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Final thesis

**THE ACCEPTANCE OF THE IDEA OF COMPOSTING – CASE STUDY IN
THE CITY OF MWANZA, TANZANIA**

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ABSTRACT

The Tampere-Mwanza Local Governance Cooperation project aims at diminishing the gap between northern and southern countries in the world. The project cooperates with TAMK University of Applied Sciences to build environmental awareness in Mwanza city, Tanzania. To improve small-scale waste management, a school composting project was started in 5 primary schools in 2008. These schools are located in 5 different wards where also ward meetings were arranged to inform and educate the community. Composting is an important element of sustainable solid waste management thus this study was conducted to find out the reception and attitudes towards composting, to survey the possible challenges as well as the distribution of the idea. This information helps to plan for the future activities of the project. The study was conducted from April to July 2009. The information was gathered by observation, interviews and a questionnaire. The attitudes in the community were seen to be positive and the information spreading succeeded well especially in the ward meetings. However, to make composting a viable option in waste management, the community needs more education. Thus it is important to continue the project to build awareness and support the community. Suggestions on how to continue spreading the information effectively were made based on the study results.

Keywords Tanzania, Mwanza, composting, environmental projects, civil education, small-scale waste management

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Tampere-Mwanza paikallishallintojen kehittämisprojekti yhteistyössä Tampereen ammattikorkeakoulun kanssa on organisoinut Mwanzan kaupungissa, Tansaniassa kansalaiskasvatusta koskien ympäristöasioita ja jätehuoltoa. Vuonna 2008 harjoittelijat aloittivat projektin kaupungin viidellä hallintoalueella keskittyen viiteen peruskouluun tarkoituksena levittää tietoa kompostoinnista. Alueen asukkaille järjestettiin myös projektia koskevat kokoukset. Kompostoiminen kotitalouksissa on tärkeä osa jätehuoltoa kehittyvässä ja kasvavassa kaupungissa, jossa jätehuoltoa ei vielä ole kaikilta osin organisoitu. Opinnäytetyön tarkoituksena oli selvittää kompostointi-idean vastaanottoa, levinneisyyttä, mahdollisia haasteita ja ehdotuksia projektin tulevaisuudelle. Opinnäytetyö tehtiin huhti-heinäkuun aikana vuonna 2009. Aineisto kerättiin havainnoimalla sekä haastattelujen ja kyselyn avulla. Yhteisö otti idean kompostoinnin käyttämisestä avoimesti vastaan ja tiedon levitys oli menestyksekkästä, erityisesti kaupunginosissa järjestetyissä tapaamisissa. Kuitenkin yhteisö tarvitsee vielä lisäkoulutusta ja ulkopuolista tukea, jotta toiminnan jatkuvuus olisi paremmin taattu. Tutkimuksen avulla löydettiin ehdotuksia tehokkaampaan tiedon levitykseen projektin jatkoa ajatellen.

Hakusanat	Tansania, Mwanza, kompostointi, ympäristöprojekti, kansalaiskasvatus, jätehuolto
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TABLE OF CONTENTS

1 Introduction on the project and the city	6
1.1 General information on Mwanza	6
1.2 Tampere-Mwanza Local Governance Cooperation Project.....	7
1.2.2 The environmental component of the project	7
1.2.3 School composting project.....	8
1.3 The purpose of the research	10
1.4 Composting and its applications in the tropics	10
1.4.1 Composting in general	10
1.4.2 Composting in the local conditions.....	11
2 Study methods.....	13
2.1 Data collection methods.....	13
3 Composting project at Primary Schools	15
3.1 Evaluating what has happened since the starting of the project.....	15
3.2 Lessons on composting and environmental issues.....	18
3.3 The visits of local gardener	20
3.4 Questionnaire to the pupils about opinions and experiences on composting	22
3.4.1 The questionnaire results	23
3.4.2 The results from Sahwa Primary School.....	33
3.4.3 The results from Kirumba Primary School	33
3.4.4 The results from Kahama Primary School.....	34
3.4.5 The results from Igoma Primary School	34
3.4.6 The results from Isenga Primary School.....	35
3.5 Visiting pupils' homes	36
3.5.1 Home visits from Sahwa Primary School	37
3.5.2 Home visits from Kirumba Primary School	37
3.5.3 Home visits from Kahama Primary School	38
3.5.4 Home visits from Igoma Primary School	38
3.6 Discussions with the project teachers	39
3.6.1 Discussion in Sahwa	40
3.6.2 Discussion in Kirumba.....	42
3.6.3 Discussion in Kahama.....	43
3.6.4 Discussion in Igoma.....	44
3.6.5 Discussion in Isenga.....	46
4 Ward meetings	48
4.1 Meeting in Buhongwa ward.....	49

4.2 Meeting in Kirumba ward	50
4.3 Meeting in Ilemela ward	50
4.4 Meeting in Igoma ward	51
4.5 Meeting in Pasiansi ward	51
5 Discussion	53
5.1 Evaluation of the composting project	53
5.2 Problems and challenges	54
5.3 Evaluation of the schools	55
5.3.1 Sahwa	55
5.3.2 Kirumba	56
5.3.3 Kahama	56
5.3.4 Igoma	56
5.3.5 Isenga	56
6 Plans for the future	58
References	61

Appendices

- Appendix 1: Questionnaire to the pupils about the opinions and experiences on composting, in English
- Appendix 2: Questionnaire to the pupils about the opinions and experiences on composting, in Swahili
- Appendix 3: Instructions on making pit compost and list of materials to compost, in English
- Appendix 4: Instructions on making pit compost and list of materials to compost, in Swahili
- Appendix 5: Timetable and curriculum for the school composting project

1 Introduction on the project and the city

1.1 General information on Mwanza

Mwanza is the second largest city in Tanzania, with about 700 000 inhabitants. It is located in East-Africa on the coast of Lake Victoria in Northern Tanzania (Figure 1). It is situated just south of the Equator. It has an altitude of 1,140 metres above sea level. Mwanza city has two districts: Ilemela and Nyamagana. These districts are divided into 21 wards. The wards in Ilemela district are Sangabuye, Bugogwa, Ilemela, Buswelu, Pasiansi, Kitangiri, Nyamanoro, Kirumba and Nyakato. The wards in Nyamagana districts are Butimba, Mkuyuni, Igogo, Pamba, Nyamagana, Isamilo, Mbugani, Mirongo, Igoma, Mahina, Buhongwa and Mkolani /8/.



Figure 1: Map of Tanzania with the major cities /2/

Granites and granodiorite cover Mwanza especially in the hills surrounding the city. The soil type ranges from sandy soil to loam. Mwanza City receives approximately 700–1000 mm of rainfall per annum with two rainy seasons. The short rains occur from August to October and the long rain seasons from December to May. The average annual temperature is between 20 °C and 30 °C. /7/

1.2 Tampere-Mwanza Local Governance Cooperation Project

The co-operation between the cities of Tampere and Mwanza aims at diminishing the gap between northern and southern countries. The project is coordinated by the Association for Local and Regional Authorities (ALFRA) and funded by the Foreign Ministry of Finland. The purpose of the project is to work towards sustainable development, good governance, public participation, cultural exchange and the improving of the professional skills of the employees of the cities. The co-operation between the cities started in the 1980s and since 2002 it has operated under the North-South Local Governance Cooperation Programme.

The overall aims of the project are capacity building of municipal administrations, enhancing democracy, improving environmental management and increasing mutual understanding through cultural exchange. The project focuses on the following eight sectors:

1. Fire Brigade cooperation
2. Teachers' training and school cooperation
3. ICT-training
4. Museum cooperation
5. Councillors' cooperation
6. Youth cooperation
7. Waste management
8. Environmental conservation /12/

1.2.2 The environmental component of the project

One component of the Tampere-Mwanza Local Governance Cooperation Project is improving environmental management. The aim is to promote sustainable and broad based environmental management system which is adjustable to the growth of the city.

The environmental activities were started by a forestation project. Tree planting was done by some individuals and non-governmental organizations (NGO). At present there are two components: waste management and environmental conservation. Waste management is improved by capacity building on the management level and by civil education on composting, separation of waste and the importance of keeping the near-by environment clean. Activities of environmental conservation component have been tree planting and supporting woodland management. TAMK University of Applied Sciences has been involved in the project since 2005. A group of students from TAMK went to Mwanza for the first time in 2006 to make preliminary studies on waste management and since then students have been there annually. /12/

1.2.3 School composting project

Urban solid waste management is considered to be one of the most immediate and serious environmental problems that cities in developing countries are facing. Waste disposal to the environment together with inadequate collection (Figure 2) create a health risk to the population and cause environmental degradation. Composting is an ideal way of starting small-scale improvements, as the main part of the waste created in households is organic waste. Vegetable markets and the food processing industries also produce large quantities of organic waste. Composting is an important element of sustainable solid waste management as it offers a way of processing the organic waste fraction. It reduces the amount of waste to be disposed of, thus reducing the negative effects to environment. In addition composting reduces the costs of waste collection and transportation. /10/



Figure 2: A common street scene of micro dumps and littering in Mwanza city (Photo: Khalfani Abdulahman)

It was seen that waste management needs improvements in Mwanza. Since the Tampere-Mwanza cooperation project could not start any major waste management project at this point, it was decided that small scale activities by teaching composting in schools would be started. During the first year, 2008, four students from TAMK University of Applied Sciences did their practical training in Mwanza and in 2009 two of those trainees continued the school composting project. The schools that took part in the project are located in five different wards around Mwanza city: Sahwa Primary School in Buhongwa ward, Kirumba Primary School in Kirumba ward, Kahama Primary School in Ilemela ward, Igoma Primary School in Igoma ward and Isenga Primary School in Pasiansi ward.

The expected result of the cooperation was that the meaning of waste-management will be well understood by the cooperation quarters. This means grass-root level information spreading, started with school composting project, wherefrom the idea of separation of waste would spread to neighbourhoods. Children are usually open to new ideas so it was good to start with them. Also the future waste management depends on them. In

addition to teaching composting at schools, ward meetings were arranged in each ward, where the teachers who participated in the project were helping to introduce the topic to the people. The ward meetings were a successful way to reach the members of the society since participants were invited from all over the wards.

1.3 The purpose of the research

Civil education on waste management was done to persuade people to take better care of the environment. The purpose of the research was to study and observe the reception and distribution of the idea of composting. The research was important in ensuring that the development project is appropriate to the needs it is targeting. As the desired result of the composting project in the primary schools is to spread the information on composting, it was good to evaluate what has been done and what could be done in the future. When the attitudes and opinions are known, it is easier to plan for ways of building awareness and methods of teaching. As these facts are known, also the continuity of composting can be better assured. This information can be used in the cooperation project by the personnel of the project and the future trainees to overcome possible problems and challenges.

1.4 Composting and its applications in the tropics

1.4.1 Composting in general

Compost is a product of controlled biological decomposition of organic matter into a soil-like material. This material has soil-conditioning properties and varying amount of nutrients. /11/ It is done to produce an organic fertilizer to improve plant growth. Compost improves soil fertility, moisture retention and soil aeration. It can be used in all kind of soils. /4/

Compost can be made of organic waste like kitchen waste, garden waste and animal manure. Kitchen waste can be, for example, vegetable waste such as peelings and spoiled vegetables. Garden waste can be, for example, dry leaves and grass clippings. Appendix 3 shows a more exact list of materials which can be composted. Animal manure of any kind is also good to compost because as such it is a strong fertilizer which can damage plant roots.

Composting can be done in a number of ways like using simply a pit, piling up the organic waste or collecting it into a container. Basically the idea is that when organic waste, moisture, warmth, air and micro-organisms work together, after some time it results to compost /1/. Depending on the materials and methods used it takes from three to six months though in very dry or cold conditions the process can even stop.

Composting is a natural way of recycling. Composting provides not only a way of reducing the amount of waste that needs to be disposed of, but also converting it into a product that is useful in gardening. Therefore, practicing composting is sustainable management of natural resources.

One important aspect is the health and hygienic advantage that can be achieved by using compost. The waste that is dumped creates living environments for some animals and insects that spread diseases. These detrimental animals can be for example rats, cockroaches, flies and mosquitoes spreading diseases such as cholera and malaria. By composting these living environments are not created.

Plants grow better in compost soil. Compost also helps to maintain the soil fertility. It has a moderate content of important plant nutrients like nitrogen, potassium and phosphorus and it can contain beneficial minerals. These are slowly released over the cropping period. /11/ Compost helps the soil to retain nutrients and water, reducing the need of chemical fertilizers. Moreover, it improves the drainage of soil and reduces erosion. All gardeners, regardless of their financial abilities, can make and use compost.

1.4.2 Composting in the local conditions

The tropical climate speeds up the decomposing process of organic waste. In Mwanza there are two seasons: a humid rain season and a hot and arid dry season. During the rain season the process of decomposing is relatively fast due to the heat and humidity. But sometimes during the dry season the process of decomposing was observed to be very slow. If accelerating the process of decomposing is needed, watering is advisable. Anyhow, this can be impossible or irrational since sometimes water is a scarce commodity.

Composting was started by using a pit method as it is a free and easy way. Digging a pit is also a traditional way of disposing waste. To make the process as simple as possible, small pits were used to avoid the need of mixing the waste during decomposing process as well as to avoid hard work of digging big pits. At the project schools, kitchen waste, garden waste and soil were put in layers to prevent odours which could attract pests. Also, by using this method of mixing the waste, the garden waste decomposes quickly. A pit compost made in Isenga in the year 2008 is seen in Figure 3. The detailed instruction for the method of making the pit composts in school composting project can be found in Appendix 3. /3/ /9/



Figure 3: A pit compost made in Isenga Primary School during the project of 2008
(Photo: Mari Laukka)

During the school project in 2008, composting in containers was also tried. It is an option for places where digging a pit is impossible. However, it was found that the container maintenance is demanding and supplying the container is expensive.

2 Study methods

The research was done in order to investigate the Mwanza people's opinions on composting and to get information for understanding the challenges in small-scale waste management in Mwanza. It was planned in cooperation with the relevant personnel of the Tampere-Mwanza Local Governance Cooperation Project. The field research was conducted by working with people and gathering experiences and opinions in respectful interaction. Cultural and social inequalities were taken into account. As the data gathering was done in five wards of Mwanza city, the samples were planned to be equal and the data collection was systematic. The field research was conducted from the beginning of April until the end of June.

The information was collected so that conclusions as well as recommendations for actions could be made for the future. However, it is important to realise that people might not have fully-formed views on the issues investigated because of limited experience and the opinions may change as people think further on the issues.

2.1 Data collection methods

The information was gathered by observation, interviews and a questionnaire to the pupils. Observing and discussion were the main methods for finding out the reception of the idea of composting. Those were used during the lessons in the project schools, the visits to pupils' homes and the ward meetings.

The questionnaire was answered by 190 pupils who took part in the project. The questionnaire form (Appendices 1 and 2) was translated into Swahili and made as unambiguous as possible. In the beginning of the questionnaire, there were background information and brief instructions on how to answer the questionnaire. These were also explained to the pupils by the project teachers in the beginning of the session. The questions were directed for the respondents so that they dealt with issues that the respondents have information about. The questionnaire consisted of structured and pre-coded questions and one open question. Most of the questions had a list of items offered, any of which could be selected. Also there was a ranking question where the respondents were asked to place something in order of importance. This qualitative

approach was used to find out how many people share a particular characteristic or hold a particular view. /5/ /6/

Interviews were used as a qualitative method to look more deeply what the project teachers in each project schools think and why. The interviews were conducted at the end of the school composting project. It was made sure that the interviewees understood the purpose of the research and were comfortable with it. The data was recorded by the interviewees' permission. The interviews were semi-structured, having some standard questions which could be asked in different ways, so that it was more like a conversation. Some questions could also be added depending on the course of the discussion. The interviews took 15–45 minutes.

An interpreter was used at times. Before that, some time was spent with her to explain the purpose of the research and how the work should be done.

3 Composting project at Primary Schools

The composting project at primary schools was carried out during April and May 2009. The purpose of the research was to evaluate the project, instruct, guide and persuade all the participants to get familiar with composting and spread the information. The project schools were: Sahwa Primary School in Buhongwa, Kirumba Primary School in Kirumba, Kahama Primary School in Ilemela, Igoma Primary School in Igoma and Isenga Primary School in Pasiansi. Each school had 1–2 teachers responsible of the project. Most of the schools had an environmental club to take part in the project. The pupils were chosen to the composting project from standard three to seven, about half of them girls and half of them boys. In Sahwa and Igoma Primary school there were about 70 pupils, in Kirumba, Kahama and Isenga Primary School about 30 pupils attending. Part of the pupils in Kirumba, Kahama and Igoma had also been involved in the project in 2008. Therefore the lessons and activities were constructed to be suitable for both the beginners and the experienced pupils.

3.1 Evaluating what has happened since the starting of the project

As the project had been started in 2008, it was interesting to see how the schools had continued composting and spreading the information. Many of the schools had planted plenty of trees since the beginning of the project. Benefits were observed in plant growing because a lot of plantations were made using compost material.

Sahwa Primary School

The teachers of Sahwa Primary School had told about the composting to many pupils who were not involved in the project previous year. Therefore it was easy for them to start the project this year. New trees were planted last year on the spots of compost pits. They had continued making compost and using it for plants around the school area. It has helped the plants to grow fast and the environment to be greener. Compost has been made using especially garden waste, since the teachers have a long experience on that. The pupils had also prepared saplings at the school (Figure 4). Those can be planted later by utilizing compost material.



Figure 4: Saplings prepared in Sahwa Primary School (Photo: Mari Laukka)

Kirumba Primary School

In Kirumba Primary School the pupils had planted about 200 trees this year. Compost material was used for this, as it was found beneficial for plant growth. The pupils had also delivered the information of composting to their homes. Those pupils, who were involved last year, seemed to remember well the idea of composting and were able to present it. The information on compost was delivered initiatively to some other schools nearby.

Kahama Primary School

The pupils had planted about 300 trees around the school area (Figure 5) in Kahama Primary School. The plantings were done mainly in November 2008, so the positive effect of compost to plant growth was already observed especially in interaction with the rain season. They had also continued making compost using kitchen waste and animal manure. The knowledge of compost was discovered very important and opportune. The pupils had spread it to their families. It had been new information to the

society that the waste can be utilized this way. Therefore they had been very happy to get this ability.



Figure 5: Saplings planted to the yard of Kahama Primary School (Photo: Mari Laukka)

Igoma Primary School

Unfortunately, in Igoma Primary School there had not been enough time to continue making composts with the pupils. They had perceived benefits in the plant growth as a result of the previous project thus they were assured of the importance and benefits of compost. Also they were curious to see the results after rain season. The teacher believed that the pupils still remember well the topics of last year, and this was made certain during the first meeting with the pupils when they presented the principle of composting.

Isenga Primary School

Isenga Primary School was going to get new seedlings soon and then start using compost to support the plants of the school area. The school has a small garden where they can also use compost material in the future. Some of the plants were grown with

the help of compost material before placing them to this field. However, so far the school has little experience on making and using compost on their own. An interesting discovery was done that grass is growing very well in those spots where composting was done previous year. Probably the further benefits will be seen later.

3.2 Lessons on composting and environmental issues

Since there was a time of two months for the school project, about 6 lessons were given in each school. The original timetable can be seen in Appendix 5, but it was implemented flexibly according to the conditions and possibilities of the project schools. The number of visits was sometimes limited by holidays and the schedules of the schools. The comprehension and acquisition of information was assessed as well as the eligibility of the teaching methods. Attitudes towards composting were observed particularly thinking of the future of the project.

The lessons were started by a story about insects that live in compost but can not survive in the conditions of a landfill. It reminded the pupils about composting and the importance of separating waste. The story was also an introduction to the topic for those who did not take part last year. The pupils were activated by a task to sort a bagful of waste to those which are suitable and unsuitable to compost. Many of the pupils remembered well how to separate the waste although some of the materials like bones, egg shells, paper and tissue were a bit troublesome. The list of waste that can be composted was read through (Appendix 3) and the method of making pit compost was discussed and demonstrated. As composting was discussed in general, it aroused some questions among the pupils e.g. they wanted to hear a comparison of industrial fertilizers and compost and advice on adding water to compost.

Worms, insects and microorganisms which are decomposing organic waste were dealt with to find out their function and significance. They chop and degrade the organic material and drill tunnels to the ground which contribute aeration and drainage. Worms also mix the soil transporting large amounts of organic material into great depths. /14/ Besides the advantages, also the disadvantages were discussed from the point of hygiene and health. To clarify the issue of decomposers, traps were made for hunting them. Some insects, worms and maggots were found. The topic aroused lots of questions among the pupils, so it was found to be an interesting way of dealing with

composting. Pupils were interested to know how the insects find their way to compost, whether the compost works without those and how they help the process of decomposition. Also hygiene and health aspect arouse interest and further comments.

The next topic was the waste in wider scale. Littering and dumping the waste to the environment are considerable problems in Mwanza city. The fact that waste management is not yet adequate is seen around the city and the residential areas. Some photos of littering were shown to the pupils as stimulus material and through those the discussion about waste was started. The core of the lesson was the hierarchy of waste management (Figure 6). It includes four pieces of advice: avoid producing waste, recycle or reuse the material, use the energy of the waste and treat safely so that the waste does not harm the environment. This was handled using examples that fit into the local environment. The Pupils understood the idea and also this helped them to comprehend better the importance of composting. They had good suggestions on how to recycle and reuse some waste e.g. the skins of animals for making drums and belts and animal bones to make buttons and jewellery.



Figure 6: The hierarchy of waste management poster used in teaching (Photo: Mari Laukka)

In the following weeks the program and the number of the visits varied depending on the schedules of the schools. The local gardener Mama Mbogamboga was invited to visit all of the schools, but eventually she managed to visit three: Sahwa, Kirumba and Isenga. Many of the pupils had already started composting at homes, so it was interesting to get the possibility to see how it went and also to meet the family members for discussion. The home visits were done in Sahwa, Kirumba, Kahama and Igoma.

At the end, there was enough time at some of the schools to make revision in a form of a crossword puzzle group work. The puzzle had questions from all of the lessons. It seemed to activate the groups and to be well-participating method as everyone tried to solve the correct answers. The pupils found it pleasant.

Eventually, instructions on how to make compost and which materials can be composted, were handed to every pupil of the environmental club. The instruction of course supports their memory, but moreover, is important to give it to the families of the pupils in order to spread the information. Appendix 3 is the instruction leaflet in English and Appendix 4 the same in Swahili.

3.3 The visits of local gardener

Mrs. Ashura Athumani, known as Mama Mbogamboga has worked in the field of gardening for almost 25 years. She cultivates vegetables in two gardens, one located near the city centre of Mwanza, and the other one in Geita. She uses natural and environmentally friendly methods like composting in taking care of the gardens. The knowledge that she has got through experience is valuable and very interesting. Thus the cooperation with her and her help in spreading the information on composting is of high importance.

Mama Mbogamboga also uses the pit method for producing compost. She has done it using the same means that has been taught at the project schools: using kitchen waste, garden waste and soil in layers, covering it always with grass and soil. The organic waste heats up during the decomposing process. During the dry season, water is added regularly on top of the pit to keep the material moist thus speeding up the process of decomposition. After about 3 months the ready compost can be shifted to where it is needed. Usually she uses this kind of compost manure in the planting stage. However,

she has wider experience about composting animal manure by using the same pit method. According to her own experience, manure of any animal will do as those have almost equal qualities. She makes compost using for example bat, chicken, goat and cow dung. The amount of manure which is put into soil, will give triple amount of compost fertilizer, as the surrounding soil also gets lots of nutrients from the manure. This material is always mixed with soil. It is important to treat the manure by composting instead of putting it straight to plants. Plain manure is usually too strong a fertilizer and can damage the plant roots because it contains too much salt.

Mama Mbogamboga prefers planting the saplings by using compost material made of kitchen and garden waste. Later it is good to add the plants some mixture of soil and compost material made of animal manure to support the plant growth. The animal manure has the same nutrients as industrial fertilizers. The way she uses it in her garden, is to add a tiny amount (like one spoonful) monthly to the plant roots.

Mama Mbogamboga has these natural nutrients from compost found much better than the artificial fertilizers. When the industrial fertilizers are used, soil will lose its fertility after some years and it can not be used for cultivation. But when compost is used the soil quality improves and it stays fertile year after year. The food is healthy when it is produced in a natural way. Also, when using compost, one saves money as it is free to produce.

Mama Mbogamboga uses also self-made insecticides in order to avoid the chemicals and to minimize expenses. Ingredients to prepare insecticides are ground leaves and bark of margosa tree, ground garlic, laundry detergent and sometimes cow urine. These ingredients are mixed and left to a closed bucket for three days. Thereafter the liquid is filtered and sprayed to plants. Margosa tree leaves are also used e.g. for making soaps and local medicines. The function of garlic is to evict insects with its strong odor. This “recipe” was found by trials. Usage of the self-made insecticide reduces the amount of insects notably, but since the gardens have sometimes lots of insects, industrial insecticides might be needed in addition. One advantage of this self-made insecticide is that the vegetables that are sprayed with it can be picked and eaten even during the same day, unlike with the industrial insecticides it is usually needed to wait from seven to fourteen days before eating the vegetables.

Mama Mbogamboga is willing to spread the knowledge and experience to all. To those people who want, she also sells the ready compost material getting some profit and gives advice on how to use it. She has already been teaching other farmers.

3.4 Questionnaire to the pupils about opinions and experiences on composting

The purpose of the questionnaire was to find out the opinions and attitudes towards composting. It was also important to learn what the pupils have understood and which kind of supplementary information would be needed. Through the questionnaire the distribution of knowledge and the use of compost can be estimated. Information on the present ways of disposing waste in the households was wanted as well to consider the possibilities of modifying those to be more environmentally friendly. The questionnaire is in English as Appendix 1 and in Swahili Appendix 2.

The questionnaires were made at the end of the school project. Before starting, the pupils were given some instructions for answering the questionnaire. It was emphasized that there are no wrong answers and everybody can answer according to their opinion and experience. Some questions were clarified and the pupils had opportunities to ask for advice. The questionnaires were answered anonymously, but the grade and gender were stated. Some of the responses were not always eligible or consistent to compile statistics e.g. sometimes the answer was not filled in or it was written unclearly.

The opinion about the necessity of composting was asked in the beginning of the questionnaire. It was there to find out if the pupils have a positive attitude towards the idea of composting and if they already feel a need for it. Understanding and need for more information was required by asking if it is easy to understand which materials can be composted and if the overall information has been sufficient. There were options from where pupils could choose which kind of information is needed more and also there was a chance to write it in their own words. This is important to know when the methods and topics of teaching are planned for the future of the project. Also to help the promotion of composting, the advantages of compost which persuade and encourage making it, were wanted to know. Those advantages were asked to be numbered in order of preference. This ranking appeared to be hard to understand for the respondents thus

all the results were not reliable. Then naturally following this, it was also asked if the pupils had perceived any benefits personally.

To find out the chances to start composting in the households, the pupils were asked the present ways of disposing waste and if they have a possibility to compost at home. Since the questionnaire was made at the end of the project, it was also interesting to ask how many pupils have started composting at home and how many of them are going to do it in the future.

3.4.1 The questionnaire results

Altogether 190 pupils of the environmental groups answered the questionnaire. This number includes the majority of the pupils as the total number of pupils taking part to the lessons was about 250 and thus the response percentage was about 75 %.

The pupils were from grades standard three to seven. About half of them were male (45 %) and half female (55 %). The division of the grades is seen in Figure 7. Table 1 shows the division of respondents' genders and grades in each school.

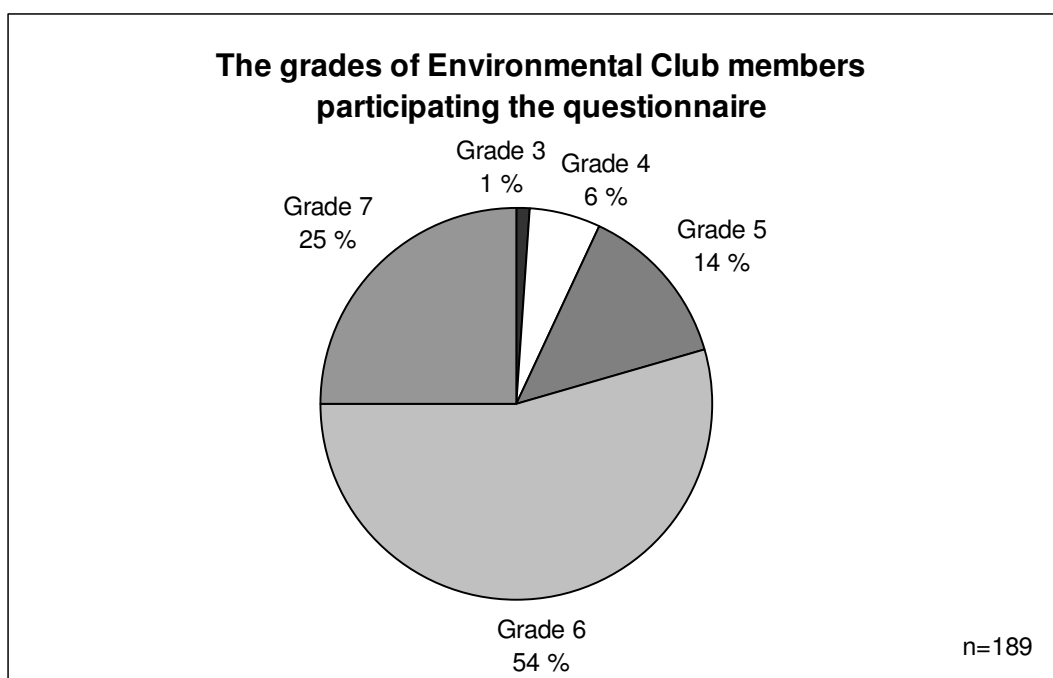


Figure 7: The division of the grades of environmental club members who have answered the questionnaire

Table 1: The respondents' gender and grade in each school

	Sahwa	Kirumba	Kahama	Igoma	Isenga	Total
Number of respondents	73	31	20	39	27	190
Male	30	19	10	16	9	84
Female	42	12	10	22	18	104
Grade 3	-	-	2	-	-	2
Grade 4	-	6	5	-	-	11
Grade 5	3	7	4	-	12	26
Grade 6	60	8	9	11	15	103
Grade 7	9	10	-	28	-	47

All the pupils shared the opinion that composting is needed. This shows that the main idea of compost is accepted and understood. It also reflects positive attitude. However, this result might be partly caused by the way of presenting the question: "Do you think composting is needed?". This might lead to choosing "yes".

A fundamental question was whether the pupils understand which materials are suitable for composting. As it can be seen from the Figure 8, the majority finds it easy to understand. However, 18 % of the respondents are unsure or feel it difficult. This topic is important to be dealt with using practical examples. It can be hard to understand what some concepts such as "garden waste" contain. These should be described with examples like specifying garden waste to be e.g. dry leaves and grass clippings. Children will understand the decomposable materials better, when the process of decomposing is observed every now and then. It clarifies if the difference between decomposable and non-decomposable materials.

From Table 2 the differences on understanding decomposing materials between the project schools can be seen. All of the schools except Isenga are rather close to the average. This deviating result is discussed in chapter 3.4.6.

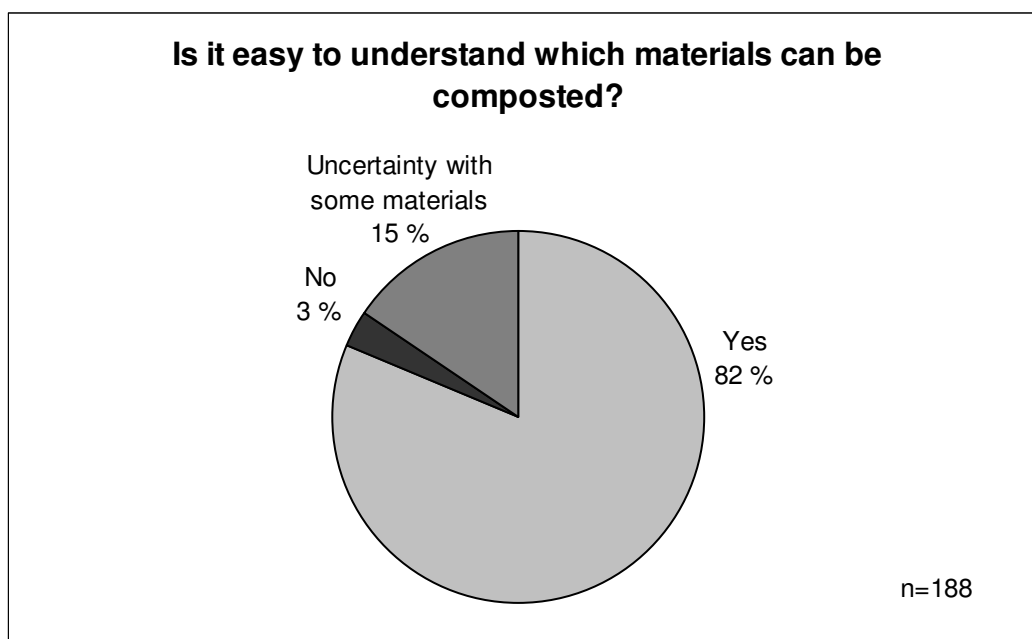


Figure 8: The pupils' opinion on their understanding the materials which can be composted

Table 2: The responses from each project school to a question "Is it easy to understand which materials can be composted?"

	Yes	No	Uncertainty with some materials
All respondents	153	6	29
Sahwa	65	1	5
Kirumba	24	1	6
Kahama	16	2	2
Igoma	32	1	6
Isenga	16	1	10

The need for more information was asked. Most of the pupils (73 %) thought that the information given is sufficient, while 27 % felt that they need more information (Figure 9). At some schools the group of pupils attending to the lessons varied from time to time, causing lack of information to some of them. Some problems of information getting through were caused by the language barrier. Also, it is difficult for children to comprehend new information without much repetition, and repetition was sometimes inadequate due to lack of time. One of the reasons for needing more information can be that the pupils were also naturally curious to learn more. The responses did not have much variation between the schools, except in Kahama, where the pupils felt a need for further information more strongly (see chapter 3.4.4).

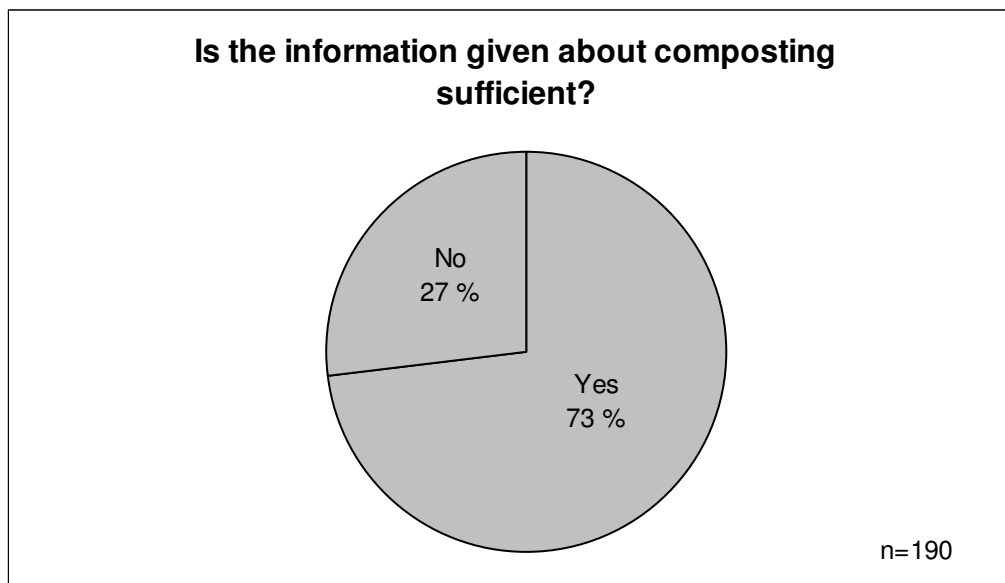


Figure 9: The sufficiency of information on composting according to the pupils

The pupils (27 %) who thought that further information on composting is needed could specify it or choose from the ready options. Most of them chose from the ready options (Figure 10). More information was wanted on preparing compost. Since there are many ways of making compost those could be introduced more profoundly. Still it has to be done so that it is not confusing. Sometimes the pupils tend to follow the instructions too thoroughly and then become uncertain in case they do not remember exactly. More information on using the ready compost material in gardening was also needed. The local gardener Mrs. Mama Mbogamboga advised the pupils in this, but unfortunately she was not able to visit all the schools. Some of the pupils also wanted more information on the benefits of composting. This is important to present since knowing the benefits encourages the people to start composting. Some of the pupils composed their own answers on what kind of information they want more. These are discussed separately in the chapters of each school.

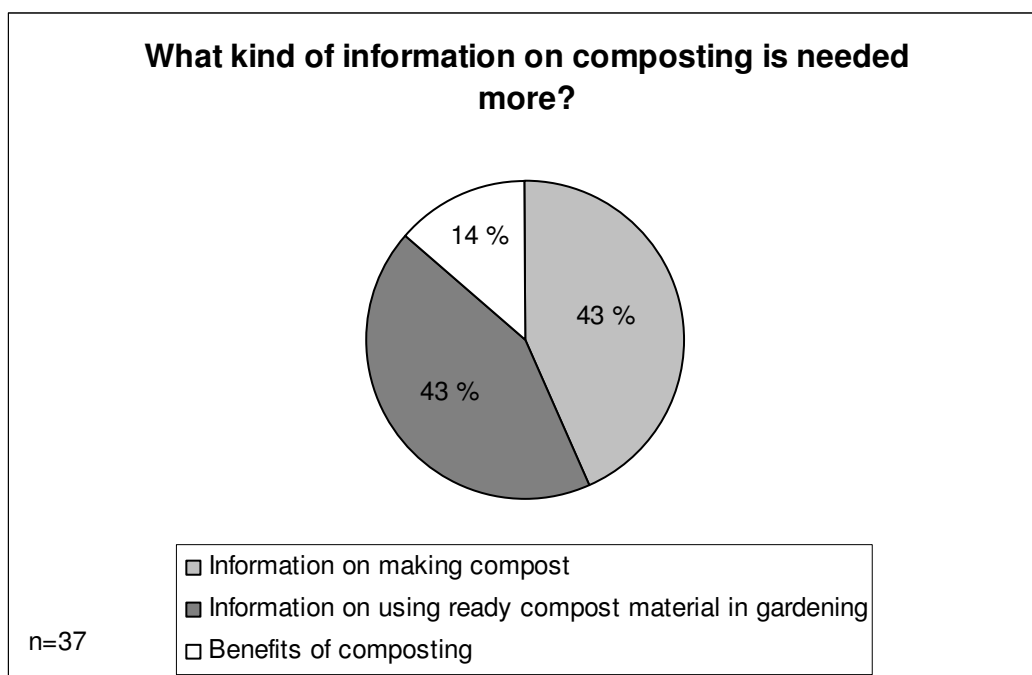


Figure 10: The information on composting that is needed more in the pupils' opinion

Some advantages of compost were asked to put in order of preference (Figure 11). This was done to find out those which encourage them the most to do composting. Those advantages could be pointed out in the future in promoting. When conducting and analysing the questionnaire, it was noticed that this question was quite complex and difficult to understand. That made interpretation difficult. The answers had some differences between the schools, but when the results were gathered together, the advantages were considered to be quite equal.

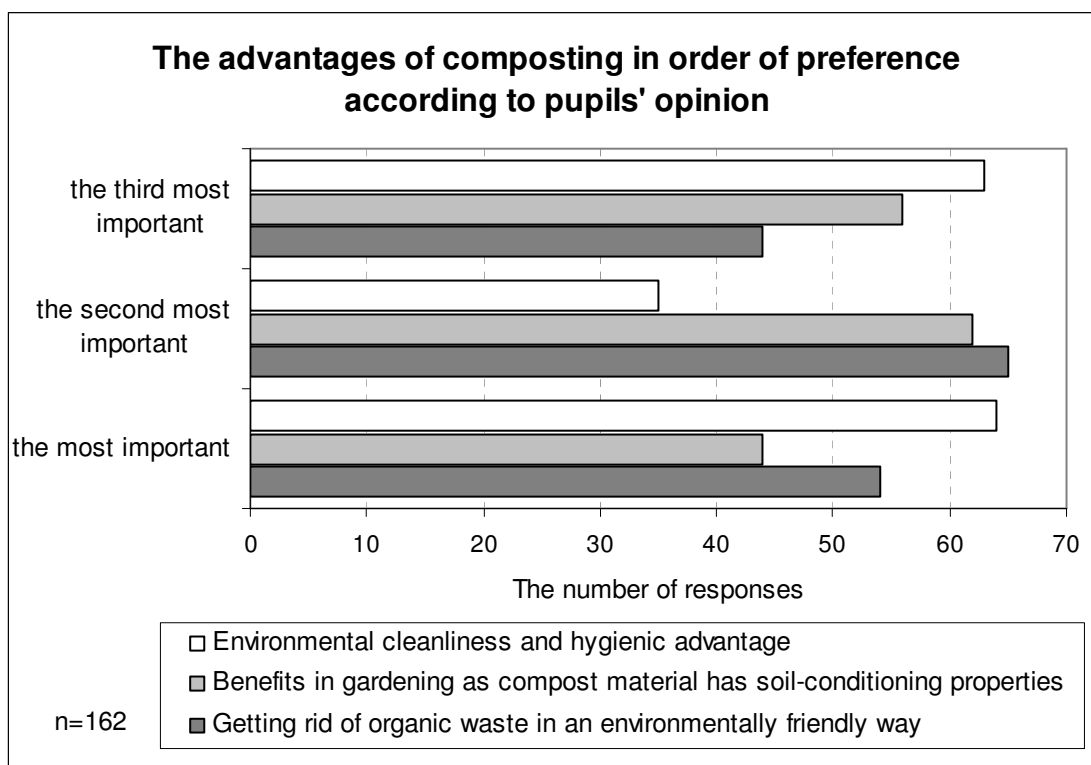


Figure 11: The advantages of composting in order of preference according to pupils' opinion

Next point of interest was if the pupils have perceived any benefits of compost personally (Figure 12). These benefits were mentioned to be for example the same as in the previous question.

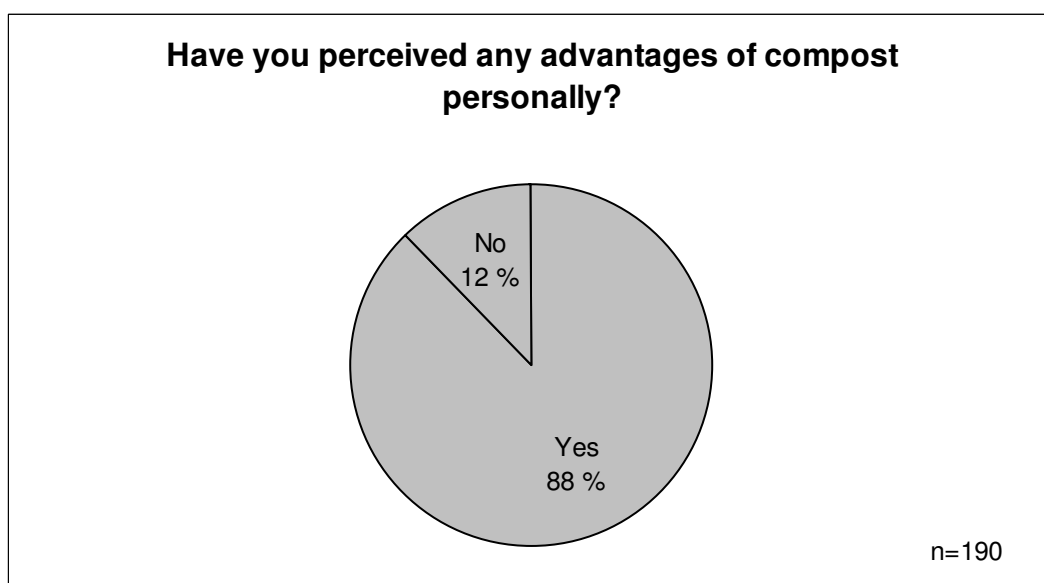


Figure 12: The percentage of the pupils who have and have not perceived the benefits of compost

It is important to know if they have observed benefits as it affects their interest. The majority (88 %) had perceived some benefits personally. This shows also that they have understood the idea of composting. Some of the pupils did not yet observe these, possibly because it takes relatively long time to notice the effects of compost on plant growth and from the angle of waste management, some children are not concerned with household waste.

The present ways of disposing waste were asked in order to find out possibilities for starting composting (Figure 13). The ways used depend mainly on the residential area. In urban areas, Kirumba and Pasiansi, it was most common to take the waste to a collection point or use services of some waste collection company. In rural areas the most usual ways were burying and burning the waste. All in all, the most common way of disposing waste was to bury it into the ground. This shows that many families have good possibilities to practice composting; the household waste could be separated and put into two different pits instead of one. Also the other ways of disposing do not usually exclude composting.

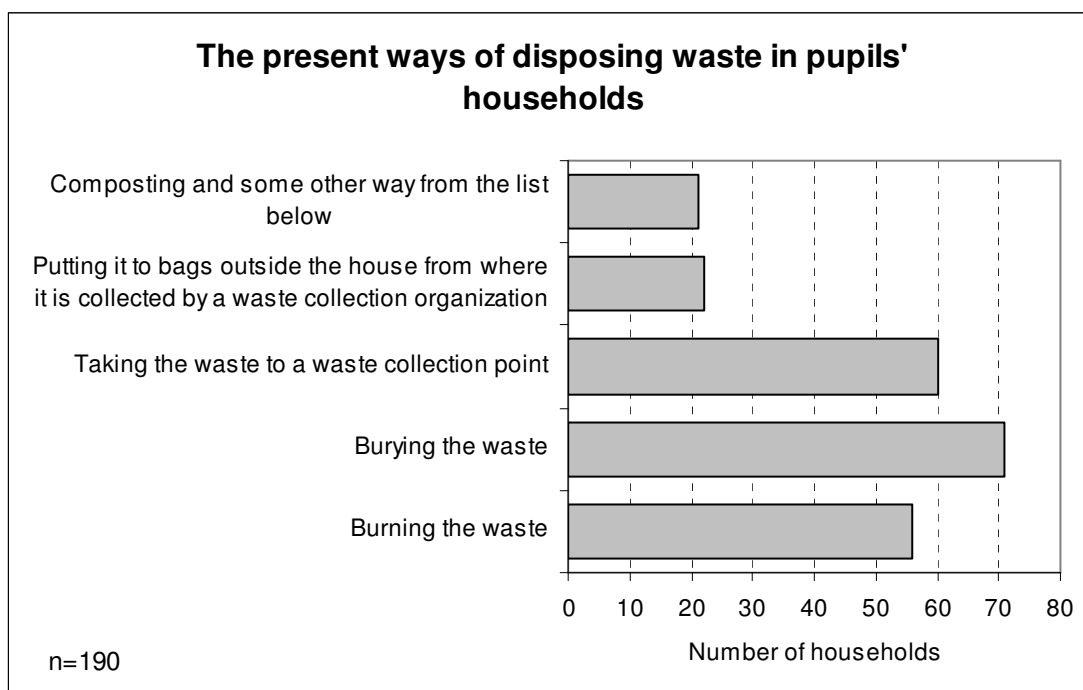


Figure 13: The present ways of disposing waste in pupils' households

One significant question was if the pupils have possibilities of composting at home (Figure 14). Even though it requires only a little work and equipment, the geographical location of the house might not enable composting. There were 7 % of all the pupils

who have no possibility to practice composting at home for one reason or another. The results from all the project schools are seen in Table 3. Sometimes the yard of the house is too small or the soil can be too rocky for making pits. To conquer these obstacles, it would be important to introduce other methods of making compost.

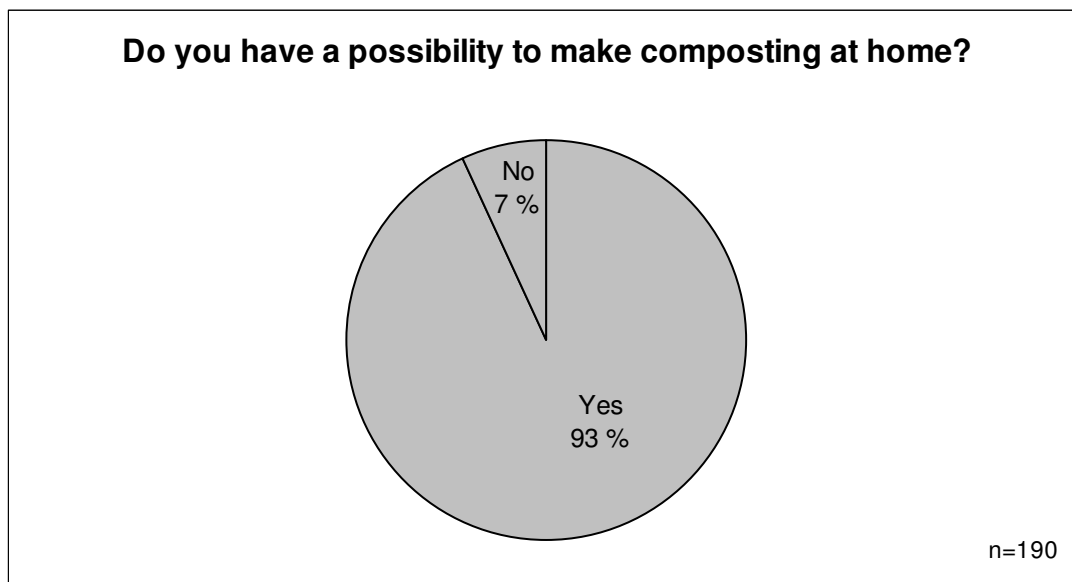


Figure 14: The possibilities of making composting at pupils' homes

Table 3: The answers from each project school to a question “Do you have a possibility to make composting at home?”

	Yes	No
All respondents	177	13
Sahwa	70	3
Kirumba	29	2
Kahama	18	2
Igoma	38	1
Isenga	22	5

In order to see how the compost education has succeeded, the pupils were asked if they have tried or started doing composting at home (Figure 15). About half of them (53 %) had done composting at home at least once. This shows enthusiasm towards the idea of composting and acceptance of the idea. Table 4 shows the number of pupils from each school who have and have not done composting at home. The pupils from Kahama and Igoma showed high activity on home composting. Exceptional low percentage on making home composts was found in Isenga. The possible causes for this are discussed in chapter 3.4.6.

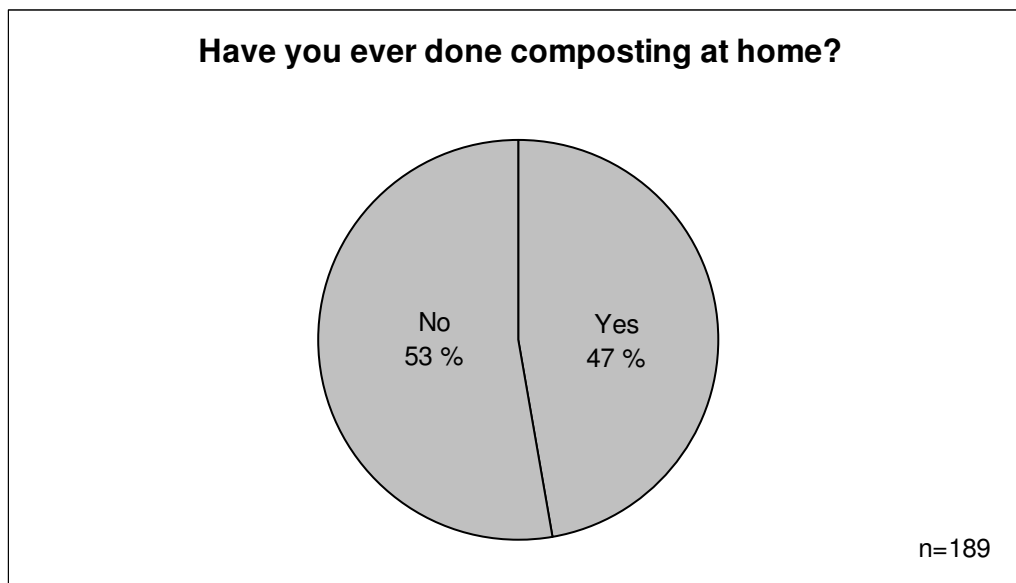


Figure 15: The percentage of pupils who have and have not done composting at home

Table 4: The number of pupils from each school who have and have not done composting at home

	Yes	No
All respondents	89	100
Sahwa	32	40
Kirumba	17	14
Kahama	14	6
Igoma	25	14
Isenga	1	26

Those pupils who had tried composting at home, had used mainly kitchen waste as raw material (Figure 16). This result was somehow foreseeable as the composting of kitchen waste has been emphasized during the lessons. The small number of people using animal manure can be explained with the lack of comprehensive knowledge about it. The local gardener Mama Mbogamboga visited three of the project school telling about composting animal manure and the rest of them got only a summary about it. Animal manure could be used more in the future because it is often available. Also, the domestic animals are usually fed with kitchen waste.

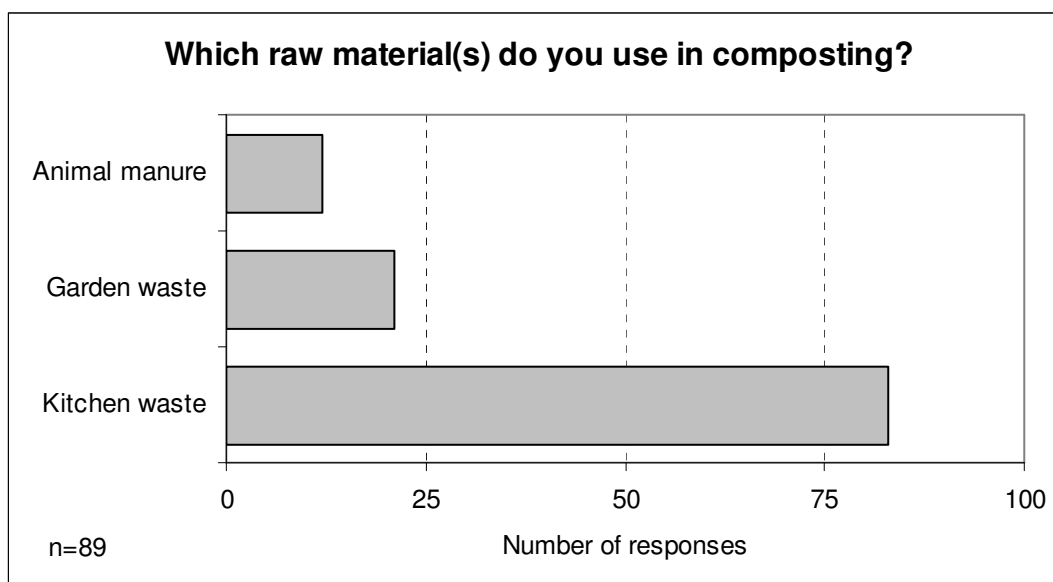


Figure 16: The raw materials used in composting

Since the pupils had started composting at school and many of them also at home, the future plans concerning composting were required (Figure 17). The majority of the respondents (86 %) were going to start or continue composting at home and 12 % were going to do it every now and then. Only 2 % were not going to continue it. This percentage also includes those who have no possibility for making it. Table 5 contains the results from all the project schools on the future plans. The responses were relatively similar in each school.

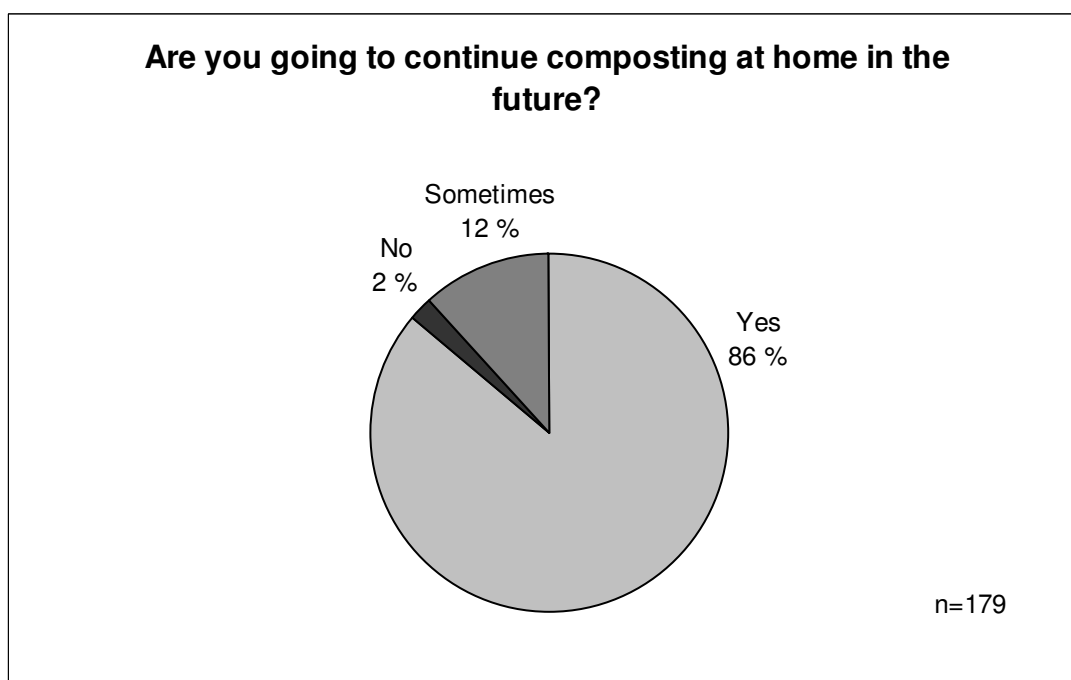


Figure 17: The plans of continuing composting in the future

Table 5: The responses to a question “Are you going to continue making composting at home in the future?”

	Yes	No	Sometimes
All respondents	154	4	21
Sahwa	64	2	6
Kirumba	29	-	2
Kahama	18	1	1
Igoma	21	-	8
Isenga	22	1	4

3.4.2 The results from Sahwa Primary School

73 pupils from grades five to seven answered the questionnaire. The majority was from standard six and seven. 58 % of them were female and 42 % male.

The materials that can be composted seemed to be very clear for the pupils of Sahwa since they had practiced composting actively together with the teacher. Further information was mainly wanted about the making and using of compost. About making it, pupils wanted to know where it is good to place, which kind of pit is appropriate, how to use animal dung and the duration of the process with different materials. About using compost they wanted to know especially how to utilize compost in tree planting and producing of vegetables. These points are very important because compost fertilizer can support cultivation a lot. Also the benefits and importance of compost interest the pupils and on contrary the disadvantages. In Sahwa the pupils thought the greatest benefit of composting to be getting rid of organic waste in an environmentally friendly way.

3.4.3 The results from Kirumba Primary School

31 members of the environmental club took part in the questionnaire in Kirumba Primary School. They were almost evenly from standards four to seven. The majority (61 %) were female.

Pupils wished to get more information particularly on using the ready compost material in gardening and the importance and benefits of composting. They would like to hear a

comparison of different fertilizers and how to make compost using different methods. Insects that contribute the process of decomposing aroused interest.

The most important benefit of composting was considered to be environmental cleanliness. The problem of littering is seen especially in urban areas like Kirumba.

3.4.4 The results from Kahama Primary School

There were 20 pupils present in Kahama when the questionnaire was done. The pupils from standard seven could not attend the questionnaire session but there were pupils from standard three to six. The majority was from standard six. The number of females and males was the same.

In Kahama almost half of the respondents considered that the information given has not been quite sufficient. This is partly due to the cancellation of Mama Mbogamboga's visit because they would have liked to hear more ideas concerning gardening and composting animal manure. Also the pupils had a natural interest towards composting. Some of the pupils thought that more information is needed in general on the process of making compost.

Among the advantages of composting, the benefits in gardening were considered to be the most important. The positive results of compost are seen well in the school area of Kahama since without compost the soil is very poor in nutrients and water holding capacity. Probably for this reason the pupils of Kahama were the most active when it comes to home composts started.

3.4.5 The results from Igoma Primary School

In Igoma Primary School 39 pupils took part in the questionnaire. They were from standard six and seven. The majority were female (58 %).

Further information was wanted before all about making compost such as clarification of the materials that can be used, which places are suitable to place a compost, how to make the pit correctly and how to take care of compost. Also they wanted to know how to make compost with different input materials especially with animal manure, because

Mama Mbogamboga unfortunately could not visit Igoma to share her experiences. Furthermore, they wanted information on treating the waste that can not be composted. The additional advice to utilize compost and use it in farming was regarded important. As the health aspect was brought forth in the lessons, the pupils wanted to know more about the possible affects of compost to human health and how they are supposed to protect themselves from the harmful bacteria of compost. They want to know more about the importance of environmental cleanliness considering especially health.

In Igoma, the benefits of compost to the environment were valued the most. Taking care of the environment is part of the curriculum in Igoma and therefore the pupils have learnt to appreciate it. Compared to other schools the pupils were relatively active in making composts at home.

3.4.6 The results from Isenga Primary School

In Isenga Primary School there were 27 pupils from the environmental club who took part in the questionnaire. About half of them were from standard five and the other half from standard six. Majority of the respondents were female having 67 % and 33 % male.

For the majority of them it is easy to understand what can be composted, but almost 40 % are having some doubts and uncertainty. This result was comprehensible because in Isenga the group of the pupils involved was different than last year thus the topic was new for them. The list of suitable materials was read aloud only a few times and the discussions on it were short. Also, an example of filling a compost pit was not done by the time of filling the questionnaire. Anyway, a poster was left to the school, and instructions on what to compost were given to every pupil of environmental club after the questionnaire.

More information was wanted mainly on using the compost material in gardening. Their own ideas for need of more information were environmental cleanliness, preventing littering and removing waste from the environment. One idea was also to remove the organic waste from the environment to be used in garden. Also they suggested educating the society about composting.

The favourite of the advantages of composting was the positive affects to environmental cleanliness and hygiene, but it was not invincible since the other advantages were considered almost equal.

The possibilities to practice composting at home seemed to be slightly smaller among the pupils of Isenga than in other schools. This can be explained by the urban circumstances and stony soil.

The pupils who participated in the project in 2008 were not included this year since they are now in standard seven and busy with studies. Therefore it makes sense that almost no one of the project pupils had done composting at home. Nevertheless, the majority is going to make it in the future since they have the possibility. The visit of Mama Mbogamboga encouraged them to start composting as she was telling the benefits and positive experiences.

3.5 Visiting pupils' homes

The visits to pupils' homes were made in order to find out the possibilities for composting, as well as experiences and attitudes on it. As the initial intention of composting project at primary schools was to spread the information to neighbourhoods, it was interesting to perceive how composting had started at homes. The teachers chose 1–3 homes to visit from volunteering pupils. The visits were conducted by the teachers. The dates of the visits were 7.5. Igoma, 18.5. Sahwa, 19.5. Kirumba and 20.5. Kahama.

Observations were made about the possibilities to compost in respect of size and geographical qualities of the yard or surroundings of the house. Potential cooperation with neighbours was discussed. One of the aims was to see if the households have gardens or some plants for which the compost would be needed and how would they use it. Usually the input material was kitchen waste and some garden waste and they had no problems in getting the material.

Secondly, the experiences and attitudes on composting were inquired. It was interesting to hear which kind of benefits they had perceived and how do they feel about the idea of composting. Chances to ask for advice and more information were given.

3.5.1 Home visits from Sahwa Primary School

In Buhongwa ward, the area where Sahwa Primary School is situated, the possibilities to make composting are excellent since it is rural area having lots of land for agriculture and gardening. Two pupils, who had just recently started composting at home, were visited. Both of them had a garden close to the house.

The families had positive attitudes towards composting and they considered the idea good. The parents got more interested in composting due to the visits and many questions about compost were asked. Although the pupils had told some things about composting to the parents, they felt that they are not having enough information on it. Thus they were taught the way of doing and using it and benefits as well. The effects of compost in maintaining the fertility of soil were discussed and compost was compared with artificial fertilizers. Also using animal manure was discussed. It was seen important to get an instruction leaflet because the pupils, though they have learned composting, they can forget some things or do not know how to explain it to the families. The family had not yet talked about compost with neighbours, but they were going to discuss it with them.

The pupils already had some plans for using compost material in tree planting. The interest towards composting was noticeable but before continuing it more actively they wanted to observe it and see the outcomes and benefits. Both of the pupils were going to continue composting in the future.

3.5.2 Home visits from Kirumba Primary School

In Kirumba, two home visits were made. Both of the pupils took part in the compost project already in 2008, so they had started composting at home that time. Kirumba Primary School is located in an urban area thus the home gardens there were small and the soil seemed to be quite rocky. In spite of the small size and rocky soil, gardens were there as decoration and as to grow some eatable plants. Therefore compost material is also needed in urban areas and the significance is emphasized in waste management. One of the pupils has used the waste generated in the nearby vegetable market to make compost. This idea is good as the vegetable waste in the market is abundant.

The pupils had passed the information to their parents. The families had good experiences and the parents were willing to learn more. In addition to the general information of making and using compost, they wanted to know new methods and were eager to hear about the benefits. The families were going to continue composting although sometimes lack of time disturbs or prevents it.

3.5.3 Home visits from Kahama Primary School

One home visit was done in Kahama with a group of eight pupils eager to take part. This appropriate pupil had started composting at home a couple of weeks ago. Also in Kahama the feasibilities to compost are very good since it is rural area and houses are having big yards and often even gardens. In that area composting would be very useful, even necessary to the plant growth, helping the soil to retain water in dry seasons.

The idea of composting was explained to the family members as well as the benefits and the possibility to use animal manure as raw material. The family members listened to the teacher carefully and seemed to be pleased to get the information. The compost material was dug up from the pit to see the phase how decomposing is proceeding and in this way demonstrate the process to the family. Kitchen waste was not recognizable anymore but garden waste was. They were advised to wait until all of the materials look like soil. They were also happy to notice that there was no bad odour anymore on the waste. In all, the family was welcoming and content to hear about compost.

3.5.4 Home visits from Igoma Primary School

Three households were visited in Igoma. In every household the experience of making compost was in different phase. One was about to start composting as they had tried it only once, the second one was making composting every now and then and the third family used it continuously. The pupils had passed the information on composting to adults.

The first family shares the yard with many neighbours, so a dozen of adults and several children followed and attended the discussion. There is a possibility to grow some plants and make small-scale gardening. For composting, the area suits very well. The topic was started by dealing with all kind of waste. It was discussed that from the

present pile of waste, a big part could be separated and used as a resource in composting. At the same time it serves other purposes, like preventing odour problems caused by organic waste. As the teacher had very active role in guiding and advising composting, the visit arouse interest and made the people to ask questions. The people saw that the present way of getting rid of the waste was problematic e.g. the waste pile attracts animals and gives unpleasant odours. The benefits of compost were discussed as encouragement. The people saw compost as a positive thing and thought that there is enough information on it so they were going to start it.

In the second household, compost had been used occasionally since last year. They had already seen the positive effects of compost as they had used it in gardening e.g. a palm tree was planted on top of a compost pit. The garden was quite big, so compost would be definitely needed and the possibilities to make it were good. There were a couple of people present. They agreed that it would be good to make composting continuously in the future and also spread the information to the neighbours. The benefits in plant growth were perceived. So the challenge is to motivate people more and more and persuade them in action.

The third family was using compost continually since last year because it supports their business of cultivating vegetables and fruits. They had noticed that without compost it is very hard to produce crop. Also when they have used compost there has not been any need to add industrial fertilizers. The benefits of compost were seen even so superior that they did not want to spread the information in order to make the business bloom and not to get competitors. It is good that also this viewpoint came up, because sometimes this is the reason why knowledge does not spread. The information given was thought to be enough to carry on composting but extra information is always welcome.

3.6 Discussions with the project teachers

In the end of the composting project the project teachers were interviewed to exchange ideas, get some feedback and make suggestions for the future. As the project teachers were already experienced and skilled, some things about composting in general were also good to bring into discussion. Through the discussions many ideas and suggestions for improvements came out.

Teachers were asked about the sufficiency of the information given, the needs of additional information, the benefits of compost project, possible problems faced, people's attitudes in general from their point of view and also possibilities and willingness to start composting in the society. The methods of teaching composting were evaluated, considering at the same time methods and schedules for the future. Also, ideas for spreading the information on compost to neighbourhood were consulted.

3.6.1 Discussion in Sahwa

The information given about composting was considered to be sufficient for the activities that have been done so far. Further studies and experiments are wished to be made on how to make compost by using different methods. Exchanging experiences on composting between people from different places was suggested. In Sahwa Primary School there is a lot of experience of composting garden waste and through the project, at present also about kitchen waste. Still, using these different input materials as well as animal manure could be trialled more and making different sizes of pits as well. More time is needed to practise composting which leads to learning it better and getting familiar with different methods. Now it is time to use the knowledge that is learnt during the project.

Compost has been beneficial for the trees that already exist in the school area and when saplings are made. The long time effects to the soil are considered important, as compost maintains the soil fertility from year to another unlike artificial fertilizers. Economical benefits are seen also as the raw materials are free of charge and available for almost everyone who is willing to use it. The knowledge of these benefits spreads from school to the community. The teacher involved in the project had met some representatives of the ward, like ward health officer of Buhongwa, to exchange the information on composting as to rouse interest among the community. There has not been any problems with compost because the community gives its collaboration e.g. when the pupils are asked to bring some waste from home, the family members help to collect it. It seems that the society is willing to try compost, having no negative attitudes towards it. But if the compost is made in big scale, one possible difficulty might be lack of time to maintain it, because it might need mixing to get air.

The idea of continuing school visits and having trainees from TAMK University of Applied Sciences concerning compost was considered good because new ideas are welcome and sharing experiences is needed. The teaching methods used so far were regarded successful as the combination of theory and practice gave eligibility for composting. Next year the group of pupils participating in the project could be different to spread the information further and also some new methods of composting could be taught to them. The frequency of school visits is a matter of arranging, but the timetable of the school should be taken into consideration. Sometimes the school routines are stopped to concentrate on the visitors, so this should be paid attention when planning the timetables. The duration of lessons could be about 40 minutes and practical work could be made in addition.

Ward meetings or seminars are precise ways of spreading information to neighbourhood. The seminar could be provided to some representatives of the ward. These meetings can be done with the help of teachers.

The new ideas from the local gardener Mama Mbogamboga were very welcome and useful. She gave many advices on gardening and ability for pupils to use animal manure as compost material. The collaboration with her is planned to be continued if it fits to her timetable, as they had already contacted her to come to the school to show gardening practically.

The lessons were considered to be adequate and fluent. Before the procedures there was introduction and presentation with some demonstrative materials which helped pupils to understand and remember and thereafter activities outside the classroom. Topics were well understood according to teachers' perception.

In the future the idea should be promoted more and do especially practical things. Perhaps more families can be visited or parents can be invited to school to spread information to the society. The teacher had discussed with the city health officer about an idea to produce compost at the school area in a certain place. In that place the people could learn about composting and also buy the manure and get advice how to use it. This idea will be planned further. He was also planning to continue visits to pupils' homes to persuade them to start and continue composting.

3.6.2 Discussion in Kirumba

Thinking of the project, the information given has been sufficient as pupils are now able to make composting on their own. Benefits of compost are seen especially after tree planting. No problems are faced because the project has the commitment of the school including other teachers and pupils of environmental group as well. Also attitudes towards compost in society seem to be positive. Composting could possibly be used even in every day life as a way of disposing waste because the students spread this information. Waste separation can be done if the families have enough information. A leaflet is a good way of getting all the information to families.

The teachers of Kirumba are pleased to be involved in the compost project and hope that it could be continued in the future to learn more and more. Of the teaching methods used, the pupils preferred group work and doing compost in practice although even theory was considered good. In the teacher's opinion, group work was the best way to learn as all of the pupils participated somehow. Hereby, in the future the pupils would like to learn by doing because it activates them better. Seeing how compost is made at school and the effects of it to plant growth also encourages pupils to start it at home. Many of the pupils want to see the results before starting composting at home, so it takes time. Some other ways of composting could be introduced in the future, like pile compost or methods for decomposing different kinds of wastes. The schedule for school visits could be once a week. The duration of the visit could depend on the activities done e.g. doing in practice can take longer like one or one and a half hour but theory lessons should be shorter.

Ideas for spreading the information in the future could be inviting parents to the school to educate also them on composting. In order to start composting at home, it is important for the parents to know it well, because ultimately it is their decision if composting is used at the household continuously. It is not very common for parents to visit the schools so it needs some preparations and efforts. Also work can limit their participation so it was suggested to arrange a meeting during weekend.

The visit of the local gardener Mama Mbogamboga was considered good because the pupils heard experiences about practicing agriculture with natural methods and they were able to ask questions on gardening. It convinces them to do it on their own.

The teaching methods used were not much different compared to ones that are used normally. Project was considered to be successful because the pupils have understood the idea of composting and also many of them have started to make it at home.

3.6.3 Discussion in Kahama

The information given on composting was considered to be sufficient. But unfortunately the local gardener Mama Mbogamboga was not able to visit the school during the project so the methods of using animal manure were not dealt with much. Additional ideas are thought to be valuable. Benefits of compost in gardening are seen at the school area. It is good to know how to make compost fertilizer because it is free of charge and utilizes the waste that would otherwise be harmful to the environment. The only problem related to composting at the school has been lack of water since the school has not a well of their own. During rain season (January-April) composting proceeds fine. From June to September the environment is very dry. Dry season is problematic for composting since the process of decomposing can even stop without adding water.

The pupils and people in the society seem to have an interest in compost. This was also seen when pupils were asked about the home visits because then there were many of them who were willing to take part. The school visits should be continued to spread the information more widely. The groups of pupils are changing and there could be many groups chosen to join the project from standard three to seven. About teaching methods, the practical ones were the best and most inspiring for the pupils. Group discussions were also comfortable according to pupils' opinions. A suggestion for the future is to do some tree planting. A good schedule for the visits could be twice a week, for example teaching theory on the other day and carrying it out in practice the next time. It is better for the pupils if there is no long pauses between the visits as the theory can be forgotten by the time when things are done in practice. The duration of the lessons could be about 40 minutes to keep the interest on.

The suggestions to spread the information widely and also outside the school could possibly be done with the help of media. If some media would get interested, the distribution of knowledge would be very wide e.g. by using newspapers, magazines or even television. Some reporters could be invited to see the school project in a couple of

schools. Also information leaflets having instructions and pictures would be good e.g. to parents. Planting some fruit trees or vegetables would be encouraging as well because the concrete results and benefits of compost are seen. Inviting parents to hear about composting was also discussed although some payment might be needed so that they would attend in big number. At least it would require fares of transportation or offering food.

The teaching methods used were considered to be good and quite similar to their own. It is good that the project continues as the pupils and the teachers involved in the project get more confidence. The pupils who have learnt composting can also spread the information to their fellow pupils in addition to spreading the information to the families.

3.6.4 Discussion in Igoma

The theoretical information about compost was thought to be enough, but more practical experience would be required. It would be important to plant something with the help of compost material in order to demonstrate how compost can be utilized. The teacher will require the environmental club members to plant something at the school area, like each of them could plant a tree, possibly fruit tree and then observe the benefits. When the fruits are ready they can see the effects of compost manure and spread the information to others. The group with the teachers have already observed some benefits such as the economic efficiency of composting because waste material is easily available thus it is better to use it than dispose. Also compost manure is better than other fertilizers and some years later the differences can be seen more clearly. Compost has not been problematic, only the missing experience of planting is needed.

According to the visits to pupils' homes, the community is open to the idea of composting and happy to get the information. Even one of the visited pupils gave a papaya as a gift of thanks of getting the information on compost. The family had used compost since 2008 and were grateful because now they could cultivate fruits and vegetables cost-effectively and productively. When the positive results are seen by neighbours, the information will spread further and others will copy the idea.

The compost project is desired to be continued in the future. Teaching methods, like group work, simple games or some stories are good with the practical experiments and activities like planting trees and flowers. Tree planting is a long term project but as a short term project flowers could be planted because blooming flowers can be seen already in a few months. Each class could plant flowers in front of their classrooms using compost and having a kind of competition who makes them flourish. Tree planting could be made too, but as a long term programme e.g. making it with the pupils of standard five. Those pupils could plant for example papaya trees which take from one to one and a half years to give fruits. The pupils could pick the fruits when they are in standard seven.

The suggestion for timetable was that visits could be made even more often than once a week. Also it was suggested that project could be done according to the seasons because water supply depends on rain season so it is good that compost manure is ready when the rain falls. The duration of lessons could be from one to two hours. During longer lessons some activating or practical tasks are needed to keep up the interest.

Now that there are a lot of pupils who know composting, the teacher is planning to choose 20 of them to teach groups of other 20 pupils who are not aware of compost. In this way 400 more pupils will know it. This is needed because there are many pupils who are enthusiastic to participate in the compost project, but can not since the size of the group must be limited.

To get the people of the neighbourhood to practice composting, they need some encouragement and support to start and continue it. As people learn more by seeing, it is likely that when the results are seen in some family garden, they will copy the idea. In spreading the information it is good to use some visual material like photos, pictures and even video clips to help teaching and demonstrate the progress that can be achieved with compost. Information leaflets are also very useful as those are read at home by parents and other family members. Although it must be kept in mind that there are many people who are not literate. To arrange a meeting and tell about composting can require money. Therefore it is good to infiltrate the information in some other meetings. Parents' meetings are normally arranged twice a year, so possibly informing a bit about composting could be included since those meetings they attend without payment. The

chance could be used to give some information on compost among the other activities, to see composting in practice or possibly a video clip or photos.

The teaching methods of TAMK trainees were considered very good and interesting and also the teacher told that he has learned some things about how to deal with the children. The trainees had enough teaching aids, e.g. pictures to arouse discussion. It was easy for each pupil to involve in the lessons because not only verbal methods were used. Each pupil gained a lot and now all of them know how to compost. The school was thankful to be one of the schools chosen for compost project.

3.6.5 Discussion in Isenga

The information about composting has clearly been sufficient, because even though the idea of composting was new, the pupils now have an ability to make compost on their own. They know which kind of material can be put to compost. So far there is not actually experience on using the ready compost material because Isenga Primary School is still waiting to get saplings. When they get those, plantings will be started utilizing compost material. But some benefits in plant growth were already observed as grass grows on the spots where compost pits were made in 2008. There have not been any problems related to composting, because the attitudes of the pupils are positive and materials for making it are available. The pupils even bring hoes from home when needed. People are very eager to do such things as composting. In the city of Mwanza, the rocky soil can sometimes be a hindrance to digging pits for compost. Also the urban area is not having gardens as much as rural areas. As the school now has knowledge on composting, the activities will be practiced and the information passed to upcoming pupils. According to the teacher, the spreading of information on compost will not stop since it is highly needed both at schools and households.

Doing the compost project with TAMK students is hoped to be continued. The practical methods were considered better since for some of the pupils theory can be difficult to understand. In the future, the activities could include planting trees and seedlings, growing and taking care of those. A suggestion for the timetable of the future was visits once a week lasting the maximum of one hour. But the project should not take place in the end of May since that is a period of making exams. Also the school is on holiday almost from the beginning of June until to middle of July. Sometimes the other

activities have also prevented the visits this year and thus decreased the total number of those. The timetable of the school is quite limited, and because of the visitors the periods are broken. During the examinations it can not be broken because it might be confusing for the pupils. So before starting the visits, the timetables need to be discussed precisely. It would be better to arrange the meetings in the afternoons, after the normal periods so that those would not be interrupted and on the contrary, the normal activities would not interrupt the composting project. Then there would be more time. The possible reasons why so few pupils of Isenga had tried composting at home were discussed. The reasons for these might be the low number of schools visits compared to other schools thus the information is not as broad as elsewhere. The teacher thought that another reason for composting not been practised, could be also lack of kitchen waste as animals can sometimes eat it before pupils have managed to collect a sufficient amount. The participation of the school to the project was discussed too. Time used for the project was clearly shorter compared to other schools. The obstacles were lack of time which prevented the similar progress as in the other schools. Also due to the big number of pupils in the school, it was not possible to arrange an empty class room to teach composting. Lack of time affected the amount of information and knowledge, also the amount of interest among pupils. Nevertheless, Isenga is willing to continue the project in the future.

The ward meeting was considered to be a good way of spreading the information to the society; also it is a good indicator of people's interest. The visit of local gardener Mama Mbogamboga was considered very educational and it was highly appreciated. One of the teachers even visited her garden afterwards to get more information. The teaching methods were considered good and quite similar compared to their own.

4 Ward meetings

The ward meetings were organized in order to inform the society about the ongoing school project and spread the knowledge of composting. Meetings were arranged in cooperation with the city health officer, ward health officers of Buhongwa, Kirumba, Ilemela, Igoma and Pasiansi and the teachers who were involved in the compost project. The meetings were held 2.6. in Buhongwa, 5.6. in Ilemela, 9.6. in Pasiansi, 12.6. in Kirumba and 26.6. in Igoma. Each meeting took place in the ward office, except Kirumba ward meeting was arranged at the school. The local gardener Mama Mbogamboga took part to the meeting of Pasiansi and Kirumba ward to tell her experiences on composting and gardening.

About 30 people were invited to each meeting. These people included the ward health committee, some parents of the pupils and people from normal families from the whole area of the ward. A particular request was to invite some people who have gardens or practice agriculture. A couple of pupils were chosen from each school to attend the meetings and share their own experiences. All of the participants got a small fee of attending the meeting. Therefore the number of people invited was dependent on the funds available.

The agenda of the meeting included general information on composting, its advantages and instructions how to make and use it. These topics were introduced according to chapter 1.4. The translations were done by the project teachers. Some visual material was used to clarify the presentation. Figure 18 is an example of this. All the participants got the instructions of composting (Appendix 4). A couple of pupils from the project schools took part to the meeting to share some experiences. This also helped the people to discover the simplicity of composting. After the presentation of about 45 minutes, people were given a chance to ask questions and discuss.

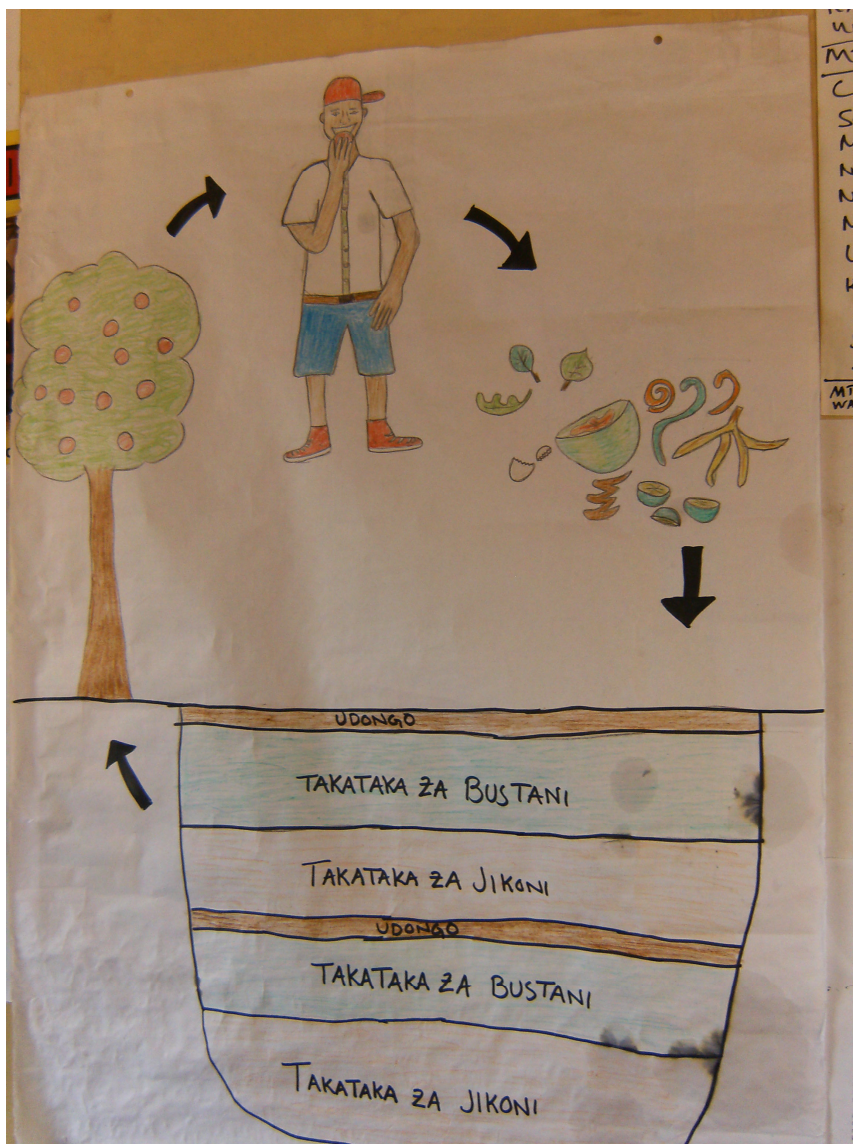


Figure 18: An illustration of composting as a natural way of recycling and one of the options to make pit composting (Photo: Vilhelmiina Harju)

The reception of the topic was very positive. People were thankful to hear the information about composting. The questions and discussion showed that the topic was well understood.

4.1 Meeting in Buhongwa ward

34 people including the project teacher and 4 pupils took part in the meeting of Buhongwa ward. There were some people who practice cultivation and e.g. the agriculture officer of the ward. The participants listened carefully and had lots of questions after the presentation. The discussion and questions concerned the procedure of making compost, the input materials and cultivation. More in detail they were asking

e.g. how to know if the material is ready, about the size of the pit that can be used, and the amounts and frequency to use the ready compost material. Interestingly one participant enquired the utilization of urine for moistening the compost during dry season. This was seen to be a good idea.

4.2 Meeting in Kirumba ward

26 people attended the meeting, including 2 pupils. The teacher was not present because of other duties thus the project coordinator of Tampere-Mwanza project translated the presentation. The pupils were very familiar with composting and therefore able to present their knowledge assertively. The discussion dealt with mostly general issues on composting. One special question was about the use of ash in compost and gardening. It was not recommended to be put in compost as it can disturb the microorganisms. Nevertheless, it is good to add as such for plants because it has minerals and trace elements. /13/ Mama Mbogamboga was a great source for information to questions about gardening.

4.3 Meeting in Ilemela ward

All together 32 people attended the meeting having many gardeners as well. From the project school Kahama, there were 4 pupils and a teacher. The pupils had prepared an outstanding presentation with demonstrative materials (Figure 19). This made the audience to be even more interested and curious as the pupils showed deep knowledge of the facts about composting. About composting, the audience was asking more information on general things like making and using it. They also wanted to know about the possible damages of compost to the plants. The participants were concerned about the cleanliness of the city and the lack of adequate waste collection. It was discussed that composting can contribute to this for its part.



Figure 19: Pupils from Kahama Primary School presenting the idea of pit composting in Ilemela ward meeting (Photo: Reuben Sixbert)

4.4 Meeting in Igoma ward

There were 26 participants in Igoma ward meeting including the project teacher and 2 pupils. The audience was active to make questions and give suggestions. One of the concerns was that how compost material can be sufficient for big farms. The concept of garden waste needed some declaration and it was mentioned that e.g. a term “yard cleaning waste” could be more explanatory. The people were highly interested and were going to spread the information further.

4.5 Meeting in Pasiansi ward

31 people took part in the meeting, having 2 teachers and 2 pupils from Isenga Primary School. Also Mama Mbogamboga was presenting her experiences. The participants were interested to hear further methods of composting, the disadvantages of using plain animal manure as a fertilizer and ways of using compost. There seemed to be some confusion over the concept of garden waste like what does it include. The usage of diseased plants as input material needed clarification. Those were not recommended to

be used because there is a possibility that those can contaminate the compost material which is used for other plants afterwards. As Mama Mbogamboga was present, the audience had good chances to ask about composting animal manure. She advised to use the strong animal manure with water. It was suggested that the leaflet given to the audience should have pictures as there are illiterate people.

5 Discussion

5.1 Evaluation of the composting project

The composting project as a whole seems to have been a success. The cooperation with the project schools and other associates such as ward health officers has started and proceeded very well. People have been eager to hear the information on composting and they have also been grateful to get the knowledge. All in all the attitudes have been favourable and the dissemination of information has succeeded. The project schools show also unprompted activeness. It can be estimated that the information on composting has spread through the projects of years 2008 and 2009 to 800–1000 people, including the pupils, their families and the people who took part in the ward meetings. Probably the number is even higher as the schools have practiced the activities outside the project with new pupils and spread the information in many ways. The teachers and pupils who have been involved in the project are familiar with composting and able to practice it as well as distribute the knowledge further.

As composting practices in Mwanza are still in the beginning it would be important to add the awareness and continue the project. Composting has potential to improve waste management in low-income countries, thus benefiting society as a whole. The awareness on environmental issues is poor and this limits the actions that people could do. During the project it was noticed clearly that people have interest but still insufficient knowledge. Therefore intensive education and support is needed. When it comes to improving environmental cleanliness and waste management, ordinary people are important actors and the project should aim to empower them to better understand their situation, and hence to take action to change it.

The primary schools who have been involved in the project have shown their commitment. Especially now that the idea of composting is understood, the cooperation proceeds well and the schools are more initiative. The responses to the questionnaire showed that the pupils have understood the idea of composting and are willing to get further information. Nearly all of the pupils are having good possibilities to make composting at home and about half of them have tried it at home. The project of this

year encouraged them to start composting at home and interestingly, the large majority responded that they are going to continue it in the future.

The home visits revealed that even the parents are open to new ideas and show interest to get to know more about composting, gardening and environmental issues. But to get the compost to be a regular way of disposing waste, the community needs more support and advice.

The ward meetings were very serviceable and opportune because many of the participants practise agriculture or gardening, therefore they found the information significant. Naturally some doubts arouse but those can be overcome when the awareness is increased.

5.2 Problems and challenges

There are some places for improvement in the planning and implementing of the school compost project as well as in information spreading to the society. It would be necessary to plan in advance and precisely what the trainees will do, with what kind of schedule and with what kind of funding. It should be noticed that the collection and preparation of teaching material is considerably more difficult in Mwanza than in Finland. Also, if it is done in Mwanza, it requires more funding from the project. To enable the trainees to prepare it, they should be informed in time. Early planning also enables the trainees to study the basics of Swahili, which helps them to adapt to the culture.

The main problem with the school composting project has been timing. It is clearly seen that the project should not take place during the school holiday or the period of final examinations. During these times the project is disturbed a lot due to the lack of time and cancellations of the meetings. In practice, this means that the school project should be finished by the mid-May or started after the mid-July. In the planning phase of the project it is important to make sure that the participants understand the plans of the schedules and discuss their views and possible restrictions so that the schedules are clear to all cooperation partners. With proper planning the resources will be utilized efficiently.

The language barrier between the trainees and the pupils and sometimes the teachers caused difficulties at times. Therefore having an interpreter is important. A translator is needed to translate the teaching materials as well.

Sometimes getting a certain group of pupils to be involved in the project has been difficult. It would be necessary to make the education more efficient and to enable the pupils to get a wide picture of the topic.

Due to the resources, the instruction leaflet on composting that was distributed to the people, was rather simple and having only text. However, the fact that there are many illiterate people shows the need for illustrated or photographic instruction leaflet.

One considerable obstacle in spreading the information wider among the community members is that there are people who do not want to share the knowledge with others since then they might not profit on it as much as they could. This can happen when a farmer benefits from composting by getting good crop and the farmer does not want competitors to the markets. This might even be the major obstacle for the information to spread further on its own and therefore more civil education and support from Tampere-Mwanza project is still needed.

5.3 Evaluation of the schools

5.3.1 Sahwa

In Sahwa the teachers and the pupils are very active and initiative. The cooperation is easy and attitudes towards the project positive. One of the reasons for high interest was that there was also previous experience on composting garden waste.

One outstanding feature in Sahwa was that there are many ideas and suggestions for improvements concerning composting. They are willing to make experiments on different ways of composting e.g. trying different input materials. Also they had plans of their own about spreading the information to the families of the pupils and to the community. The schedules for the school project were well organized and adjustable.

5.3.2 Kirumba

In Kirumba there is enthusiasm and interest towards the project and will to do things concerning composting on their own. The information about composting was already shared with some primary schools nearby. The pupils in Kirumba are very active during the lessons having a good team spirit. The attitudes towards the project were approving.

5.3.3 Kahama

Kahama showed great activity and interest towards the composting project. The activity is seen through initiatives and suggestions like inviting an expert to the school to tell about tree planting and taking care of garden and introducing the local gardener Mama Mbogamboga to the trainees from TAMK University of Applied Sciences. The commitment to the project was also seen as they were ready to do activities on composting regularly also outside the project. The forecourt was used as a project area for making compost pits so that later the area would be verdant. Some plants that can stand also the dry conditions as well as some eatable plants were planned to put there.

In Kahama the pupils had found a better way to bring the waste to the school composts – instead of using plastic bags they had wrapped the waste in paper. Thus there was no problem of dirty plastic bags.

5.3.4 Igoma

In Igoma the cooperation was very fluent. The attitude of the project teacher was very motivating and encouraging. The pupils also showed high interest towards the composting project. The teacher even persuaded all the pupils to plant for example tomatoes and onions at home using compost material. Also there were plans of planting activities at the school area.

5.3.5 Isenga

In Isenga the time used for the composting project was considerably less than in the other project schools. More careful and early planning for the schedules would have been needed. In the end of the project it came up that the afternoons would be better time to organize the project lessons. For example this could have been implemented if it

had been known by the trainees. In the future it would be important to have a certain teacher responsible for the project to be able to organize the meetings regularly and in order to avoid the problems of transmitting information. The project might also need more effort such as arranging a class room for some of the lessons or some resources like organizing pupils to bring waste. There is potential for the composting project as the responsible teachers are already familiar with composting. This makes spreading the information is efficient.

6 Plans for the future

In order to make composting a viable option, it is important that the small-scale demonstration projects are continued, developed and supported. The benefits should be communicated with the society to stimulate demand, to build awareness and to overcome possible negative attitudes. The habits are changing slowly, therefore the people need a lot of encouragement and persuasion.

In the future, the number of school visits to each school should depend on their abilities. This should be discussed individually with each partner school in the beginning of the project. Attention should be paid to the school holidays, examination periods and national holiday days to avoid unexpected cancellations of the meetings.

The pupils who have been involved in the project should be taken to the process of spreading information to the other pupils. To get a certain teacher to be committed to the project is advantageous as it lessens troubles in information movement from one person to another. Also, it can improve the motivation when the responsible person is chosen in the beginning. The motivation of the project teacher has a strong effect on the enthusiasm of the pupils.

The project schools have required getting more information and practical instructions on planting trees and other plants and using compost material. It is wished that the trainees could do these activities together with the pupils. It would be good to choose plants that can stand the dry conditions. The best idea would be planting fruit trees or anything eatable to make the pupils see and enjoy the results of their work. Trees are good for preventing erosion and for making shade. Other plants could be placed in the shadows if the trees are not too water demanding. Another topic on which the schools need more information is making compost piles on top of the soil. When the pupils are asked to bring kitchen waste to the schools, it is important to promote the idea of wrapping the waste in paper to avoid the waste problems of dirty plastic bags. This idea was discovered in Kahama Primary School.

The schools were given some illustrated posters during the years 2008 and 2009. These posters included information in the Swahili language e.g. on making compost. These

kinds of posters with pictures and photos are effective and successful in information spreading. Many of the schools still had the posters which were given in 2008.

The project should invest in illustrated information leaflets which the pupils could take to their homes and these leaflets could be given for example to the participants of ward meetings. This year the information leaflet delivered at schools and ward meetings was rather simple, having only text. It was noticed that the leaflet would need more illustrations or photos. This is necessary because there are illiterate people.

The schools could organize with the trainees a day of inviting the people from the neighbourhood to learn about composting and to see a demonstration. It is important to spread the information outside the schools to activate the people more. The ward meetings were very successful. Those should be continued with greater emphasis. The ward meetings bring the information straight to the farmers and gardeners who have a natural interest on it. Educating the adults and especially those concerned with agriculture was pleasant as one could see that the information is needed and appreciated. In the meetings it was observed, that the people who are working in the field of agriculture understood quickly and well the idea of composting, but some of the people from the community might need demonstration to get better understanding. The meetings are arranged with the help of the city health officer and the ward health officers. Therefore it is essential to plan it well and inform the participants in time.

There were about 30 people in each ward meeting. The participants showed much interest and many of them intended to start composting. The lists of the participants were stored, thus it would be possible to follow up later if composting is continued among those people and see also if the information has spread further.

The cooperation with the local gardener Mama Mbogamboga should be continued. Her contribution is significant as it gives encouragement and support to those for whom the topic is new. Through her long experience she is able to convince the people on the advantages of composting. The working contract should be negotiated in advance.

It is reasonable to continue the composting project within the same project schools, as the cooperation is easy and proceeds well. In these schools where the teachers are familiar with the topic and the aims of the project, the information spreading is

effective. But even though the orientation to the composting project takes time in the new schools it would be worthwhile to consider involving some secondary schools in the project. In secondary schools there would not be such big language barrier between the trainees and the pupils as the official teaching language is English. The pupils of secondary schools would also have wider understanding and possibly more influence at homes to affect the ways of disposing waste and taking care of the garden. The secondary schools could be visited during the same days as the primary schools if those are located in the same wards as the primary schools.

To support the project more, there could be some university students from Mwanza making cooperation in the composting project together with the students of TAMK University of Applied Sciences. As the trainees from Tampere are competent with environmental issues, the students from Mwanza could be e.g. from the field of education. This combination would support the education process. For example the students from Saint Augustine University of Tanzania might be interested in cooperation.

It is important for the trainees to plan the project and outline the teaching materials already in Finland. This makes it possible to start the project in Mwanza without delay. The trainees might need advice in adapting to the culture and in the beginning of the stay some help in the daily routines organized by the project.

It is essential to establish good communication with the cooperation partners. Where different languages are involved, interpreters might be needed. The interpreter needs to understand the project before starting the work and also has to be able to give accurate and full translations. Especially the interpreter is needed when translating the teaching materials.

Through the project the community will be aware of the idea and advantages of composting and can get encouragement to practise it. Cooperation with some stakeholders and non-governmental organizations could help the information spreading in the future.

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Photos taken by Khalfani Abdulahman, Mari Laukka, Vilhelmiina Harju and Reuben Sixbert

Appendix 1: Questionnaire to the pupils about the opinions and experiences on composting, in English

EXPERIENCES AND OPINIONS ABOUT COMPOSTING

School: _____

Grade: _____

Sex: Male Female

Composting is recycling organic waste. Organic waste like kitchen and garden waste decompose into dark brown soil-like material which can be used in gardening as soil amendment.

Please answer the questions by choosing from the alternatives according to your own experiences and opinions.

1. Do you think composting is needed?

- Yes
- No

2. Is it easy to understand which materials can be composted?

- Yes
- No
- Uncertainty with some materials

3. Is the information given about composting sufficient?

- Yes
- No

If not, what kind of information is needed more?

- Information on making compost
- Information on using ready compost material in gardening
- benefits of composting
- something else, what?

4. Arrange the following advantages of composting in order of preference according to your opinion. (1= the most important, 2= the second most important, 3= the third most important)

- Getting rid of organic waste in an environmentally friendly way
- Benefits in gardening as compost material has soil-conditioning properties
- Environmental cleanliness and hygienic advantage

5. Have you perceived any advantages of composting personally?

- Yes
- No

6. What is/(are) the present way(s) of disposing waste in your household?

- burning the waste
- burying the waste
- taking the waste to a waste collection point
- putting it to bags outside the house from where it is collected by a waste collection organization
- composting and some other way (choose the other one also from the list above)

7. Do you have a possibility to make composting at home?

- Yes
- No

8. Have you ever done composting at home?

- Yes
- No

If yes, which raw material(s) do you use in composting?

- kitchen waste
- garden waste
- animal manure

9. Are you going to continue composting at home in the future?

- Yes
- No
- Sometimes

Appendix 2: Questionnaire to the pupils about the opinions and experiences on composting, in Swahili

UZOEFU NA MAONI KUHUUU KOMPOSTI

Shule: _____

Daraja: _____

Jinsia: Mwanaume Mwanamke

Komposti ni jinsi ya kutumia takataka ambazo zinaweza kuoza. Taka zinazoweza kuoza kama vile taka za jikoni na za shamba huoza na kuwa na rangi ya kahawia kama rangi ya udongo, ambazo zinaweza kutumika shambani kama kirutubisho cha udongo.

Tafadhali jibu maswali yafuatayo kwa kuchagua kutoka katika orodha kwa kulingana na uelewa na maoni yako.

1. Je unadhani komposti inahitajika?
 Ndio
 Hapana
2. Je ni rahisi kuelewa vitu vinavyoweza kutengeneza komposti?
 Ndio
 Hapana
 Sina uhakika na baadhi ya vitu kama vinaweza kutengeneza komposti
3. Je taarifa inayotolewa kuhusu komposti inatosha?
 Ndio
 Hapana

Kama hapana, taarifa ipi inahitajika zaidi?

- Taarifa jinsi ya kutengeneza komposti
- Taarifa jinsi ya kutumia komposti iliyo tayari katika shamba
- Faida za kukomposti
- Kitu kingine, nini hasa?

4. Panga umuhimu wa kukomposti katika mpangilio kulingana na mawazo yako. (1= La muhimu zaidi, 2= La pili kwa umuhimu, 3= La tatu kwa umuhimu)
 - Kuondoa taka ambazo zinaweza kuoza kwa kutumia njia nzuri
 - Faida bustanini kwa sababu komposti ina virutubisho ambavyo ni muhimu kwa udongo na ukuaji wa mazao/ mimea
 - Usafi wa mazingira na umuhimu wa hali ya usafi
5. Je wewe umeshagundua umuhimu wowote wa kukomposti?
 Ndio
 Hapana
6. Njia ipi/(zipi) zinatumiwa katika kutupa uchafu nyumbani kwenu?
 - Kuchoma uchafu
 - Kuchimba shimo na kufukia uchafu
 - Kupeleka uchafu katika sehemu ya kukusanyia uchafu
 - Kuweka uchafu kwenye mifuko nje ya nyumba na kusubiri wanaohusika na ukusanyaji wa uchafu
 - Kutengeneza komposti na njia nyingine (Chagua njia moja kutoka katika orodha hapa juu)
7. Kuna uwezekano wa kutengeneza komposti nyumbani?
 Ndio
 Hapana
8. Umeshawahi kufanya komposti nyumbani?
 Ndio
 Hapana

Kama ndio, vitu gani vinatumika kutengeneza komposti?
 - Taka za jikoni
 - Taka za shamba
 - Mbolea ya wanyama
9. Je utaendelea kukomposti nyumbani katika maisha yako ya badae?
 Ndio
 Hapana
 Mara chache

Appendix 3: Instructions on making pit compost and list of materials to compost, in English

PIT COMPOST

- Make a pit for example with depth of 50 cm and width of 50 cm. It can be easier to dig and fill small pits, but also larger ones will do.
- Fill the pit with organic waste (kitchen waste, garden waste).
 - The pit can be filled with only kitchen waste or only garden waste, or by using both of them.
 - When using both kitchen and garden waste, the pit can be filled for example in layers. First layer is kitchen waste (at least 10 cm). Second layer is garden waste (about 5 cm), followed by a layer of soil (about 5 cm). The waste layers are put in until the pit is full.
 - Cover the waste always with soil to prevent bad smells which could attract animals.
- Depending on the soil type and weather conditions, it takes about 3 months for kitchen waste to decompose. If the pit is filled only with garden waste, it can take about 6 months until the compost material is ready. Thus compost is ready to be used as a fertilizer after one can not recognize the original waste. End product should be dark brown fertile soil.
- Trees can be planted straight on top of the pit or compost manure can be removed and used elsewhere in the garden to grow vegetables.
- After dealing with waste, one should always wash hands

Benefits of compost

Plants grow better in compost soil. Compost also helps to maintain the soil fertility. It contains important plant nutrients (like nitrogen, potassium and phosphorus) and can also contain beneficial minerals. Compost helps the soil to retain nutrients and water, reducing the need of chemical fertilizers.

COMPOSTING – WHAT TO COMPOST

SUITABLE FOR COMPOST

Kitchen waste

- vegetable and fruit waste, peelings
- tea grounds
- leftovers
- egg shells
- nut shells (no coconut)
- paper napkins

Garden waste

- hay or straw
- leaves and grass clippings
- twigs, thin branches
- weeds and other garden waste

CAN BE COMPOSTED IN SMALL AMOUNTS

- paper
- milk products
- high fat foods
- meat products
- diseased plants

NOT SUITABLE FOR COMPOST

Materials that do not decompose or can poison the compost

- ash
- bones
- coconut shells
- metals
- plastic and plastic bags
- glass
- rubber
- leather
- chemicals, oil, gasoline
- medicines
- batteries
- cigarette ends

Appendix 4: Instructions on making pit compost and list of materials to compost, in Swahili

KOMPOSTI YA SHIMO

- Tengeneza shimo kwa mfano urefu wa sentimeta 50 na upana wa sentimeta 50. Itakuwa rahisi kuchimba na kujaza mashimo madogo, lakini hata makubwa yanawezekana pia.
- Jaza shimo kwa takataka (Taka za jikoni, taka za bustani).
 - Shimo linaweza kujazwa na taka za jikoni pekee au taka za bustani, au kwa kutumia zote.
 - Wakati unatumia taka za jikoni na za bustani, shimo linaweza kujazwa mfano katika matabaka. Sehemu ya kwanza ni taka za jikoni (angalau sentimeta 10). Sehemu ya pili ni taka za bustani (angalau sentimeta 5). Ikifuatiwa na sehemu ya udongo (angalau sentimeta 5). Takataka zinawekwa mpaka shimo lijae kulingana na sehemu ya kila takataka.
 - Kawaida fukia takataka na udongo kuzuia harufu mbaya ambayo inaweza kuvutia wanyama.
- Kutegemeana na aina ya udongo na hali ya hewa, inachukua kama miezi 3 kwa takataka za jikoni kuoza. Kama shimo limejazwa na takataka za bustani peke yake. Itachukua muda wa miezi 6 mpaka komposti iwe tayari. Hivyo komposti huwa tayari kutumika kama kirutubisho baada ya mhusika kushindwa kugundua taka alizoweka. Mwisho kabisa udongo utakuwa na rangi ya kahawia ambayo inaonyesha kuwa una rutuba ya kutosha.
- Miti inaweza kupandwa moja kwa moja juu ya shimo au mbolea ya komposti inaweza kutolewa kutoka kwenye shimo na kutumiwa kwenye bustani ili kukuza mbogamboga.
- Baada ya kushughulika na takataka, unatakiwa kuosha mikono.

Faida za komposti

Mazao husitawi vizuri katika udongo ulio na mbolea ya komposti. Vilevile komposti huongeza virutubisho kwenye udongo na utunzaji wa udongo kwa ujumla. Virutubisho muhimu kwa mimea (kama nitrogeni, potasiamu na phoshorasi) na inaweza kuwa na

madini muhimu. Komposti husaidia udongo kutunza virutubisho na maji, hupunguza uhitaji wa virutubisho vya kemikali.

VITU VINAVYOTUMIKA KUTENGENEZEA MBOLEA

MAMBO YA KUZINGATIA

Takataka za jikoni

- takataka zitokanazo na, mboga za majani, matunda na maganda yake
- majani ya chai
- mabaki
- maganda ya mayai
- maganda ya karanga (usitumie vifuu vya nazi)
- tissue/ toilet paper

Takataka za bustani

- majani makavu na ya miti
- makuti madogo madogo
- magugu na takataka zingine zitokanazo na bustani

WAZEWA KUCHANGANYA VITU VIFUATAVYO KWA KIASI KIDOGO SANA

- karatasi
- bidhaa za maziwa
- vyakula vyenye mafuta mengi
- nyama
- mimea yenye magonjwa

VISIVYOFAA KUCHANGANYWA

Vitu visivyo oza au vinavyoweza kuzuru mchanganyiko

- majivu
- mifupa
- vifuu vya nazi
- vyuma
- plastiki na mifuko ya plastiki
- vioo
- mipira
- ngozi
- kemikali, mafuta na mafuta ya gari na mashini
- madawa
- betrii
- vichungi vya sigara

Appendix 5: Timetable and curriculum for the school composting project

Time	Topics of the day	Aims	Method	Attention
1. visit (week 16)	Adventures of Wonky and Ugg	Remember what we did last year	Story, 2 different tasks for the pupils	Classroom needed at beginning, kitchen waste
2. visit (week 17)	Hunting for decomposers, health aspects, "compost tea"	Find out what insects can be found from compost, what is the meaning of those, learning about hygien	Activating task, discussion	
3. visit (week 18)	Littering / rubbish in our surroundings	Learn where our rubbish go, what are the effects of throwing rubbish to streets and yards, how we could reuse rubbish.	2 activating tasks, discussion	
4. visit (week 19)	Visitor: Mama Mbogamboga	Learning about composting with animal mature and gardening		Animal manure needed, maybe some kitchen waste also
5. visit (week 20)	Composting at pupils homes	Study how people have responded to the idea (Maris final thesis)	Visits to pupils homes	No activities for all pupils
6. visit (week 21)	Discuss about environmental club	Make up some ideas for activities for the Env. Club, make up club rules etc.	Discussion	Classroom
7. visit (week 22)	Review, aims for the future	Review	Discussion	