



The Use of Urine as Fertilizer

The Use of Urine as Fertilizer



KÄYMÄLÄSEURA HUUSI RY
GLOBAL DRY TOILET ASSOCIATION OF FINLAND

Content

| | |
|---|----|
| What is Urine? | 4 |
| Ecological Sanitation Technology – Urine Diversion Dry Toilet (UDDT) | 9 |
| How the Urine Diversion Dry Toilet (UDDT) Works? | 11 |
| How to Use Urine? | 12 |
| Steps to Follow | |
| 1. <i>Collection of Urine</i> | 14 |
| 2. <i>Storage</i> | 17 |
| 3. <i>Utilization</i> | 18 |
| How to Apply Urine? | 22 |
| To Keep in Mind | 24 |

© Global Dry Toilet Association of Finland have all the rights for this guide and its illustrations. This guide can be quoted and copied for non-profit use, so long as proper acknowledgement of the source is made when used.

Käymäläseura Huussi ry /
Global Dry Toilet Association of Finland
www.drytoilet.org
toimisto@huussi.net



KÄYMÄLÄSEURA HUUSI RY
GLOBAL DRY TOILET ASSOCIATION OF FINLAND

What is Urine?

Urine is a liquid by-product of the body secreted by the kidney through a process called urination and excreted through the urethra (WHO, 2006). Urine can be considered as an almost PERFECT NUTRIENT SOLUTION for growing food because it contains high amounts of Nitrogen (N), Phosphorus (P) and Potassium (K) which are very important for plants. The best way to collect urine is by a urine diversion dry toilet (UDDT) which allows for the source separation of urine and faeces through the use of a specially designed seat or a squatting pan.

Why separate urine at source?

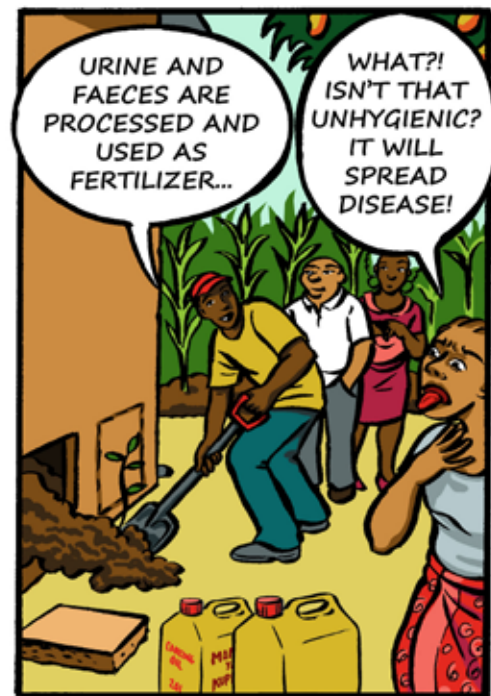
- Reduces smell
- Enables fast drying of faeces which makes handling of faeces much easier (less volume) and hygienic
- Decreases the run-off of micro-organisms and nutrients to soil, groundwater and surface waters
- By separating urine at source, you can best take advantage of all the nutrients in human excreta.

The nutrient amounts in urine (person/year) in the western diet:

| The most important nutrients | Urine (500 L) |
|------------------------------|---------------|
| Nitrogen (N) | 5,6 Kg |
| Phosphorus (P) | 0,4 Kg |
| Potassium (K) | 1,0 Kg |
| Total | 7,0 Kg |



Figure 1. With ecosan toilet you can utilize urine as fertilizer.



Ecological Sanitation Technology – Urine Diversion Dry Toilet (UDDT)

There are many ways and technologies to practise ecological sanitation. The most common types of toilets are urine diversion dry toilets (UDDT's) and composting toilets.

Urine diversion dry toilet (UDDT)

UDDT consists of eight basic functional elements:

1. A urine diversion toilet seat or squatting pan
2. One or two vaults, usually above ground, or one shallow pit for faeces collection and storage
3. Piping to lead urine from the user interface to an infiltration or collection system
4. A ventilation pipe to exhaust moisture and odours from the vault or pit
5. If required, an anal cleansing area for the separate collection and drainage of anal wash water
6. A toilet superstructure, unless the toilet is installed inside an existing house
7. A bucket with dry cover material (e.g. dry grass, sawdust, dry leaves)
8. A hand washing facility with soap and water.

The advantages of urine separation:

- reduces odour (a mix of urine and faeces causes substantial odour)
- enables fast drying of faeces which makes handling of faeces more simple and hygienic
- reduces environmental impacts
- source-separated urine can be used as a fertilizer on plants or crops.

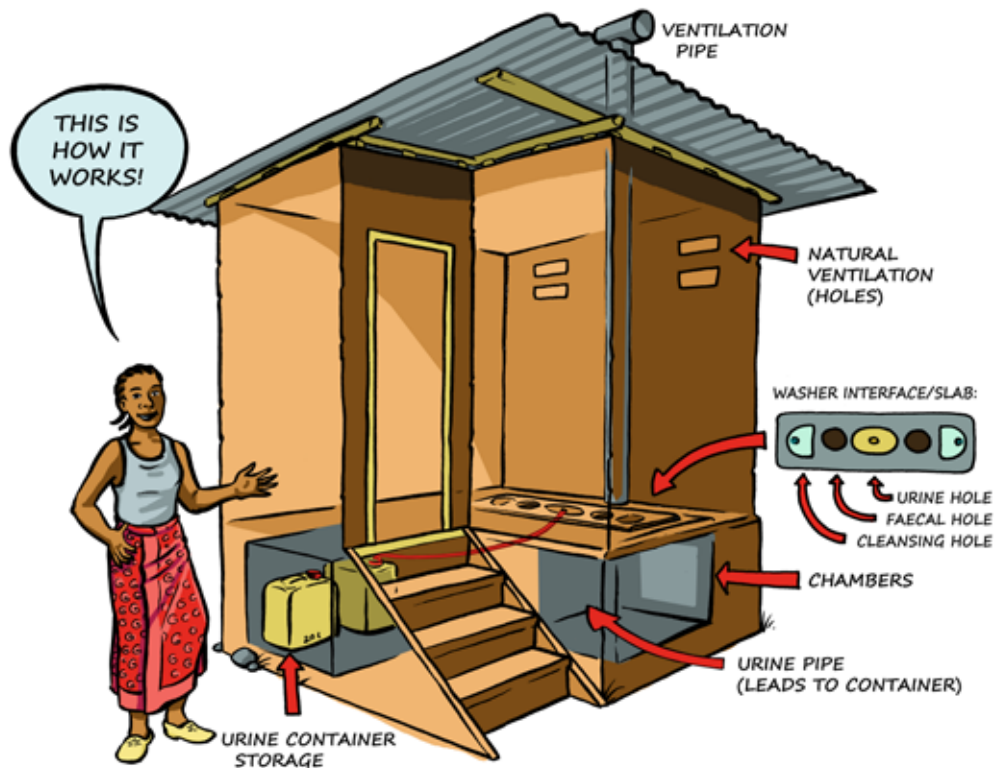


Figure 2.
The principle of urine diversion dry toilet (UDDT).

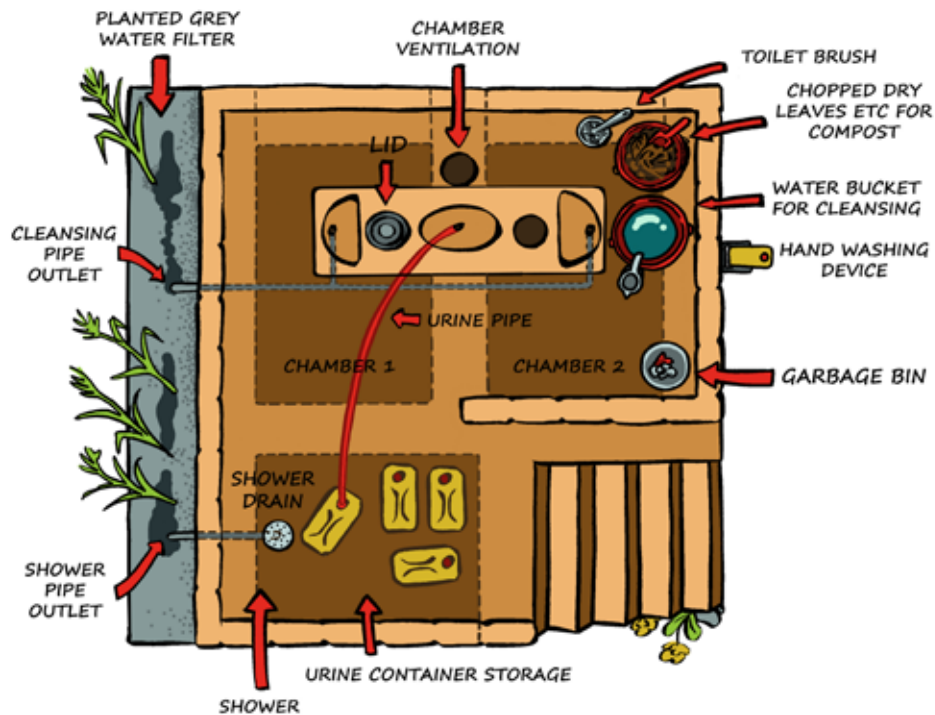


Figure 3. Layout of urine diversion dry toilet (UDDT).

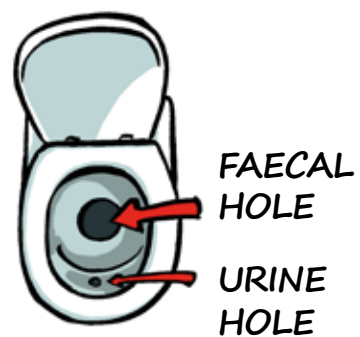


Figure 4. Urine diversion toilet seat.

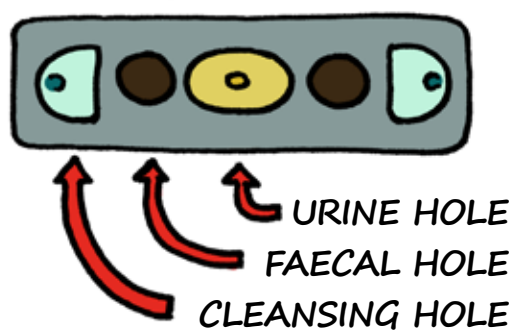


Figure 5. Urine diversion squatting pan.

How the Urine Diversion Dry Toilet (UDDT) Works?

Urine-diverting dry toilets (UDDTs) allow for the source separation of urine and faeces through the use of a specially designed toilet seat or squatting pan, as shown in Figures 4 and 5. Urine is diverted via small hole through a urine pipe to a urine container. Faecal material goes through a bigger hole to a chamber below. There may be a third hole for washing.

The faeces drop into a pit, vault or container. There can be either single or double vault collection system. In single vault systems, interchangeable containers can be used or the container can be emptied and compost stored and treated elsewhere. In the double vault toilet, the material is stored in the vault. When the first vault is full, it is closed and left to rest, while the other vault is used. When the second vault is full, the first vault is emptied with a shovel through an access door located at the rear of the vault. The second full vault is then sealed and left to rest while the first vault refill. There are examples of the double vault collection system in Figures 2 and 3. Properly designed faecal vaults will fill in 6 to 12 months and then rest for an equal period of time. During the storage, the moisture in the faeces slowly evaporates and is released through the vault's ventilation system, or is absorbed by the dry cover material. This process is called dehydration. The resulting dry and odourless material can be used as an agricultural soil conditioner.

Urine diversion serves a number of important functions including reducing odour and simplifying the excreta management process. Dry or 'waterless' operation indicates that no water is used for flushing faecal material, though water must be present for hand washing and other hygiene practices following defecation and urination.

How to Use Urine?

Urine is a very good fertilizer that can be used both in household scale and large scale farming. It is suitable for example to fertilize food plants, ornamental plants, seedlings and trees.

Urine can also be used to accelerate the composting process. Urine can be poured as such on top of the compost. Proportioning depends on the moisture and size of the compost. In most cases, proportion is not crucial but compost should not get too wet as this slows the composting process down and it may also cause odour problems.

Urine is mostly a nitrogen fertilizer. It is suitable especially to plants with high nitrogen demand such as grain, grass crops, oil plants, spinach, cauliflower, maize, lentils, red beans and soy beans. It can also be used to fertilize tree seedlings and fruit trees.

Urine is used as a fertilizer according to its nitrogen value. Usually one litre of stored urine contains approximately 3–7 grams of nitrogen. If specific instructions of the use of nitrogen fertilizer are not available, all plants can be fertilized as follows: urine produced by one person in a day (ca 1-1,5 litres) fertilizes one square meter per growing season.

Figure 6.

Source-separated urine can be used as a fertilizer on plants, crops, seedlings and trees.





Steps to Follow

1. Collection of Urine

Construct a self-made urine separating toilet or purchase urine diversion toilet seat/squatting pan. There are several options available for different needs and cultures. You can also collect the urine to a bucket or any type of container, but for the longer storage, the container should be closed for nitrogen not to evaporate.

Choose the size and type of the container to fit into your needs. Keep in mind that a person produces around 1.5 litres of urine per day. If you use bigger storage container you have to have a tap or a pump in it for further use. For example, if there are 15 people using the toilet in your home, they will produce around 22 litres of urine per day. To change the container once a week, you would need a container that is around 150 litres. You can also use 20 litre containers (e.g. plastic jerry cans), but in that case, you will need many containers as they will fill out more quickly.



Figure 7.

Choose the size of the container(s) to fit the amount of urine produced.

CHOOSE RIGHT KIND OF CONTAINERS FOR YOUR TOILET:

1 PERSON PRODUCES 1,5 l/DAY **15 PEOPLE USING THE TOILET**

= 22 LITRES /DAY **= 150 LITRES /WEEK**

SEALABLE PLASTIC CONTAINERS ARE GOOD!



Steps to Follow

2. Storage

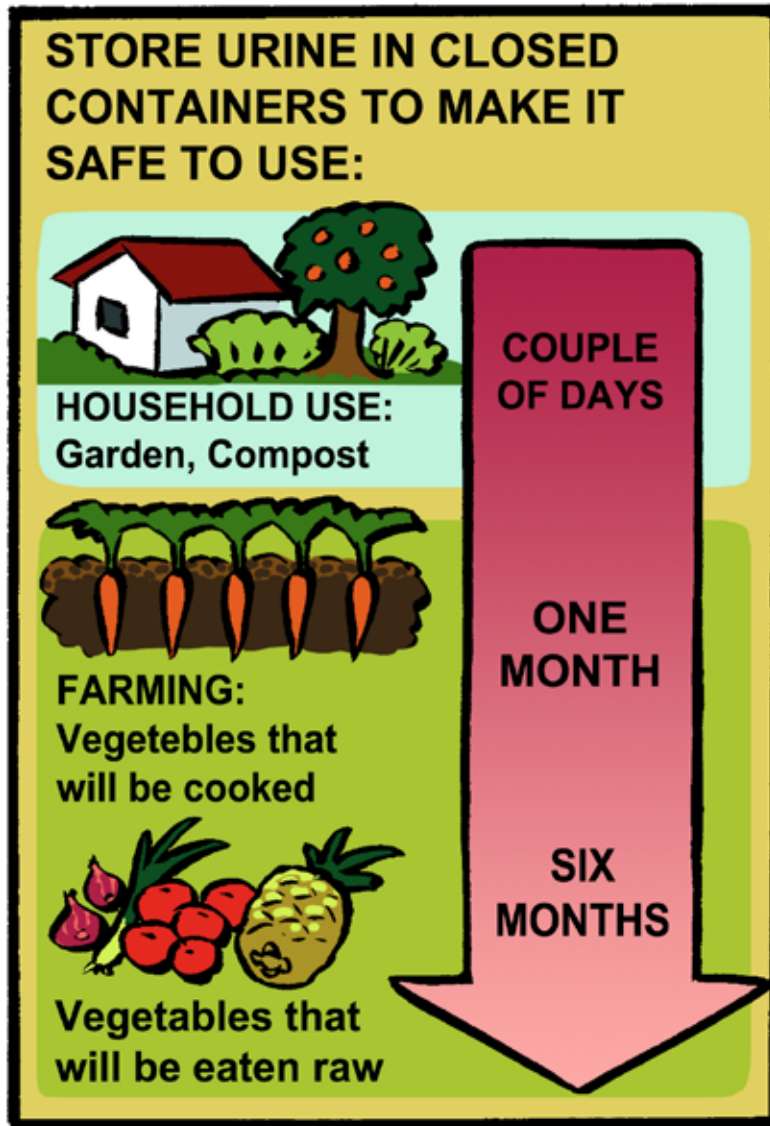
To prevent the loss of nutrients such as nitrogen, urine needs to be stored in closed containers. NB! Always store urine in a plastic container (metallic will corrode).

With healthy people, separated urine is usually free from pathogens. Some diseases may infect the urine and there may also be some faecal contamination (e.g. faecal matter mixed with the urine) so for safety reasons, urine must be stored before using it as a fertilizer. If urine is collected from a household toilet and used for **household's own purposes** e.g. in garden, it can be used **after a month of storage** (WHO guidelines). If you use urine to accelerate composting, you can use it after a couple of days of storage.

If urine is **collected from a public toilet or used in large scale farming** and for food and fodder plants that are not consumed untreated, the storage period should be **at least six months** (WHO guidelines).

NB! Urine should always be stored undiluted.

Figure 8. Urine should be stored from few days up to 6 months depending on the source and use.





Steps to Follow

3. Utilization

Urine can be used either undiluted or diluted. However, it is recommended to dilute the urine before use. Always stir the urine before use as nutrients will concentrate to the bottom of the container.

A) Utilization of diluted urine

Dilution of urine reduces the risk of evaporation of nitrogen, over-fertilization and damages to the plant. The dilution rates vary from 1:1 (1 parts of water and 1 part of urine) to 10:1 (10 parts of water and 1 part of urine), but **the most common dilution ratio is 3:1**. (3 parts of water and 1 part of urine). Always pour the urine on the plant root, never on the leaves. To reduce the risk of evaporation, you can cover the ground with soil or compost afterwards. If urine is used diluted, separate watering after spreading is not needed.

B) Utilization of undiluted urine

Pour undiluted urine to the soil (not on the leaves of plants) and water immediately with watering can. Watering ensures the absorption of nitrogen to soil and decreases evaporation to the air, so nutrient loss is small.

NB! When using undiluted urine, there is a risk of over fertilization, which can lead to death of the plant.



Figure 9. Urine can be diluted with water using e.g. dilution rate of 3:1.



Figure 10. Urine should be applied to the soil, not on the leaves of the plant.



Figure 11. Wash hands with soap after handling urine!

How to Apply Urine?

Urine can be spread one or many times depending on the duration of the growing season and the demand of the plants. Main/first spreading should take place in the beginning of the growing season, for example on planting stage. Plants with small roots like carrot, onions and lettuce can benefit from many spreading occasions. Wait at least one month between last spreading and harvest. Spread urine early in the morning or in the evening to avoid evaporation of nitrogen and smell.

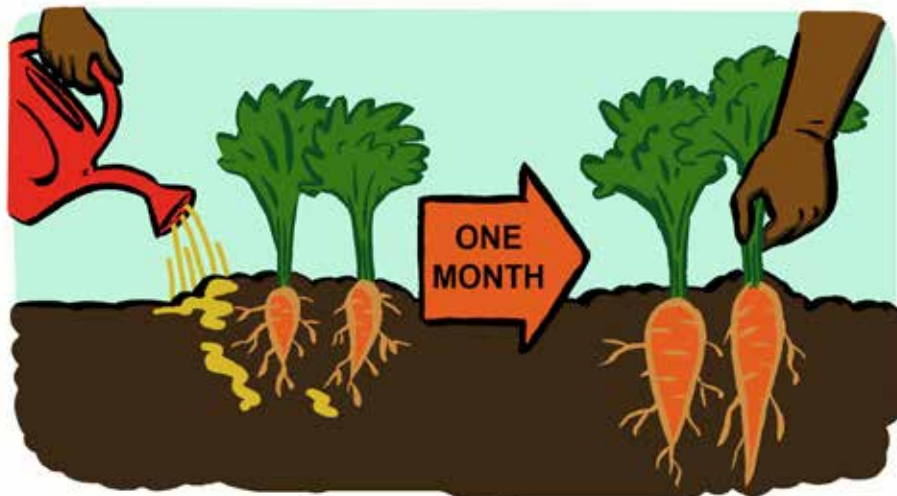


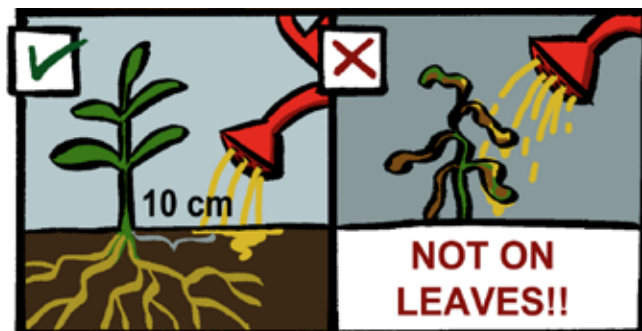
Figure 12. Wait at least one month between last spreading and harvest.



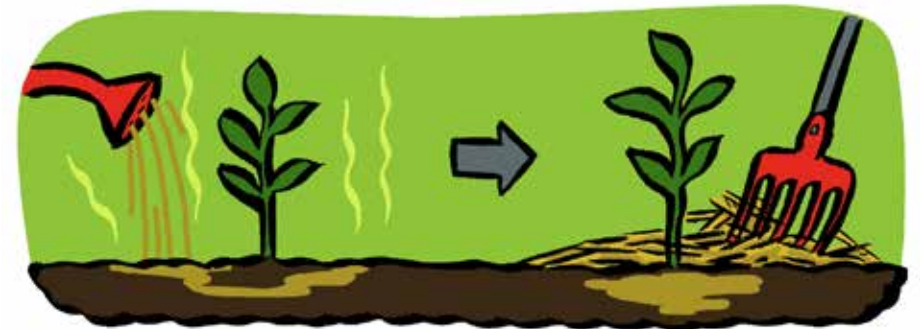
Figure 13. Urine is a suitable fertilizer for many plants and crops.

To Keep in Mind

- Urine should be carefully separated on the source so that it does not get into contact with faeces
- Urine must be stored in a closed container before using it as a fertilizer
- Preferably use diluted urine
- Apply urine directly to the soil, NEVER on the leaves of the plant
- If large amounts of undiluted or diluted urine accidentally come into contact with leaves of the plant, wash it off with clean water
- Large bushes and trees have nutrient taking root hairs on the same level as their outermost branches and therefore the fertilizer needs to be applied there
- With vegetables and perennials, the spreading distance is approximately 10 cm from the root



- You can use bedding material such as shredded grass or compost to reduce evaporation



- Always wear gloves when handling urine!



- Wash hands with soap after handling urine!

FIRST, REMEMBER TO ALWAYS USE GLOVES WHEN HANDLING URINE!

CHOOSE RIGHT KIND OF CONTAINERS FOR YOUR TOILET:

= 22 LITRES /DAY

1 PERSON PRODUCES 1,5 /DAY

15 PEOPLE USING THE TOILET = 150 LITRES /WEEK

SEALABLE PLASTIC CONTAINERS ARE GOOD!

STORE URINE IN CLOSED CONTAINERS TO MAKE IT SAFE TO USE:

HOUSEHOLD USE: Garden, Compost

COUPLE OF DAYS

FARMING: Vegetables that will be cooked

ONE MONTH

Vegetables that will be eaten raw

SIX MONTHS

URINE CAN BE USED FOR:

HOUSEHOLD: -Gardening -Compost accelerating

FARMING:

I GET INCOME!

I GET GOOD FERTILIZER!

YOU CAN DILUTE THE URINE, SO YOU DON'T NEED TO WATER THE PLANTS AFTERWARDS.

1

3

POUR DILUTED URINE ON THE ROOTS OF THE PLANTS.

10 cm

NOT ON LEAVES!!

URINE IS PERFECT FERTILIZER FOR PLANTS WITH HIGH NITROGEN DEMAND.

WAIT AT LEAST ONE MONTH BETWEEN SPREADING AND HARVEST!

REMEMBER!

WASH YOUR HANDS CAREFULLY AFTER HANDLING URINE!

SOAP

A Series of Educational Manuals on Ecological Sanitation and Hygiene has been produced as a part of the development co-operation project called "Sanitation Improvement and Social Enterprise in Dar es Salaam, Tanzania".

Graphic Design

Ulpu Kojo, Finland

Illustrations

Sanna Hukkanen, Finland

Swahili Translation

Dora Jokinen, Finland

A Series of Educational Manuals on Ecological Sanitation and Hygiene has received financial support from

Aalto-yliopisto / Aalto University, Finland

Tähdenkantajat ry, Finland

Ympäristö- ja kuluttajapoliittinen yhdistys /

Miljö- och konsumentpolitisk förening ry, Finland

Publisher

Käymäläseura Huussi ry /

Global Dry Toilet Association of Finland, Tampere 2017

In cooperation with

Centre for Community Initiatives (CCI), Tanzania





KÄYMÄLÄSEURA HUUSI RY
GLOBAL DRY TOILET ASSOCIATION OF FINLAND

**Käymäläseura Huussi ry /
Global Dry Toilet Association of Finland**

www.drytoilet.org

toimisto@huussi.net

Tel. +358 503 012 539

ISBN 978-952-68658-5-0 (volume)

ISBN 978-952-68658-6-7 (PDF)

SUPPORTED BY OFFICIAL
DEVELOPMENT AID FROM THE MINISTRY
FOR FOREIGN AFFAIRS OF FINLAND