural and traditional beliefs of the social system in question.

Table 1. SWOT-analysis on pit latrines

<p>STRENGTHS</p> <ul style="list-style-type: none"> - Low cost - Traditional way - Can be built easily and fast 	<p>OPPORTUNITIES</p>
<p>WEAKNESSES</p> <ul style="list-style-type: none"> - Attracts flies - Has bad odours - Use of pit latrines is the cause of diarrhoeal diseases, and therefore responsible for millions of fatalities yearly in the developing countries - Reduces the availability of clean water - Can not be used everywhere 	<p>THREATS</p> <ul style="list-style-type: none"> - May contaminate ground water reserves - May lead to a diarrhoeal epidemics - Contributes to the <u>eutrophication</u> of water bodies

Table 2. SWOT-analysis on dry toilets

STRENGTHS <ul style="list-style-type: none">- Provides efficient fertilizer- Prevents water pollution- Improves hygiene in the area- Does not have any odours, when used properly- Is sustainable, can be used for a long time	OPPORTUNITIES <ul style="list-style-type: none">- Can have a major positive effect on the local economy- Can reduce diarrhoeal diseases- Can reduce the dependence of the farmers on artificial fertilizers- Cost effective way of improving the quality of life
WEAKNESSES <ul style="list-style-type: none">- Crosses cultural and traditional boundaries- Relatively high cost for the people	THREATS <ul style="list-style-type: none">- May be seen as a Western attempt to modify the local culture and traditions

3 INNOVATION DIFFUSION

3.1 Innovation

Innovation can be defined as any idea or a product, which is new in local context (Aubert 2004, 11). The innovation under study here is dry toilet, and it represents ecological sanitation. The particular innovation represents a modified version of the current practice, which is pit latrine. It requires a new way of thinking for the locals, when it comes to sanitation issues. It is an innovation that crosses cultural boundaries, and is in conflict with some of the traditional beliefs.

3.2 Innovation diffusion

Rogers (2003, 5) defines innovation diffusion, as the process in which an innovation is communicated through certain channels over time, among the members of a social system. Different models have been developed based on the nature of the process. In figure 4 the model of the innovation decision process is exemplified. Rogers defines the communication as a two-way process of convergence (2003, 6). The special character of the communication originates from the newness of the idea. Every new idea has its own level of uncertainty involved. Information reduces uncertainty, and therefore reduces the amount of alternatives considered for the innovation. It has been studied, that the rate of innovation diffusion follows an S-shaped curve. It begins slowly, and when enough people of the same social system have adopted the innovation, the rate of adoption increases. When the amount of potential adopters reduces because most of them have already adopted the innovation, the rate begins to decrease (Rogers 2003, 11).

Diffusion research studies the conditions, and factors which affect the likelihood of innovation adoption in a community. It is a study of the affect that the innovation related characteristics, communication channels through which the

information about the innovation is communicated, and the characteristics of the social system have on the adoption rate of the innovation. The innovation diffusion research tradition was born in the beginning of the 20th century. The S-shaped curve of the adoption rate was discovered by French sociologist Gabriel Tarde, in 1903 (Rogers 2003, 41).

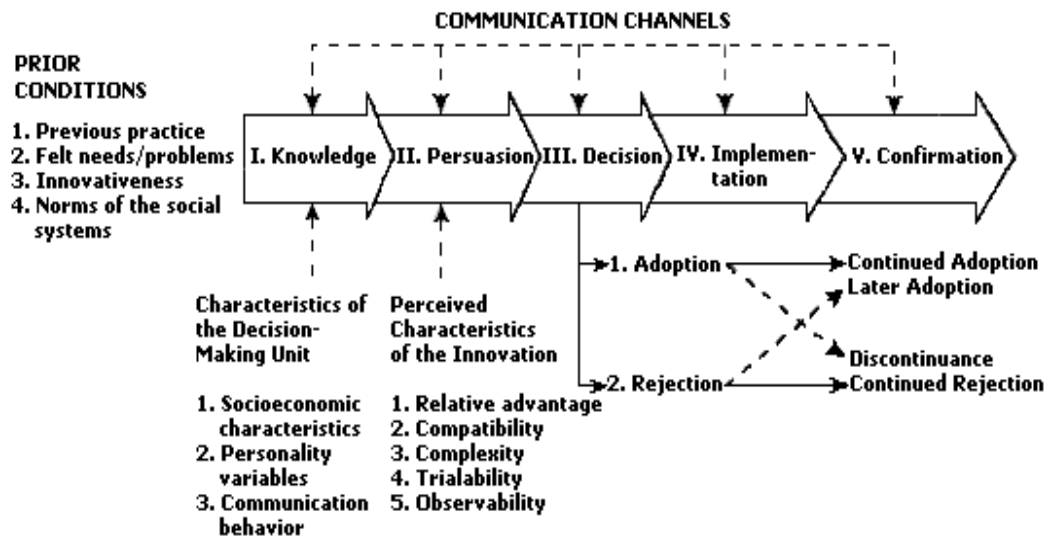


Figure 4. A model of the innovation decision process (Rogers 2003, 170)

In this research, the term innovation diffusion is used referring to the adoption of ecological sanitation through the use of dry toilets by the people in the area. Dry toilets are considered as low-tech products, but because of the sharp poverty levels in the area they are still relatively expensive for the people. This is why the attention is paid on the acceptance of the concept of using human excreta as fertilizer.

3.3 Criticism on innovation diffusion study

Even though innovation diffusion study has clear merits, it has also received some criticism. Actually the lack of criticism of innovation diffusion studies, until the 1970's has been according to Rogers (2003, 106), one of the main weaknesses of innovation diffusion studies. The criticism on innovation diffusion

studies is targeted on the pro-innovation bias, individual-blame bias, recall problem, and the issue of equality.

Pro-innovation bias

The pro-innovation bias criticizes the fact that researchers are interested in complete diffusion of innovation within the community, the fact that it should be diffused more rapidly, and the lack of rejection or re-invention of the innovation. This leads to the over-looking of the reasons for each of afore mentioned view points. Despite of the clear potential advantages of an innovation, you must consider the culture-specific factors which might make the innovation unsuitable for the particular case. This makes it important to study the innovation as experienced by the potential adopter, rather than the objective advantage. (Rogers 2003, 105-117)

Individual-blame bias

The origin of the individual-blame bias is in the tendency of innovation diffusion researchers to side with the change agents, rather than with the potential adopters. This is mainly because the change agents are usually the funders of innovation diffusion research. Individual-blame bias means blaming the individual instead of the system. In contrary system-blame would be holding the system responsible for the individuals problems. For example in individual-blame you would blame individuals of reckless driving in the case of increasing traffic accidents. In system-blame, you would blame the car manufacturers for producing unsafe cars in the same situation. In innovation diffusion study this would mean taking in to consideration that the change agent might be at fault for promoting the innovation in a wrong way. Usually change agents blame the laggards or late adopters for not being rational and adopting the innovation, but when the situation is studied from the individual point of view, the decision not to adopt might seem totally rational. Another factor that would have to be taken in to consideration more, is the nature of the adoption decision. An individual can not be held responsible, if the nature of the decision to adopt an innovation is made at community level. (Rogers 2003, 118-126)

The recall problem

Time is one of the four main elements affecting innovation diffusion. The recall problem originates from the difficulty of the adopters to remember accurately the circumstances of their adoption decision. Normally innovation diffusion research has been done by taking one-shot survey, and therefore making the innovation diffusion process timeless. (Rogers 2003, 126-130)

The issue of equality in innovation diffusion

Innovation diffusion research has been criticized for not considering the issue of equality, but rather concentrating on how the socio-economic benefits of the innovation are distributed among the social system under study. It has been shown, that in many cases the socio-economic gap between the high and low socio-economic segments increase. This tendency promotes inequality. (Rogers 2003, 130-134)

The theory of the diffusion of innovations has also been criticized by Clarke (1991). The main arguments were that the theory can not predict outcomes but is only an explanatory tool. Another argument is that the theory is suitable only for cultures which are alike the one it was created in. I would counter-argue that the theory has its strength in explaining the process, and that compensates the fact that it is not good at predicting outcomes. From the change agent point of view, it gives the possibility to affect the diffusion process and therefore achieve the best possible result. The second argument is correct at saying that the theory does not apply to developing countries for example in the same way it applies to Western cultures, but I would argue that the main differences lie within the preference of different factors in the theory, rather than the suitability of the theory itself. (Clarke 1991)

4 FACTORS AFFECTING THE INNOVATION DIFFUSION

According to Rogers (2003, 11), the diffusion of innovation is affected by four main factors. These factors are the characteristics of the innovation itself, the communication channels through which the information of the innovation spreads, social system, and time. The interest is to find out the factors which are most important when dealing with such a culturally contradictory innovation as dry toilets, rather than studying the progress of the innovation diffusion process itself. I will make an assumption about the current state of the diffusion process, based on the results.

4.1 The characteristics of the innovation

Different kind of innovations have different rate of adoption. According to Rogers (2003, 15-16), the innovation itself has five different characteristics which are of importance when looking at the affect on the rate of innovation diffusion. These characteristics are relative advantage, compatibility, complexity, trialability, and observability.

Relative advantage

Relative advantage means the advantages that adoption of the innovation will bring when compared to the previous practice. In the case of dry toilets, the main advantages would be the free fertilizer from the dry toilets, and the decrease in diarrhoeal diseases in the area. The hygienic operation of dry toilets, by reducing ground water pollution, would also lead to better availability of clean water. Both of these advantages bring economic improvement, as the free fertilizer saves money directly, and the decrease in diseases can decrease the time wasted on being ill instead of working. However, the attention here should be paid on how

the people experience the relative advantage of the innovation, not so much on the objective advantage of the innovation. (Rogers 2003, 15)

Compatibility

The second characteristic is the compatibility of the innovation, with the needs, values, beliefs, and norms of the social system. This is an important factor, and can become an obstacle of innovation diffusion, no matter how great benefits the innovation would provide. (Rogers 2003, 15)

Complexity

The third characteristic is the complexity of the innovation. This refers to how well the people understand the operating principle of the innovation, and how to use the innovation. The dry toilets are no different to the previous practice, when it comes to how they are used. In other words, everyone in the area knows how to use the dry toilets, but the aspect which is new, is using the urine as fertilizer. It is an aspect of the innovation which could be considered to be complex for the people. If the innovation is too complex in its operating principles, or too hard to use, it might hinder or even prevent the adoption of the innovation. As well as with the relative advantage, the attention here should be put on the experienced complexity, rather than the objective complexity. (Rogers 2003, 16)

Trialability and observability

I summed these characteristics together, since the observability, and trialability come in to play at the same time in this particular case. Trialability means the extent in which the person can try the innovation by himself, before the decision of adoption or rejection. Observability means the degree in which members of the social system can observe the effects of the adoption of the innovation. If positive results can be seen, it will increase the communication about the innovation within the social system. (Rogers 2003, 16)

4.2 Innovation types

Uutinen (2002) writes referencing Engel et al. (see Uutinen 2002, 17) in dividing innovations into three types. The first type is continuing innovations, second type is dynamically continuing innovations, and the third type is discontinuing innovations. Continuing innovations are changes to already existing product. Dynamically continuing innovations are for example new products which don't require the adopters to change their behavior. Discontinuing innovations are totally new and require the adopters to change their behavior. (Uutinen 2002, 17-18)

Dry toilets have the characteristics of both dynamically continuing and discontinuing innovations. On the other hand using the toilet is done in the same way as before, but then again the use of the dry toilet fertilizer is a totally new concept and requires the users to change their habits. It could be said that the dry toilet and the disease reducing character represent dynamically continuing innovation. And from this dynamically continuing innovation a new discontinuing innovation, the dry toilet fertilizer, can be derived.

4.3 Communication channels

Second factor affecting the innovation diffusion process, is the communication channels of the social system where the diffusion is being studied. Diffusion is a communication process, which concerns a new idea. The communication process includes the innovation, a person who has information or experience on the innovation, a person who doesn't have information or experience on the innovation, and a channel through which these two subjects exchange information about the innovation. The relationship between the two subjects defines the nature in which information about the innovation is passed on. Mass media is usually an effective way for passing on information, but interpersonal channels are most effective generally speaking. In this case we are dealing with the rural area of a developing country, and that is why the information exchange between individuals is the most important communication channel. Especially in

the case of such innovations which require a new way of thinking, and letting go of some of the traditional beliefs, the information exchange between two individuals who are in a similar position becomes vital. If the experiences on the innovation are negative, the information transmitting through the social system can also be negative. In that case, the innovation diffusion can progress in an opposite direction, leading to rejection of the innovation within the community. In the case of dry toilets, the adoption of the innovation would lead to changes in the social system through new habits and rejection of old beliefs. For most individuals the information that they get from their peers is more important, than the information received from objective scientific evaluations. (Rogers 2003, 18-19)

Innovation diffusion has been referred to as a process of imitation. Homophily means the degree in which two individuals are similar in such attributes as education, beliefs, socio-economic status etc. Heterophily is the opposite of homophily. Homophilous communication is more likely to occur, and is usually more effective than heterophilous communication. But if the two individuals are totally homophilous regarding the knowledge about the innovation, diffusion cannot occur because there is no new information they can exchange. (Rogers 2003, 20)

4.4 Social system

Social system is an abstract structure, which is constructed of the relationships between individuals, belonging to the same social system. These individuals are joined together to accomplish a common goal. The structure defines the boundaries in which the innovation diffuses. Social system is formed of formal and informal relationships. The informal relationships define who communicates with who, and in what circumstances. The high probability of homophilous communication defines the communication structure of the system. If the situation was such that each individual would communicate with equal probability with each other member of the social system, there would be a lack of communication structure. (Rogers 2003, 23-24)

Norms of the system define the way in which the individuals are expected to behave. Norms may set up a barrier to change. The people who are respected in the social system, and who people look up to, can be referred to as opinion leaders. Opinion leadership is the extent in which the individual is able to affect the opinions of other individuals. The opinion leaders may set up a model of innovative behaviour, which other individuals can follow. Opinion leaders are usually in a different position compared to other members of the system, in the way that they are more exposed to external communications, are more innovative, and are at the centre of interpersonal communication networks. Change agents are individuals that affect the innovation-decisions within the social system. They are professionals, who represent external change agencies. Change agents often use opinion leaders in speeding up the adoption of innovation, or preventing the spread of undesired innovation. Change agents are usually heterophilous to their typical clients in the social system. Change agents can also employ aides within the social system to reduce the gap between them and their clients. (Rogers 2003, 24-28)

The innovation adoption or rejection decisions can be divided in to three categories, optional, collective, and authority decision. In the optional decision, the individual decides by himself whether to adopt an innovation, even though the norms of the social system may have an effect on the decision. In the collective decision all the individuals of the decision making body must conform to the decision once it has been made. Authority decisions are made by few individuals who possess power over the system, and the individuals of the system must conform to the decision. Adopting new legislation is a good example of an authority decision. (Rogers 2003, 28-30)

4.5 Time

Time is present in the innovation diffusion process when an individual goes through the phases, which lead to adoption or rejection of the innovation. The phases are (1) knowledge, (2) persuasion, (3) decision, (4) implementation, and (5) confirmation. In the knowledge phase the individual gains awareness of the

innovation. In the persuasion phase the individual receives more information about the innovation, and forms a positive or negative attitude towards the innovation. The decision phase leads to either adoption or rejection of the innovation. If the individual chooses to adopt the innovation, then the implementation phase is the time the individual puts the innovation in to use. In the confirmation phase, the individual decides whether to continue or discontinue the use of innovation. If the decision phase leads to rejection, it might be so that the individual decides to adopt the innovation at a later stage. This whole process can be seen as information seeking process, which aims to reduce uncertainty around the innovation. Because the individual wants to know if the innovation is useful at his particular situation, the importance of homophilous communication on the innovation is emphasized. (Rogers 2003, 20-22)

People can be divided in to different adopter categories depending on the time that an individual takes to move from knowledge phase to implementation phase. The categories are (1) innovators, (2) early adopters, (3) early majority, (4) late majority, and (5) laggards. These categories represent the innovativeness of the individual. As said before, the rate of innovation adoption has been seen to follow S-shaped curve. The S-curve represents the percentage of the members to adopt the new innovation measured in a period of time. (Rogers 2003, 22-23)

5 CASE ZASP: DESCRIPTION AND ANALYSIS OF THE RESULTS

I will analyse the material by looking it through the theoretical framework set up in the previous chapter. SPSS statistical analysis package is used as a tool for cross-tabulations, chi-square tests, and presenting the results. The questionnaire (see Appendix 1) which I had prepared was based on the innovation diffusion theory described in chapter 4.

5.1 Background information

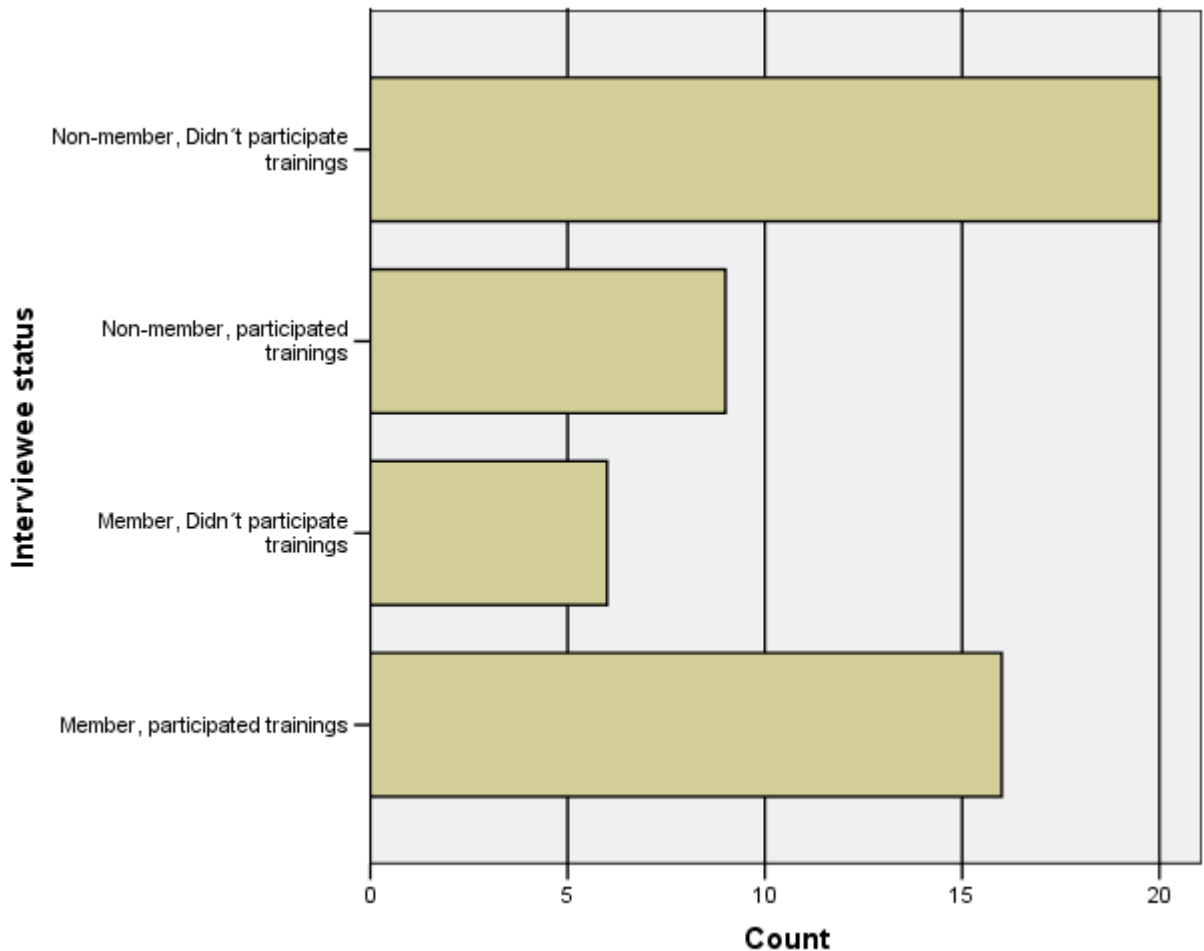


Figure 5. Interviewee statuses. Non-member and member refer to the membership in the sanitation club, training refers to the sanitation training.

From figure 5 we can see the interviewee statuses. From the interviewees who were not members of a sanitation club, 20 did not participate the hygiene and sanitation trainings and 9 did participate the trainings. From the interviewees who were sanitation club members, only 6 persons did not take part in the trainings while 16 did. The key informants used in this research, were the people from the project administration, and the headmen of the villages who are considered as the opinion leaders in the area. The sample size for the research was 51 one-on-one interviews with the members of 6 different villages, and the frequencies by village can be observed from table 4.

Table 3. The number and share of interviewees in different villages

	Number	Percent share (%)
Mwaitwa	5	9,8
Lumombwe	12	23,5
Kasamwa	8	15,7
Kwesha	9	17,6
Kantolo	6	11,8
Chisapa	11	21,6
Total	51	100,0

From table 4 we can see that the average age of the interviewees was 45,78 which is higher than the actual average of the area. This was because the interviews were carried out during day-time, when the younger men and women were working in the fields. The average family size in the area was 7,61 persons per household. Out of the 51 interviewees, 48 were farmers by profession and the rest of them were teachers. There were 49 % males and 51 % females who took part in the interviews. Figure 6 show that the interviewees estimated their level of knowledge on dry toilets to be generally poor. Only 4 people estimated that they know a lot, while 21 said that they know very little. From figure 7 we can see that most of the interviewees said that they would rather be looking for new ways of doing things, than relying on traditional ways. The scale for this estimation was from 1 to 5, where 1 was searching for new ways of doing things, and 5 was valuing traditions. There were 29 persons who chose 1, and only 7 persons who chose 5. The estimation gave also a clue of the innovativeness categories described in chapter 4. The possibility to make an innovativeness profile of the

interviewees was one reason for asking this question. There was 5 options in the question, and they reflect the 5 adopter categories, where 1 symbols innovators, and 5 symbols laggards.

Table 4. Descriptive statistics of the sample group.

	Number of sample	Minimum	Maximum	Mean	Std. Deviation
Age	51	18	88	45,78	± 14,905
Family size	51	2	15	7,61	± 2,987

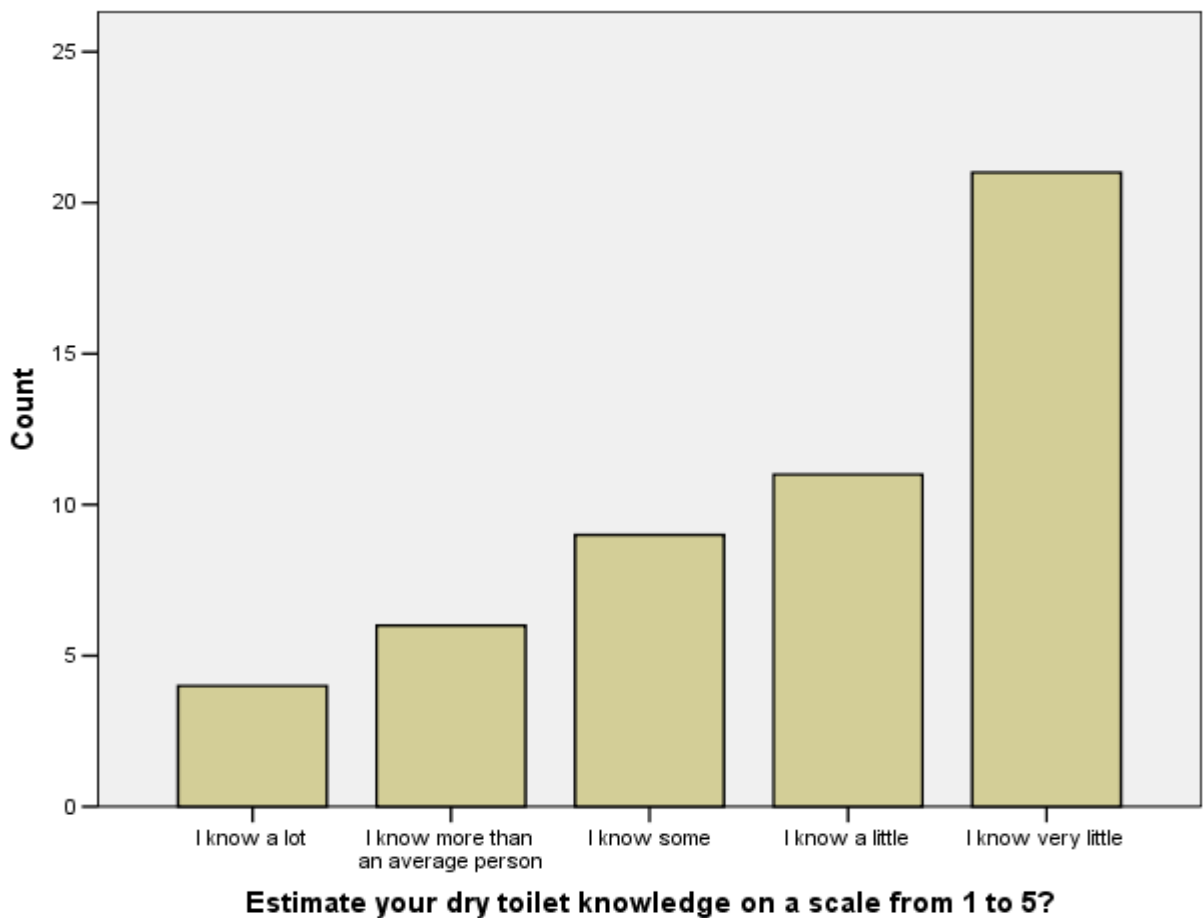


Figure 6. The interviewee’s estimate on their level of dry toilet knowledge. (N=51)

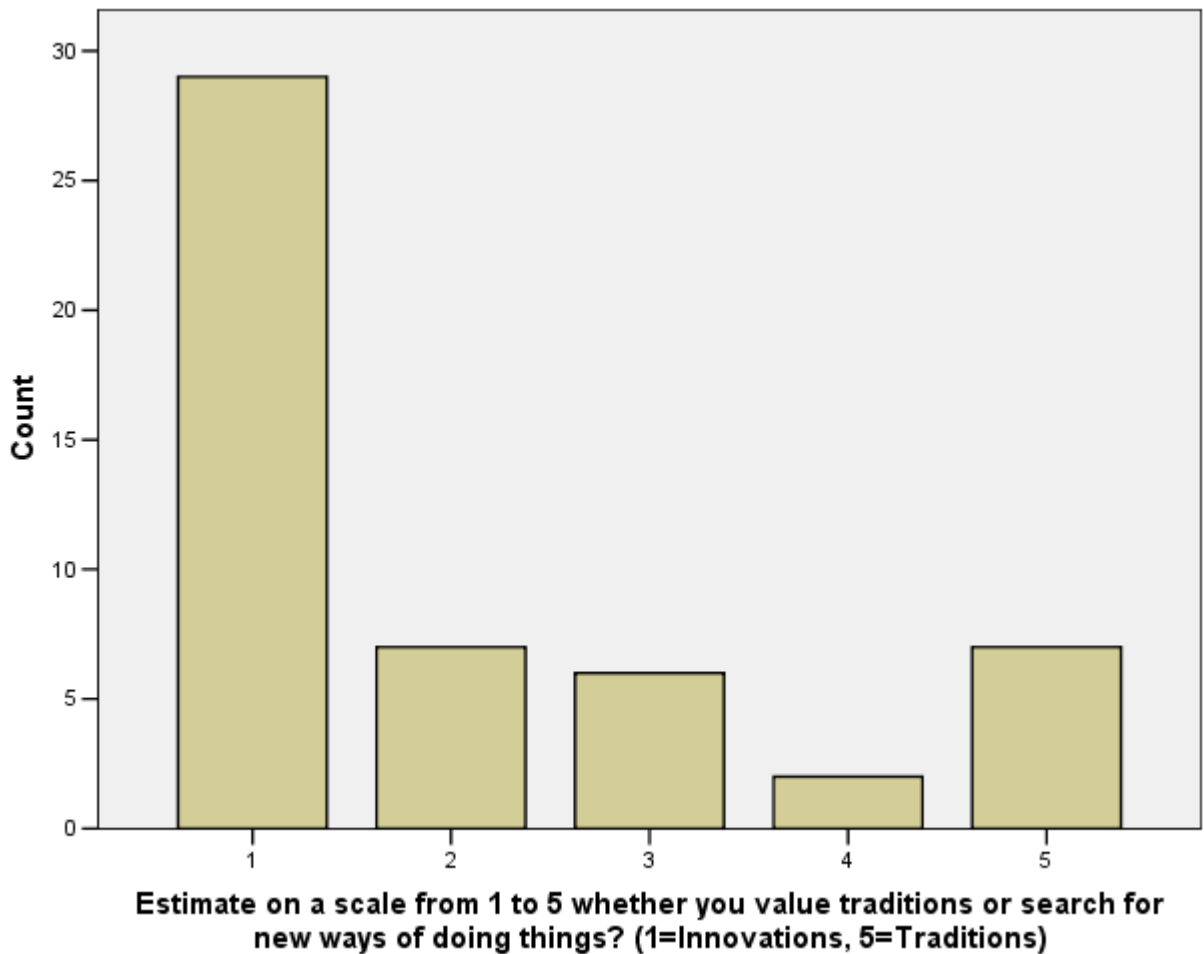


Figure 7. The interviewee's estimates whether they value traditions or search for new ways of doing things (N=51).

The villages involved

There were 6 villages in which the questionnaire was implemented in. These villages were Mwaitwa, Lumombwe, Kasamwa, Kwesha, Chisapa, and Kantolo. The situation in each village was a bit different. At the moment of the interviews, there were no ready toilets in any of the villages. However, the building process of the dry toilet was almost finished in 3 of the villages. There is 1 operational dry toilet at the Luansobe basic school, which is situated at Kaloko. An effort has been made to involve the villages in the construction process of the dry toilets by having the villagers decide the spot for the dry toilet, participate in the building of the dry toilet, and acquiring of the building material such as sand and stones. There was no correlation between the village of residence and the view towards dry toilets, as we can see from table 5. (Mutamba 2008, Katambo 2008)

Table 5. Cross-tabulation_ of village of residence and perceived advantage of the dry toilets (number and percentage share in each village).

			Categorized relative advantage				Total
			A lot more useful than the current solution	More useful than the current solution	Doesn't differ from the current solution	The current solution is better	
Village of residence	Mwaitwa	Count	2	1	2	0	5
		% within Village of residence	40,0%	20,0%	40,0%	,0%	100,0%
	Lumombwe	Count	1	3	4	4	12
		% within Village of residence	8,3%	25,0%	33,3%	33,3%	100,0%
	Kasamwa	Count	2	3	3	0	8
		% within Village of residence	25,0%	37,5%	37,5%	,0%	100,0%
	Kwesha	Count	1	2	5	1	9
	% within Village of residence	11,1%	22,2%	55,6%	11,1%	100,0%	
	Kantolo	Count	1	1	3	1	6
		% within Village of residence	16,7%	16,7%	50,0%	16,7%	100,0%
	Chisapa	Count	4	5	1	1	11
		% within Village of residence	36,4%	45,5%	9,1%	9,1%	100,0%
Total		Count	11	15	18	7	51
		% within Village of residence	21,6%	29,4%	35,3%	13,7%	100,0%

The structure of all the villages was quite similar. There was a central meeting place, and the houses were scattered around this meeting place. The population in the villages varied from a few hundred, to few thousand inhabitants. Each of the villages in the area had a headman.

5.2 Experiences on the dry toilet innovation

Relative advantage

The free fertilizer available from dry toilets was by far the most important advantage that the people were expecting. This became clear from the quantitative questions, as well as from the open questions. When asked, which was the most important difference between dry toilets and pit latrines, 43 % of

the people answered that dry toilets provide fertilizer. In the same question, 24 % of the people answered that dry toilets improve hygiene. From figure 8 we can see that there was a clear statistical relationship between the fact if the person had attended the hygiene and sanitation trainings, and the persons view on the relative advantage. Chi-square test showed that this relationship was very strong ($p=0,003$). We can see from Figure 5, that people who had attended the trainings regarded dry toilets to have more advantages than those who didn't take part in the trainings.

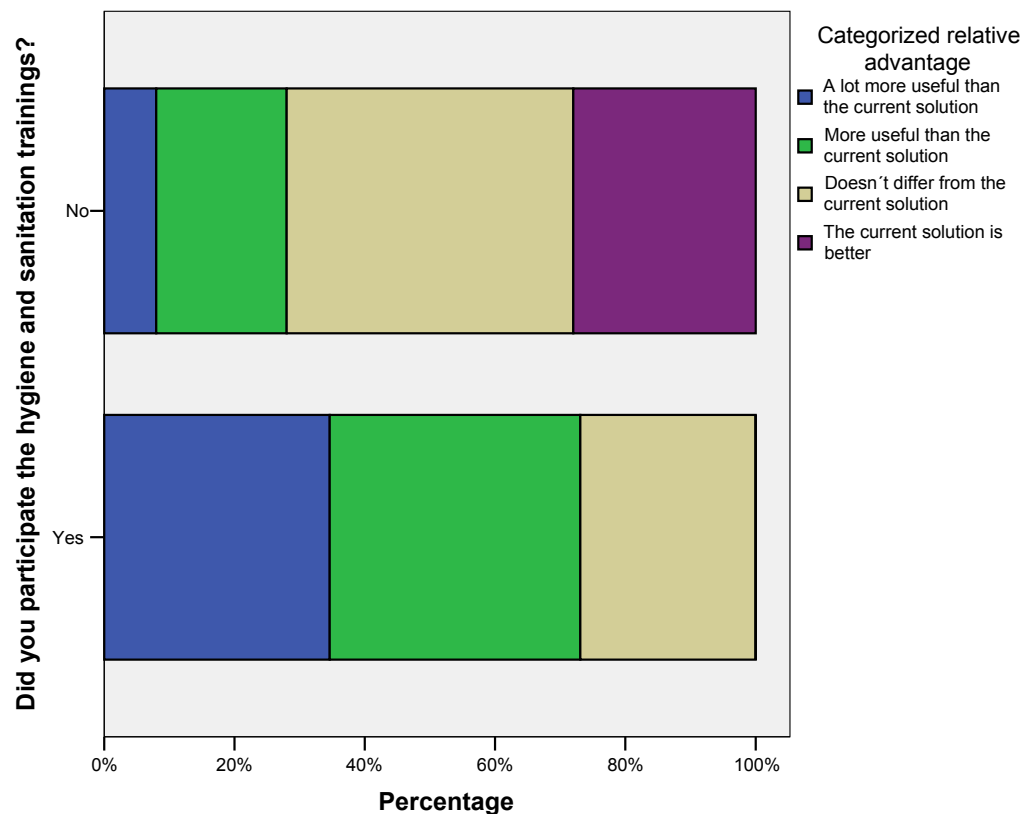


Figure 8. Effect of sanitation training on perception towards dry toilets compared to traditional pit latrine option.

Compatibility

The main contradictions for the use of dry toilets with the compatibility to the values and beliefs in the project area are the belief that man should never see the blood of a woman who is having her periods, and the fear of diseases that might spread through using the urine of a sick person as fertilizer. The first belief will

become a problem when collecting urine for fertilizing purposes. Also the need for being in contact, visual or physical, with the faeces was viewed negatively by some people. The adoption of the use of dry toilets in the area would require new ways of thinking from the people and that can be a very slow process. However one dimension of compatibility is the extent, in which the innovation fulfils the needs of the user. And there is a clear need for the innovation since the prices of fertilizers are increasing, and most of the people in the area are farmers. This is the reason behind the excitement around the dry toilet fertilizer. (Jere 2008)

Complexity

The complexity of the innovation is formed of two parts, complexity of the use of the innovation, and complexity of the operational principle behind the innovation. The way dry toilets are used is simple, and does not differ from the use of the previous practice, pit latrines. However, the principle behind the diseases reducing characteristic of dry toilets, and the use of the waste as fertilizer is quite complex. From table 6 we can see that the overall evaluation of the dry toilet knowledge in the area proved, that the people generally do not believe that they know very much about dry toilets.

Table 6. The interviewees estimate on his/her level of knowledge on dry toilets

	Number	Percent share (%)
I know a lot	4	7,8
I know more than an average person	6	11,8
I know some	9	17,6
I know a little	11	21,6
I know very little	21	41,2
Total	51	100,0

Table 7 shows, however, that the people who took part in the trainings were generally more confident on their dry toilet knowledge, than the people who did not participate.

Table 7. Cross-tabulation between participation to the hygiene and sanitation trainings and dry toilet knowledge

Did you participate the hygiene and sanitation trainings? * Estimate your dry toilet knowledge on a scale from 1 to 5? Crosstabulation

			Estimate your dry toilet knowledge on a scale from 1 to 5?					Total
			I know a lot	I know more than an average person	I know some	I know a little	I know very little	
Did you participate the hygiene and sanitation trainings?	Yes	Count % within Did you participate the hygiene and sanitation trainings?	4 15,4%	5 19,2%	6 23,1%	5 19,2%	6 23,1%	26 100,0%
	No	Count % within Did you participate the hygiene and sanitation trainings?	0 ,0%	1 4,0%	3 12,0%	6 24,0%	15 60,0%	25 100,0%
Total		Count % within Did you participate the hygiene and sanitation trainings?	4 7,8%	6 11,8%	9 17,6%	11 21,6%	21 41,2%	51 100,0%

If an innovation is too complicated, it can hinder the adoption rate of the particular innovation. As the attention should be focused on the experienced complexity rather than the objective complexity, it can be said that the trainings seem to promote the adoption rate of the innovation, through reducing the experienced complexity of dry toilets.

Trialability and observability

The trialability and observability of the dry toilets was limited. This was because there was only 1 finished dry toilet at the time of the interviews, and no experimental gardens had been set up to show the fertilizing effect of urine. The people were able to use the dry toilet, but the advantages that they were expecting of the dry toilets could not have tried nor observed yet. Some people expressed their need to see the results, and suggested that the project would set up experimental gardens to prove the fertilizing effect of urine. Also 11 people said that they are not able to set up an opinion on dry toilets because of lack of experience. By this they were referring to experience in the use of dry toilet waste as fertilizer.

5.3 Communication channels

The main interests when studying the effect of the communication channels on the innovation diffusion process, were the way that the interviewee had first found out about dry toilets, how big of an influence do different information sources have on the person’s opinion of dry toilets, and the experienced reliability of the different sources of information.

Table 8. The source through which the person heard about dry toilets

	Number	Percent share (%)
Other villagers	18	35,3
Through educational meetings	24	47,1
Other villages	7	13,7
Other	2	3,9
Total	51	100,0

Half of the interviewed people had learned about dry toilets through educational meetings. From table 8 we can see that the second biggest source was other fellow villagers, and only few had learned of dry toilets from other villages. Out of the people who took part in the hygiene and sanitation trainings, 72 % considered that it influenced their opinion a great deal. Only 2 people out of the 51 interviewees had used a dry toilet, so use experiences didn’t play such an important role at this point. All the people who took part in the trainings thought the information received there was reliable. The information received from family members was also considered reliable. The biggest doubt was towards the information received from other villagers, even though it was in most cases also considered reliable.

Table 9. Innovativeness and participation to the hygiene and sanitation trainings

Did you participate the hygiene and sanitation trainings? * Estimate on a scale from 1 to 5 whether you value traditions or search for new ways of doing things? (1=Innovations, 5=Traditions) Crosstabulation

			Estimate on a scale from 1 to 5 whether you value traditions or search for new ways of doing things? (1=Innovations, 5=Traditions)					Total
			1	2	3	4	5	
Did you participate the hygiene and sanitation trainings?	Yes	Count % within Did you participate the hygiene and sanitation trainings?	20 76,9%	3 11,5%	2 7,7%	1 3,8%	0 ,0%	26 100,0%
	No	Count % within Did you participate the hygiene and sanitation trainings?	9 36,0%	4 16,0%	4 16,0%	1 4,0%	7 28,0%	25 100,0%
Total		Count % within Did you participate the hygiene and sanitation trainings?	29 56,9%	7 13,7%	6 11,8%	2 3,9%	7 13,7%	51 100,0%

Interesting point came up when placing the interviewees to innovativeness categories based on the categories described at the end of chapter 4, and on the answers of the interviewees to the question whether they search for new ways of doing things, or rely on traditions. When studied with chi-square test, it was shown that there was a significant positive statistical relationship ($p=0,018$) between the person's innovativeness and participation to the hygiene and sanitation trainings. The division to different adopter categories can be seen in table 9.

Mass media is usually an effective way to pass on information about an innovation. In this case, the only channel that could be seen to represent mass media is the local radio channel. However most of the people in the area don't own a radio. So this makes the interpersonal channels most effective ways of communicating the innovation forward. The most important interpersonal connections in the area that came up during the key informant interviews are the school-family-, sanitation club-community-, and health centre-individual-connection.

The school-community connection works so, that the students at the school are educated about the benefits of dry toilets, and they pass on that information to their families. This way they increase the information flow about dry toilets to the potential adopters. At the moment the children at the Luansobe basic school are

in touch with dry toilets through the use of the dry toilet situated at the school, and through working at the test garden which is situated next to the school. Also teachers who speak in favour of dry toilets are important, because teachers are considered as opinion leaders in the area.

The sanitation club-community connection works in the way that the members of the sanitation club communicate on dry toilets in to the communities. The clubs work with the project in constructing the dry toilets, and in testing the dry toilet fertilizer at the communities. This will bring the important factor of trialability and observability to the diffusion process. The sanitation clubs provide also an easy way for new interested participants to join the dry toilet project. According to the results of the interviews, the sanitation club members have achieved some creditability as opinion leaders when it comes to dry toilets. Almost half of the interviewees identified sanitation club members as the people who affect their opinion of dry toilets the most.

Health centre-individual connection comes in to play when an individual is infected with a diarrhoeal disease. At that point, the health centre personnel can advise the person towards hygienic habits and using dry toilets to prevent diarrhoeal diseases in the future. According to the information received at the interviews, the health centre personnel have also a degree of opinion leadership in respect to such an innovation as dry toilets. At the moment the health centre personnel has been told to advice their patients towards the correct use of dry toilets.

5.4 Social system

The social system in this research is constructed of all the villages where the project is being implemented. Main characteristics of the social system in the area are extremely homophilous social structure, low level of communication with the outside world and strong traditional norms. The two interests when studying the effect of the social system of the project area on the diffusion process of dry toilets were the norms, and opinion leaders of the social system. The norms were charted through the key informant interviews, and the opinion leaders were

charted during the one-on-one interviews in the villages. There were diverse set of answers during the key informant interviews, when asked about the cultural restrictions that the norms in the social system of the project area set on the use of dry toilets. All of the restrictions were connected to the use of human excreta as fertilizer, and especially to the use of faecal matter. Being in contact with human excreta was associated with mentally ill people.

The communication structure in the area has two clear characteristics, most of the communication is restricted to within the villages, and the communication that occurs between different villages is channelled through the Kaloko centre. There is no clear communication structure within villages because of the extremely homophilous social structure. The relationships between people are mostly informal, and there is low level of hierarchy within the villages.

As we can see from table 10, there are clear opinion leaders in the project area. The most respected opinion leader is the chief of the project area, who has expressed her support for the project. Other opinion leaders are the headmen of the villages, the headmaster and teachers of the schools, and the health personnel. The GDTF and Kaloko Trust can be identified as the change agents. GDTF has hired a local project coordinator, who could be seen as the aide to reduce the gap between the change agent and the typical client. The clients are all the people in the project area. The innovation adoption or rejection decision in the case of dry toilets is an optional decision. However the norms of the social system have a tremendous effect on the individual.

Table 10. The opinion leaders on dry toilets

	Number	Percent share (%)
Sanitation club members	23	45,1
Other villagers	11	21,6
Health workers	3	5,9
People who educate us on dry toilets	3	5,9
Traditional leaders	2	3,9
Other	9	17,6
Total	51	100,0

6 COMPARISON OF THE RESULTS TO LITERATURE

In this chapter I will compare the findings of this study, to several other studies made in the field of innovation diffusion research. The first study for comparison will be a study about the diffusion of an improved cooking stove innovation in a rural community in Mexico. The second case is a study on livestock vaccine adoption by poor farmers in Bolivia. The third case is about the role of opinion leaders when introducing a new innovation. The example is a case study of integrated pest management among farmers in Java, Indonesia.

6.1 Fuelwood harvesting in a rural community in Mexico

In the first example I will compare the results from a study made on introducing a cooking stove innovation in to a rural community in Mexico. The project setup is quite similar to the setup of ZASP. A cooking stove innovation with a fair amount of relative advantage, from both health and efficiency point of view, was introduced to women in a rural community in Mexico. This was done by setting up a meeting with the local women, where these advantages were shown to them. After the meetings a list of interested were made, training provided, and then the stoves were constructed. The participants had to cover the payment for the stove. (Troncoso et al, 2007)

Troncoso et al. write referencing Rogers and Van den Ban (look Troncoso et al. 2007, page 2) on the adopter categories: Whenever an innovation is offered in a rural community, there is usually a group of early adopters who are enthusiastic and responsive, and ready to accept innovations. As long as they are respected community members, they fulfill the role of models for the other community members. Another group will quickly follow the first one in adopting the innovation. There is a third group of skeptics, who see any new innovation with caution and will accept it only under economic or social pressure. Lastly, there are those who have their point of reference in the past, and who will accept an innovation only if it probably has been surpassed by another innovation; their

scope seldom reaches beyond the local social milieu. These adopter categories can be identified also from the results obtained in this study. The early adopters would be the sanitation club members. They are also respected by the community as opinion leaders concerning dry toilets. Another adopter group is the rest of the people who took part in the hygiene and sanitation trainings. Despite the extent of the person's involvement with the project at present, taking part in the hygiene and sanitation trainings is a sign of innovative behavior and open mindedness towards new innovations. The last two groups identified by Troncoso et al. would be the people who are in no way involved with the project.

Interesting point which came up in the study by Troncoso et al. was the need for the follow up on the use of the stove innovation. There was a critical 15 day period after acquiring a stove, during which it was essential to have technical assistance whenever a problem came up. This was to prevent wrong kind of modifications to the stoves by the users. Other conclusions of their study were: (1) the differences in adoption are more important between individuals, rather than communities, (2) the people who are more likely to adopt an innovation are the ones with an open mind, rather than the ones with for example a higher level of formal education, (3) it is unlikely to achieve a complete technology change, and therefore it is important to document the impacts of multiple technology use well.

These conclusions partly support the results of this study. The differences between the rates of adoption of dry toilet concept emerged between individuals rather than between communities also in the case of ZASP. The determining factor behind the acceptance of the dry toilet concept was the received education, rather than the surrounding social atmosphere. This is backed up by the fact that there were people who viewed dry toilets in a very positive way in every community, but there were also people in every community who disliked the concept. The extremely homogenous sample makes it hard to distinguish differences between different socio-economic classes. But the varying spectrum of opinions on dry toilets in such a homogenous social fabric suggests that the socio-economic status of the interviewee was not a determining factor behind the acceptance or rejection of the dry toilet concept. As for the similarities

concerning the third conclusion, I am sure it will be hard to achieve a complete or even a major technological change. But I am sure that if the seeds of a new improved toilet culture can be sown, in time the culture will shift towards greater use of dry toilets, since there are clear benefits available for the people.

6.2 Livestock vaccine adoption among poor farmers in Bolivia

The second example is a study made by Heffernan et al. of livestock vaccine adoption among poor farmers in Bolivia. The study was made during a five year period by interviewing Bolivian farmers from urban, peri-urban, and rural areas, on their use of different vaccinations on their livestock. The analysis of the results was based on the theory of diffusion of innovations. The purpose of the study was to look at the effect of economic, social, and cultural drivers in the diffusion of the livestock vaccine innovation. Many similarities can be seen related to the innovation. Heffernan is referencing Rogers when arguing that vaccine is a preventive innovation and according to Rogers, preventive innovations have generally a much lower rate of adoption than other kind of innovations. Also the observability of preventive innovations is lower. This is because the advantages of the innovation can not be seen so easily. In the case of vaccinations it would require an epidemic to see the protecting effect of the vaccination. In the case of an epidemic the observability of the innovation would increase and that would also increase the adoption rate of the innovation. (Heffernan et al. 2008, 1)

When comparing the results of the study by Heffernan et al. to this study, important similarities can be found. It was found out that in the Bolivian case demographic factors were not the determining factors behind the diffusion of the innovation, but the people who adopted the innovation were likely to uptake all available technologies. In other words they were open-minded towards new innovations. There was relationship between the location of the farmer and the use of different vaccinations, but it was related more to the spatial diffusion of different livestock diseases. (Heffernan et al. 2008, 3-4)

The livestock vaccine study looked also at the effect of other individuals on farmer's decision to adopt the use of a particular vaccination. It seemed that the

farmer had a tendency of using a certain vaccination, when he was a part of a certain group. But that relationship was ruled out by the fact that certain groups such as milk co-operatives require the farmer to use a certain vaccination. A further analysis showed that the decision to use a certain vaccination was more dependent on the outbreak of epidemics. And therefore we can link the decision to adopt the innovation back to the factor of observability. This is a conclusion that supports the results of this study. (Heffernan et al. 2008, 4-5)

Interesting topic for comparison between the studies is the effect of training on vaccination behavior. It was shown that only one third of the farmers who had attended a vaccination training arranged by NGOs were actually vaccinating their livestock. It was shown that even though training was related to vaccination uptake, it did not depend on any particular information received on the vaccination itself. It became clear that the reason for the relationship was the information received on the role of the vaccination on certain diseases.

However there were many farmers who disregarded the information received because it was not in line with their current perceptions, and kept to the traditional explanations on livestock diseases. Furthermore media seemed to have a big influence on the opinions of these farmers towards vaccinations, but it was also linked to the livestock epidemics. In other words, during an outbreak for example FMD epidemic, media was a channel which was forging a perceived correct answer for the farmers. The information from the media presented FMD-vaccination as a medicine for the FMD-disease, and because it was not dealing with the reasons behind the epidemic, it didn't contradict the traditional beliefs.

The point where the results contradict this study is the fact that in the Bolivian case the way of training was at fault because it contradicted the traditional beliefs by offering an alternative explanation for the diseases. However according to my findings the alternative took away space from the beliefs and therefore enhanced the adoption of the dry toilet concept. One explanation for this could be the fact that there are stronger beliefs in the Bolivian case related to livestock diseases, than there are beliefs related to dry toilets in the ZASP case. However in the case of ZASP, there are two areas which include traditional beliefs. Other is the

hygiene improving effect of dry toilets, and the other is the fertilizing effect of the dry toilet waste. As for the hygiene improving effect the advantages can not be seen, as this part of the innovation represents a preventive innovation, and therefore it is harder to prove the theoretical information correct.

Good thing is that there seems to be fewer beliefs related to the hygiene improving effect of the dry toilet than to the use of dry toilet waste as fertilizer. The fertilizing effect of the dry toilet waste is easier to observe but there seems to be more beliefs related to that aspect of the dry toilet innovation. However the beliefs are not directly related to the fertilizing effect of the dry toilet waste, but rather on the question if it is appropriate to use dry toilet waste as fertilizer. Together with the findings of the Bolivian case, this would suggest that in the case where there are traditional beliefs involved, it is most important to focus on the observability aspect of the innovation, than on the theoretical information which the adopters might feel aims at proving the traditional beliefs to be wrong. (Heffernan et al. 2008, 5-7)

Heffernan et al. reached three conclusions in their study. The first conclusion was that they identified three adopter categories, overall adopters, reactive adopters, and forced adopters. This is an interesting alternative categorization for the five adopter categories used in this study. The Bolivian study found out that the adoption of the innovation was not dependent on the uncertainty reduction over the technology itself, but about the demands created by the disease. The utility of the vaccination for these diseases was also important but secondary in respect to the demands created by the disease. Yet again in the Zambian case this aspect could be linked to the importance of the urine fertilizing effect of dry toilet waste. The rise in the fertilizer prices could be seen to have similar affect as the livestock diseases in the Bolivian case. (Heffernan et al. 2008, 8-9)

The second conclusion was that observability was not as important factor as it would be in other cultures. This was grounded by the fact that the local beliefs did not see the dynamics of health as completely observable phenomena. This might well be true in the Zambian case as well, but for the fertilizing effect of dry toilets waste I would argue that observability is extremely important. This is to

show that the dry toilet waste will provide for the need created by rising fertilizer prices. (Heffernan et al. 2008, 8-9)

The third conclusion of the study was that even though the main objective is to increase collective vaccine adoption, there is still need for that to happen for the right reasons. It was also argued that there is a need for improved knowledge transfer methods. I would counter this with the following argument: because the main point is to offer a better alternative in relation to the previous practice, it is a question of what is the most effective way to present the innovation to the community. This is regardless of the reasons behind the decision to adopt. Once you have established a culture of using that innovation in the community, there will be a better ground for addressing the operational principle behind it. (Heffernan et al. 2008, 8-9)

6.3 The role of opinion leaders in the diffusion of new knowledge

This particular case study is about the diffusion of knowledge about integrated pest management among farmers in three provinces of Java, Indonesia. The study shows that leadership helps the diffusion of knowledge, but as the socio-economic difference between the opinion leader and the potential adopter increases, the diffusion process is hampered. The study is suitable for comparison on the grounds that it is located at a rural area of a developing country, and the main communication channel is interpersonal communication. This is because most of the people in the project area lack access to mass media. (Feder et al. 2008, 1-4)

Integrated pest management is a process which aims to minimize the amount of chemical pesticides used. It is a concept which was introduced to the farmers in the 1990's after a severe outbreak of pests in rice. This was done through a large scale training program called "Farmer Field School". The selection of farmers for the training was not done randomly. The selected people were farmers who had good expertise on agriculture, farmers of high social status, and religious leaders. Also some of the chosen farmers worked as village leaders. The requirement for the selection was proven ability to spread information in the communities. The

data collection for the study was done by a panel survey of the farmers in the project area communities. The sample included farmers who took part in the training program, and farmers who did not take part in them. The questionnaire consisted of questions which aimed at clarifying the circumstances in which the farmer was introduced to the integrated pest management concept several years prior to the implementation of the questionnaire. Those circumstances were also prior to the participation of the farmer to the training sessions, which might make it even harder for the farmer to accurately describe them. It can be argued based on the recall problem that the results are not being accurate. The recall problem came up among criticism of the innovation diffusion theory in chapter 3. (Feder et al. 2008, 3-4)

The main conclusion of the study was that the effect of opinion leader in the diffusion of knowledge diminishes if the opinion leader is excessively superior to the potential adopters. The opinion leadership in the Indonesian case was determined by factors of socio-economic status and observed leadership. Several different analysis methods have been developed to measure opinion leadership. Feder et al. linked this conclusion to programs which are about spreading information, by arguing that there is two ways how these programs can go wrong. First mistake could be choosing too average opinion leaders who they want to influence. The other mistake would be the opposite, choosing opinion leader who is too superior to the surrounding community. This is because too superior opinion leaders communicate less with the surrounding community. (Feder et al. 2008, 11)

Efforts have been made towards influencing some opinion leaders in the ZASP-case as well. These opinion leaders are the clinic workers, the chief of the area, and also the sanitation clubs. However, the people who have joined the sanitation clubs are a random mixture of different people, rather than a group of people who are similar concerning certain socio-economic attributes. And no effort has been made to invite certain people to join the sanitation clubs. Interesting point which showed in table 8 was the division of opinion leadership in the area. It showed that the sanitation clubs themselves had acquired the status of being opinion leaders. The chief of the area can be seen to be too superior opinion leader, and

only few people recognized her to have an effect on their opinion on dry toilets. I would argue that the effect of such high level opinion leaders in the area is indirect, and is channeled through the hierarchy of the social system. The chief was in favor of the dry toilet project, and this might affect the opinions of the village headmen who communicate with her on a regular basis. Through the village headmen the influence can reach the average villagers.

7 CONCLUSION AND SUGGESTIONS

7.1 Conclusion of the results

There were two advantages the people were expecting, free fertilizer and hygienic sanitation to reduce diarrhoeal diseases. Out of these two, 44 % of the people named the free fertilizer to be most important. Only 24 % of the people named improved hygiene as the most important thing. However there was a bit of uncertainty among the people about the health effects of the fertilizer, which originated from the serious HIV-epidemic in the area. There were also some beliefs against the use of human excreta as fertilizer. It was shown, that through education these beliefs and fears can be reduced, and therefore the attitude towards dry toilets can be made more positive. The people trust the information they got about dry toilets in the hygiene and sanitation trainings, but at the same time they are not convinced if they don't see the results. So trialability and observability were extremely important for the people in order to use and utilize dry toilets.

According to Rogers, there are three types of information of the innovation. First there is *awareness-knowledge*, the second type is *how-to knowledge*, and lastly there is *principles-knowledge*. The awareness-knowledge is the information that the adopter gets in the knowledge phase. This is followed by the search for how-to knowledge. At the moment of the interviews the people seemed to possess only some degree of how-to knowledge. According to the results, the innovation diffusion process in the project area for the people involved is at the persuasion stage. This is because the awareness on how to use the dry toilet waste as fertilizer is not very high. How-to information is extremely important at the persuasion stage, and therefore it is essential that the people are provided with how-to information, when the construction of the dry toilets has proceeded to a point where the people at the villages can start testing the fertilizer by themselves. This would reduce the complexity around the innovation, and most likely encourage adoption. (Rogers 2003, 172-173)

There was no relationship with how the person had first found out about dry toilets, and how they perceived it. The people perceived the information that they got from other villagers to be generally reliable, and their opinion to matter when building up an own opinion of dry toilets. The two main information sources on dry toilets were the hygiene and sanitation trainings, and other villagers. Most of the people said that the educational meetings had a great influence on their opinion of dry toilets. There were hundreds of people who took part in the educational meetings, but only some are involved in the construction of the dry toilets. One reason for this could be the fact that people in the area are not used to working without direct contribution. This is a point which came up also during the key informant interviews. The fact that almost all the people who attended the trainings had a positive attitude towards dry toilets suggests that the lack of involvement to the project originates from the deep poverty levels, and that people can not afford to spare time for work without direct contribution. However, there are enough people involved at the moment to take the project forward to the testing phase of the fertilizer. If the test results are positive, then most probably more people will join to contribute to the project, since there is direct economical benefit to be seen.

Some of the key informants suggested that the project should try to promote conversation in the local radio channel on dry toilets. This could be a good way to promote conversation on dry toilets. However the nature of the conversation should concentrate on the how-to knowledge, since the need for awareness-knowledge is not that high anymore. It would also be important to discuss the beliefs around dry toilets. Emphasis should be put also on the lobbying of suitable opinion leaders.

The norms of the social system were quite strongly against the use of dry toilet waste as fertilizer. However it seemed that these beliefs were more strongly related to faecal matter, than to urine. The use of urine compared to faecal matter as fertilizer, has important practical differences. Urine has 80 % of all the nutrients in human excreta, and it can be used after preserving it for three months. Faecal matter has to be composted for a year before use, and it is considered as a

soil improving material, rather than a fertilizer. The people in the project area did not seem to have adequate information on these issues, and if these things are made clear to the people, it might help bring down the cultural barriers on dry toilets. The point is to offer a well grounded alternative to the beliefs which exist in the area, rather than to try and prove the beliefs to be wrong.

The involvement of the people to the dry toilet project by letting them decide the spot for the dry toilet, and participate in the construction process appeared to be successful, since the people felt that the dry toilets were being built for the communities rather than for some external entities. I believe that this kind of involvement in the future as well will help the people to feel, that they are building their own kind of dry toilet culture, rather than adopting western habits to replace traditional habits. The homophilous social structure will probably increase the innovation adoption rate, once enough people have adopted the use of dry toilets, and results of the fertilizing effect of urine have been shown. For this to happen there will also be a need for a low-cost model of a dry toilet.

7.2 Suggestions for ZASP

1. The sanitation clubs should be provided with clear instructions on how to use the urine as fertilizer, and how to use the faecal matter as soil improvement material. It is important to set up demonstration gardens to the villages as soon as possible.
2. Another set of educational meetings in the villages should be arranged once the fertilizing effect of urine has been shown. These educational meetings should concentrate on teaching how to use urine as fertilizer, and faecal matter as soil improvement material. The point that urine is the main fertilizer should be emphasized.
3. The project should promote conversation in the local radio channel about the use of dry toilet fertilizer, once the results have been shown in the communities.
4. The sanitation club members should be engaged in the fertilizing tests, to assure homophilous information flow within the communities.

5. The sanitation club members should be encouraged to speak on behalf of dry toilets within the communities. Meetings should be arranged where the sanitation club members will talk about their experiences with the dry toilet fertilizer.
6. The project should seek for ways to promote the proper use of dry toilets in the area, to prevent for example bad odours.
7. The project should lobby the village headmen for promoting the project. This is because they communicate actively with the other villagers, and are considered as opinion leaders.
8. A time schedule should be made for the implementation of the test gardens in the villages, and every effort should be made to hold on to this schedule.

7.3 Future prospects and suggestions for future research

According to the findings of the research, the future of dry toilets in Kaloko area depends largely on the success of fertilizing tests, and how well the results will be communicated through the area. Although there is little doubt to the fact that if the results are positive, the communication process would not be self-sufficient. The clear correlation between the knowledge that the people have on dry toilets, and their attitude towards dry toilets shows, that barriers originating from the norms of the social system can be crossed. Therefore it is not so much a question of whether the community would be ready to accept such a contradictory innovation, but a question of how the innovation is presented to the community. Interesting topics for future research would be to study whether the point where people test the results of the dry toilet fertilizer actually is the point where the innovation adoption rate takes off, or does it take a longer time for the villagers to adopt the use of dry toilets. This way we would see if even though the results have been shown, and the economic benefit lies within the reach of the villagers, the cultural barriers for dry toilets are still too strong. Another interesting topic for future research would be the development of more cost-effective model of dry toilets, which would enable more people to use urine as fertilizer. This would also have a major positive effect on the local economy, and at the same time improve the availability the overall hygiene.

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APPENDIX 1

Survey on Zambian sanitation improvement project

A. BACKGROUND INFORMATION

(Circle the correct alternative, or write it on the lines below the question)

1. Gender

1 Male

2 Female

2. Age

3. Village of residence

5. Occupation

6. Family size

7. Position in the family (For example: Head of the family, Mother, Son, etc.)

8. Have you ever heard of/used a dry toilet

1 Yes

2 No

9. Did you participate in the hygiene and sanitation trainings

1 Yes

2 No

If yes, how useful did you find them

Useful 1 2 3 4 5 6 7 8 9 10 Not useful

APPENDIX 1

B. THEMATIC QUESTIONS

1. Dry toilet questions

9. How do you evaluate the following statements about dry toilets?(1= Totally agree, 2=Agree to some extent, 3=Disagree to some extent, 4=Totally disagree, 5=I don't know)

(Circle the correct alternative for you)

Dry toilet is a better solution than a pit latrine 1 2 3 4 5

Replacing pit latrines with dry toilets is of advantage to me 1 2 3 4 5

Dry toilets are a good way for reducing diarrhoeal diseases 1 2 3 4 5

Dry toilets improve the availability of clean water 1 2 3 4 5

Dry toilets provide efficient fertilizer 1 2 3 4 5

Using urine as fertilizer is appropriate 1 2 3 4 5

Using urine as fertilizer is safe 1 2 3 4 5

9. Would you eat food which was grown on dry toilet fertilizer?

1 Yes

2 No

8. What is the main difference between dry toilets and pit latrines?

(Write your answer on the lines below)

APPENDIX 1

10. Would you consider using only dry toilets in the future?

1 Yes

2 No

3 I don't know

11. Estimate the level of your dry toilet knowledge on a scale of 1-5 (1=I know a lot, 2=I know more than an average person, 3=I know some, 4=I know a little, 5=I know very little)

(Write your answer on the line below)

12. Are dry toilets needed in Kaloko, and if so, why?

(Write your answer on the lines below)

IV. Experiences

14. If you have used a dry toilet, how did you find it?

(Answer only if you have used a dry toilet)

APPENDIX 1

2. *Communication on dry toilets*

15. How did you first find out about dry toilets?

(Circle the correct alternative for you)

- 1 From other fellow villagers
- 2 From my family member
- 3 Through educational meetings
- 4 From other villages

16. How big of an influence have the following things had on your opinion of dry toilets? On scale from 1-5 (1=Very big, 2=Big, 3=Some, 4=A little, 5=Very little)

(Circle the correct alternative for you)

	Big	Little					
1 Other villagers opinions			1	2	3	4	5
2 Family's opinion			1	2	3	4	5
3 Experiences in the educational meetings			1	2	3	4	5
4 The information received at the educational meetings			1	2	3	4	5
5 Use experiences			1	2	3	4	5
6 Some other thing? Name which? _____			1	2	3	4	5

17. How reliable is the information from the following sources? On scale from 1-4 (1=Very reliable, 2=Quite reliable, 3=Not so reliable, 4=Unreliable)

(Circle the correct alternative for you)

	Reliable	Unreliable				
1 Other villagers			1	2	3	4
2 Family			1	2	3	4
3 Educational meetings			1	2	3	4
4 Some other source? Name which? _____			1	2	3	4

