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## Ecological sanitation: A sustainable goal with local choices. A case study from Taita Hills, Kenya

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## **Ecological sanitation: sustainable goal and local choices. A case study from Taita Hills, Kenya.**

**Abstract:** Sanitation has been a core development-related keyword since the Millennium Development Goals were launched, but its improvement in Sub-Saharan Africa has been considered generally slow. So far, sanitation needs have been mainly addressed technically and economically while lacking proper intersection with related conditions, such as health education, cultural and environmental contexts, gender and ownership. These elements seem now to be considered by the new Sustainable Goals launched in 2015. More emphasis is given to the importance of providing differentiated, instead of homogenized, guidance to any process of change and material intervention, including sanitation projects. These cannot be reduced in terms of external environmental-engineered cycle connecting households but have to be valued for the way they involve people's bodies, ecosystems and livelihoods. This paper presents the results of a research conducted in Kenya, and particularly in Taita Hills, an area mainly served by pit latrines and hit by environmental degradation. The research was meant to understand local perceptions and attitudes towards implementation of different types of ecological sanitation solutions that make possible the establishment of a closed loop of nutrients connecting food production and sanitation. The findings indicate the importance of local cultures and personal preferences in defining sanitation choices, particularly in rural areas, starting by the consideration of local livelihoods and preexisting systems serving the human waste disposal cycles.

**Key words:** *sanitation, ecological sanitation, sustainable development goals, cultural sustainability, Kenya.*

### **1. Introduction**

The year 2015 was the date set for reaching the targets of the Millennium Development Goals. Some of the goals are declared as reached in various areas of the world (United Nations 2015a), although with differences across sectors and areas. Sanitation has been deserved low attention and as a consequence, its progress has remained rather weak, with still 2.4 billion people lacking proper toilet provision (UNICEF and WHO 2015). In Sub-Saharan Africa, only 17% of the population has gained access to improved sanitation compared to 1990, and especially large rural areas lag far from the targets (ibid.). Stronger effort is then needed for the coming decades, as inadequate sanitation is a cause of spread diseases that are often life-threatening, besides effects of social segregation and environmental degradation.

In the sustainable development goals, agreed in the United Nations Sustainable Development Summit in New York in September 2015, drinking water and sanitation are unified in the goal "Ensure access to water and sanitation for all", including eight targets to be reached by 2030, namely:

- 1) 'achieve universal and equitable access to safe and affordable drinking water for all'; 2) 'achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations'; 3) 'improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally'; 4) 'substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity'; 5) 'implement integrated water resources management at all levels, including through transboundary cooperation as appropriate'; 6) 'protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes'; 7) 'expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting,

*desalination, water efficiency, wastewater treatment, recycling and reuse technologies'; and 8) 'support and strengthen the participation of local communities in improving water and sanitation management'. (United Nations 2015b)*

Having a specified goal targeting water and sanitation is a significant step forward from the MDGs. There could be a risk that in this unified goal, sanitation could be again overlooked by the water targets as it was during the MDGs programmes; but the new articulation into targets appears more focused than before in terms of policy implementation in sanitation. Of particular interest for our study are target 2, looking at the relation between sanitation and health, and at the particular constraints lived by girls and women; and target 8, calling for local community participation – although it is only coming at the end of the list, after target 7 that, on the contrary, seems to make a plea for more engineered solutions coming from other contexts, especially the Global North. Target 8 then recognizes the importance of grassroots approaches to accompany the process towards durable change, and to guarantee its ownership and its acceptance that must be people- and place- specific. Geography then counts, and participatory processes are fundamental, starting by the respect of local cultures and the recognition of users as agents of change rather than simply customers of solutions identified elsewhere.

Marginalization of sanitation and hygiene, as well as poor consideration of people's and institutions' views, is visible also in scientific literature (George 2008, Jimenez et al 2014). In this article we aim to support the idea of sanitation from a sustainability approach, involving environmental, cultural, social and local perspectives. In fact, the existence of techniques to improve sanitation in terms of environmental and human health is not enough to determine their adequacy in concrete applications. Solutions have emerged from local contexts and guarantee the widest possible local ownership. Local authorities are also responsible for supplying sanitation services, supporting people's choices and enhancing programmes to improve hygiene practices and waste management.

Our field research was undertaken in the Taita Hills region of Kenya. We investigated the local interest for basic ecological sanitation as a way to decrease organic contaminants and at the same time, use human waste as a productive resource. Our aim is then to adjust the focus within sustainable sanitation research: from the technologies to the users, from the hardware to the software. While technical aspects of ecological sanitation have been and are being covered in length elsewhere, our emphasis is on a valid and comprehensive understanding of local sanitation beyond toilets.

## 2. Human dimension of sanitation

*"Worse still, even those with proper toilet facilities do not wash their hands properly after shitting"* (Musyoki 2010). This simple evidence shows the inadequacy of looking at sanitation, even by the MDGs, only as a matter of toilets rather than involving the whole integrated cycle of human waste disposal including human behavior, hygiene, waste, disinfection, recycle and reuse. As a matter of fact, types of toilets and conditions for their use are important matters for everyone's life and the ecology; but increasing the amount of toilets is not a guarantee per se of improved sanitation. For this reason, we aim to extend the topic beyond the usual discourse *'about toilets'* and centralize the discourse on cultural and political ecological aspects.

Since the MDGs were launched in 2000, many projects have targeted deprived areas through large scale interventions and subsidies for construction of new toilets (Jenkins and Sugden 2006). Their design has been proposed on the basis of principles of economic affordability, technical simplicity, and in the best cases, in accordance to spatial and environmental conditions. In our own field experiences, we have often seen how this sector has been delegated to private companies, working in rural areas of African countries to promote improved toilet schemes. External views are also visible in the so called *sanitation ladder* that has been used

in monitoring the development goal in relation to poverty (UNICEF and WHO 2015); but it contains an over-simplified idea of progress based on a hierarchy of predefined toilets (starting by open defecation) that improve in proportion to the users' economic wealth, while at least integrated environmental functions should also enter the model (Kvarnström et al. 2011). Moreover, sanitation cannot be reduced to toilets construction, and the risk is now to delegate again providers to choose simply environmentally friendly latrines, instead of combining ecological with cultural aspects, societal networks and behaviours as well as political considerations.

Water, Sanitation and Hygiene (WASH) programmes have also looked at the governance aspects, with the attempt to share responsibilities between institutions and civil society in order to direct and manage the proposed sanitation systems (UNDP 2006, Iza and Stein 2009, UNDP WGF 2015). As a matter of fact, sanitation choices are political since they deal with issues of social inequalities and spatial-environmental injustice, whereas most of the times public authorities fail to dialogue with all part of civil societies, especially the most vulnerable groups (Jewitt 2011a). Rural landscapes and informal towns reveal unfinished walled toilets, abandoned or completely unsafe latrines; and we wonder how these are counted in the monitoring of the progress towards the sanitation goals. Certain failures depend from poor attention to socio-cultural conditions and lack of local ownership. Sustainable sanitation cannot be performed as uniform set of solutions but shall be addressed at the local level and in differentiated ways, aligned with existing practices on the ground, with cultural norms and finally, individual choices, since *"households' motivations to build and use toilets has more to do with comfort, convenience, status, privacy, and dignity"* (O'Reilly and Louis 2014:43).

Recent programmes with social components have focused on means to influence improved hygiene practices and sanitation management. Projects aiming to stop open defecation have elaborated methods for *"transforming people's mindsets"* (Musyoki 2010) and particularly the Community-led total sanitation programmes (CLTS) promoted by the Institute of Development Studies (IDS) of Sussex have started by *triggering* processes based on experiences of disgust and shame to target a multitude of hygiene behaviors, including ending open defecation, hygienic toilet use, hand washing, hygienic food and water handling, and safe disposal of feces (Kar and Chambers 2008, Bongartz et al. 2010, Sigler et al. 2014). Some criticism appears in the way the initiation of these processes still appears as top-down although Chambers (2009) on the contrary defines them as designed *"on the ground"*; other authors have considered them even unethical since they are directed by humiliation and community-led coercion (Chatterjee 2011, Galvin 2015); and others praise for softer approaches based on mutual and constructing co-learning (O'Reilly and Louis 2014).

Cultural and social sustainability is not simply an acceptance of technical propositions or even awareness raising and capacity building. It is important to acknowledge certain general attitudes towards faeces that are part of specific cultures, also influenced by religions and their conceptualization of im/purity. Cultural sustainability means what is culturally acceptable because it is adapted to behaviours, beliefs, organisation of daily lives, so that the changes can be in the long-term and contribute to transformative development with impacts on health, resource use and sustainable productions.

Furthermore, cultures are not monolithic in specific societies, and their definition can easily reproduce power imbalances and increase vulnerability of the weakest components of a society, those who are certainly already more strongly hit by sanitation gaps. The proposed changes shall consider intersectionality with other aspects, such as gender, class, ethnicity, religion, sexuality and physical ability (Cavanagh 2010, Nightingale 2011). Inequalities and differentiated risks are reproduced in the mode of defecating as reported by some authors (e.g. Greed 2004, WICI 2011), so it is a positive step if the new Sustainable Goal 6 (target 2) at least considers special women's needs. As in other matters of environmental justice all parties shall be respected and represented in decision making (Schlosberg 2013); therefore, target 8 should be interpreted in the way all social groups in a local community are included.

## 2.1. Ecological sanitation and cultural acceptability

Ecological sanitation (also known as eco-sanitation or *ecosan*) is growing in popularity as its aim is to contribute to new development goals by environmentally sustainable solutions. It includes a wide set of technologies and cycle-systems with the objective of inhibiting the loss of usable nutrients in sanitation options, thereby closing the loop of nutrient reuse (E.g. Winblad & Simpson-Hébert 2004; Langergraber & Muellegger 2005; Werner et al. 2009). The solutions enable the usage of human-produced waste, when treated and turned into fertilizer, for increased agricultural productivity, reversing the development where open-ended linear flows are created for nutrients such as nitrogen, phosphorus and potassium. Ecosan technology can support local food production and also has the direct effects of minimizing pollution. O'Neill (2012) points out that ecological sanitation addresses the three classical pillars of sustainable development laid down by the Brundtland Commission in 1987: social, economic and ecological sustainability, and Patinet (2012) highlights their possible contribution in climate-change mitigation and adaptation.

Ecological toilets can consist on cheap and easy appliances; however, their adoption must depend upon potential users' choices, coherently with their cultural sensitivity and possible consideration as livelihoods resources. Examples of different types of ecological toilets are presented in figure 1: A) the *composting toilet* or *skyloo*, which demands a level of active waste treatment to effectively produce useful fertilizer; B) the *biogas reactor* that produces cooking gas that can be used instead of e.g. firewood; C) the *fossa alterna* or *alternating pit* representing a traditional pit latrine where waste can be left to compost without active treatment but still be used as a fertilizer at a later time; and D) the *arborloo* where waste does not need to be extracted as instead a tree (e.g. carrying fruit) is planted on the old pit after a time of composting.

FIG 1: Four different types of ecological toilets (WASRAG 2012).

Ways to treat human waste and to use it to enhance agricultural production have been well documented (see e.g. Winblad and Simpson-Hébert 2004, Langergraber and Muellegger 2005, Duncker et al. 2007, Werner et al. 2009) and research on implementing eco-sanitation in developing countries is also taking place to a growing extent (e.g. ADC 2004, Werner et al. 2009, Heikkilä and Kirstinä 2012, Huuhtanen 2012, Ingle et al. 2012, Pynnönen et al. 2012). Still in general, research by instances such as the Sustainable Sanitation Alliance, an international network promoting sustainable sanitation around the world (SuSanA 2015), has focused on technical solutions and lately also on institutional mechanisms (Kanathigoda 2015), but leaving the sociocultural aspects of and responses to sanitation solutions with less attention. However, dissemination of ecosan toilets is only possible to the extent they can be easily integrated and well adapted in the everyday practices of users.

This study can reduce that relative lack of attention to sociocultural aspects even in the so-called sustainable sanitation and particularly in Global South contexts. As Dellström Rosenquist (2005) notes, 'a crucial point in need of further investigation is how sustainable [sanitation] solutions should be constructed so that they satisfy the human needs' (p.344), as those human needs are expressed in particular localized contexts. Drangert and Nawab (2011) point out that the tradition within human geography to 'explore the links between health and spatial and ecological dimensions' (p.57) can be very useful to this purpose, but Jewitt (2011b) nonetheless maintains that few geographers put a strong focus on human waste in their work. As to the question of cultural acceptability of ecological sanitation in relation to agricultural production, she adds that the fact that ecological sanitation has been adopted in various areas proves that '*positive associations between sanitation and fertilizer production or income generation can sometimes promote quite significant changes in attitudes towards (and practices surrounding) human excreta*' (p.764).

As earlier discussed, we cannot define space as a uniform context reflecting homogenous societies and uniform behaviours, and as a matter of fact growing corps of studies influenced by feminist scholars, have lately focused on phenomena and agency at the scale of the individual bodies, with their different dis/abilities and personal or family choices; so that in sanitation the starting point has to be from people's concrete lives, personal experiences and proximate social pressures (Weber 1995, Greed 2004, Cavanagh 2010, O'Reilly and Louis 2014).

Ecological sanitation provision has to take into account ecological sustainability, economic feasibility, localized cultural and social acceptability. Social and cultural sustainability means that local ownership has to be ensured, and the varied needs, otherwise quantitative indicators may only show short-term improvement instead of a long-term shift to healthier communities, their settlements and natural surroundings. Political engagement needs to be ensured by the local authorities at the different levels.

In our case study based in Kenya, we have focused on the current situation of sanitation and the potential for sustainable introduction of eco-sanitation in Taita Hills from the point of view of individuals and households, as well of representatives of NGOs and local institutions.

### 3. The potential of improved sanitation and eco-sanitation in Kenya.

#### 3.1. Sanitation in Kenya

Still around 20 million people in Kenya do not have proper sanitation facilities, despite various programmes initiated by the Kenyan government, such as the Participatory Hygiene and Sanitation Transformation (PHAST) and the Community-Led Total Sanitation (CLTS) that appears successful in many countries of Africa and South East Asia (Musyoki 2010).

Some improvement is recorded by UN statistics: according to the last updates of April 2014, the proportion of the Kenyan population using an improved sanitation facility had risen from 24,6 % in 1990 to 29,6 % in 2012, presenting a positive change of 20% but making clear that the target of doubling that proportion to almost 50% is far from met (UN 2014c). Salami et al. (2014) note different numbers but along the same lines as the UN (a rise in coverage from 26 % in 1990 to 31 % in 2008), with the proportion of the population resorting to open defecation staying on the same level during that same time. They cite a marginally more positive situation within sanitation coverage in rural areas than in urban areas (32 % versus 27 %), although pointing out a wide variance across the country and projecting that 26,6 million people would still be lacking access to improved sanitation in 2015. On the other hand, another study conducted by the University of Oxford (OPHI 2015) estimates the present numbers to be considerably higher at 50,6 %, 85,6 % and 57,4 % for rural areas, urban areas and the national level respectively.

In terms of international aid, Salami et al. (2014) point out that the water and sanitation sector has received only less than 4 % of all ODA targeted to Sub-Saharan Africa, highlighting the lack of international focus on the issues. Even this small share has been directed mostly to large-scale infrastructure projects, effectively leaving lightweight household-level solutions without much support. The same lack of international support is stated for actual waste management. Therefore, progress has been slow in Sub-Saharan Africa in general and that progress has taken place with little involvement of the end users.

When it comes to ecological sanitation in practice in Kenya, a set of initiatives can however be identified but large scale adaption is yet to take place. Robinson (2005) indicates that ecological sanitation solutions were first implemented specifically as a response to inadequate sanitation in Kenya in the late 1990s. He presents active programmes promoting ecological sanitation for instance in the city of Kisumu, in the Butere/Mumias

District and along the Tana River, where three different household-level ecological sanitation solutions that have been in use in Kenya: the *arborloo*, the *fossa alterna* and the *skyloo* or *composting toilet*. However, he also admits that the extent of implementation is still quite limited, whereas the national government has traditionally put more emphasis on actual toilet coverage than on different technical solutions and on the quality of these and has yet to take an active stance towards ecological sanitation.

By observing documentation and online reporting by organizations that have been working on ecological sanitation in Kenya (e.g. Ecosan Network Kenya 2014, KWAHO 2014), the conclusion can be drawn that despite occasional investment in ecological sanitation the projects have been fairly scarce and short-lived. Earlier research in Kenya point to the conclusion that the reasons for this include cultural and social reasons, rather than economic or ecological ones (e.g. Werner 2006). Starovoitova (2012) cites experience of a sanitation programme where one of the identified obstacles was that 'communities were not sufficiently triggered for behaviour change' (p.19) and underlines the need for awareness raising. Reasons might also include non-satisfactory usability of toilets, poor maintainance, suspicion towards handling and reusing human waste and other ways in which implementing eco-sanitation disrupts sanitation practices to a too high degree.

Sanitation cultures in Sub-Saharan Africa are often presented as being of a faecophobic nature (e.g. Winblad & Simpson-Hébert 2004, Dellström Rosenquist 2005), and our case study verifies that human excreta is often met with notable suspicion in the Taita Hills. In traditional religions human faeces were also used in witchcraft for magic rites. Even if these beliefs carry little weight today, and are mostly substituted by Christianity (Hohenthal et al 2014), they may still play an influence on the local cultural approach towards human excreta. Eco-sanitation and reuse of human waste or 'humanure' can therefore be said to meet considerable cultural resistance. This raises interest in to what extent any adaptations of ecological sanitation solutions are in use in Kenya and how possible sociocultural obstacles could be overcome.

### 3.2. Setting of the case study

The Taita Hills (Fig. 2) are located in the Taita-Taveta County in the Coast Province of southern Kenya, along the main road from Nairobi to Mombasa, with elevation reaching 2200 meters over the Serengeti plains. The land use in the study-area is dominated by small-scale and rain-fed agriculture with some relatively pristine forests still found on the higher altitudes. The steep topography provides the basic circumstances for any land use changes in the area (Pellikka et al 2009).

FIG.2: The location of the Taita-Taveta County. The study area is located close to the town of Voi (own map, data from WRI 2011).

The study area varies from a densely populated and intensely cultivated rural setting in the more humid highlands around Wundanyi town to the sparsely populated and dry rural areas in the lowlands, around Mwatate town. The small peri-urban towns of Wundanyi and Mwatate are the biggest population concentrations in the study area.

Water availability in the study area is reported as deteriorating due to many reasons, including land and forest management, natural resource exploitation, climate change and population growth (Hohenthal et al. 2014). Water is more readily available in the highlands than in the lowlands. As a consequence, food and water security risks are evident in the area. These characteristics make waste treatment of particular importance, as well as the need for efficient recycling to reduce environmental degradation and contamination of natural resources. Moreover, unpredictable rains and soil problems cause concern regarding future food security, which motivates the need to reuse all possible nutrients.



As for sanitation coverage, the situation appears better than at the national level. The First Taita Taveta County Integrated Development Plan (CIDP 2013-2017) (Taita Taveta County Government 2012) states that approximately 86 % of the households in the county have access to toilet facilities. It also estimates that 80,2 % of all toilet facilities are pit latrines and that 67,4 % of these are covered. In addition, the plan reports on the situation of waste management in the county as a basis for potential reuse: it states that organic waste disposal is used by 44,1 % in farming or gardening, and mostly using own pits or burning, while only 9,1 % of households take advantage of public garbage heaps or public or private collection services. These data show that the organic waste cycle belongs to the households' level, rather than externally managed.

The main aim of the case study was to investigate whether eco-sanitation could be locally applied and what specific preferences were expressed in the local community, thereby shedding light on the potential and feasibility of human excreta reuse in agriculture by harmless procedures in adapted forms considering the cultural and societal characteristics of the place.

### 3.3. Methods

The study is based on field research conducted in autumn 2013 and based on observation, interviews and ranking exercises involving 61 participants, plus open conversations and group discussions.

The ages of 41 out of the 61 participants were maximum 40 years, and 31 of them were female; 25 out of the 61 stakeholder had completed primary education and 23 secondary education. There were no major gender differences in the level of education: 3 men and 3 women had had college education, while 12 women versus 10 men had completed secondary education. Some of the interviews involved other people who were present in the households. The size of the households that participated in the research interviews varied from two to twelve persons with the average set at just below five persons. Almost all of the stakeholders were active in farming, and the great majority of households consumed all their agricultural produce within the household. Over half of the participants considered themselves completely or fairly (27 and 4 participants respectively) dependent on farming. Two thirds of the participants kept some kind of livestock, cows being the most widely kept animals. Shop keeping and other small business were also common sources of income.

To gain a comprehensive view of the current and potential forms of eco-sanitation and agricultural practices in the Taita Hills, the interviews involved in addition local households managers of businesses and services such as restaurants, hotels and schools, to see how they conceive the possibilities of improving ecological sanitation and recycling. Moreover, we undertook less structured expert interviews, involving 19 participants, all locals, from 9 different institutions: seven representatives of two local NGOs, one of an international aid agency, three representatives of local authorities, four of local workers' associations and four employees at a local social enterprise. We look at their understanding of the communal and ecological relations between sanitation, environment and development in the area. Treated themes included current settlement conditions; assessment of existing sanitation solutions and user priorities; identification and prioritization of specific problems within sanitation systems; identification of feasible sanitation developments; existing frameworks for raising awareness of sanitation issues; the cultural meanings attached to human excreta; perceived readiness or cultural obstacles to the use of human excreta as fertilizer, also for growing food crops. The interview frameworks were chosen based on preliminary results from the stakeholder interviews. In this way, the relationship between the two sets of interviews is that some questions arising from the individual stakeholders were presented to the experts. This of course forms a one-way flow of inspiration from one group to the other, but no significant issues were raised during the expert interviews that should have been included in the stakeholder interviews.

To shed light on the practical preferences of users regarding implementation of eco-sanitation, participatory ranking exercises were organized with the interviewees, considering a set of six different specific toilet



solutions according to their suitability to local habits and the environment. The ranking exercise was a form of individual or collective brainstorming, where different alternative solutions were ranked according to certain criteria (Chevalier and Buckles 2013) and with regards to different aspects of suitability, such as cultural, environmental, technical, financial and legal aspects.

### 3.4. Results

Regarding toilets currently used in the study area, all of the interviewees reported having access to a toilet. 53 out of the 61 said they were using pit latrines or Ventilated Improved Pit (VIP) latrines, as other forms of sanitation were not available. Reasons for using pit latrines and the harms and benefits derived from them are summed up in fig. 3.

Fig. 3: Reasons for choosing pit latrines as the household sanitation solution, benefits and harms.

Almost all respondents used latrines located outside of the house. Eight of them had either flush toilets or “pour flush toilets” (broken flush toilets used by manually pouring water to flush). Where the farmland was in the same compound as the households, the toilets were generally situated in the immediate vicinity of both the house and the farmland. None of the participants, either in the households or expert interviews admitted open defecation to be taking place in the study area; however, agricultural workers whose farms were located far away from their households used mostly open defecation, as no public toilets were available. This issue is problematic and not marginal, and shows a limit in sanitation planning, and even in monitoring of latrine coverage, when the services are only referred as to the households and resident population, rather than in areas of work, education, and mobility.

45 participants did not report any way disposing of their toilet waste other than covering a full pit latrine up and digging a new one. 49 of the 61 stakeholders stated that they do not collect the toilet waste, and only two participants have planted fruit trees on the same spot of a closed pit latrine; while two thirds of the respondents mentioned using other organic waste (but not from toilets) as composted fertilizer or as fodder for farm animals. 20 participants said there were using industrial chemical fertilizers in farming while the others denied but mainly for reasons of affordability. So, while in economic and ecological terms there could be a potential for expanding organic waste recycling with human excreta, the problem is mainly cultural. In fact, 17 respondents affirmed that this practice is not in line with the local custom, it being ‘considered dirty’, ‘not good’ or ‘generally unacceptable’.

*“In the 1970s, older people used to use human excreta because it was good for the soil. Didn’t want to waste it. It has vanished, people have come to realize that human waste should be put somewhere else. We still agree that a filled up pit latrine can be a very nutritious place for a banana tree. Some few farmers might still do that.” (woman, 45 years, Wundanyi, November 2013).*

*“We don’t like touching human waste, it is just considered unclean. It’s just a mentality; they don’t understand everything about it. They believe more in animal manure.” (man, 37 years, Wundanyi, November 2013).*

More practical reasons that were often mentioned were a lack of knowledge or skills, challenges in collecting the waste, lack of sufficient technology, insufficient amount of waste produced and a worry that produce raised with human waste would not be bought on the market.

Considering the practical preferences of people regarding toilets, 24 out of 86 mentions were connected to the quality of construction with preferences for a seat and proper ventilation. Sufficient water availability or a flush toilet was mentioned 19 times. The need for a system of removing toilet waste was mentioned only five times.

A good starting point for discussing toilet preferences was built by investigating the level of satisfaction and reasons for that regarding present toilets. All in all, 32 out of the 64 mentions were positive, with 26 being negative and 6 deemed neutral. 15 of the positive mentions only described the toilet as satisfying without any further reasons (*'It does what it needs to do'*), which we argue hints towards the feature of the toilet as something inevitable, with the single purpose of satisfying certain physiological needs rather than as a comfortable, private, clean and hygienic place for the body. Positive sides of present toilets often mentioned were a sufficient level of hygiene and cleanliness, the small use of water or proper construction. Women were those who more often raised issues of cleanliness, particularly because of their role in maintenance. The negative sides with present toilets were dominated by construction problems or lack of seat and flush with simple comments that in the present circumstances it is the only option, without further elaboration on what improvements are wished for, and even problems like safety and smell distance were only mentioned twice (safety) or once. The location of toilets and their distance from the household resulted of relevance only for women, also due to unsafety concerns at night. Lack of mention of other aspects, for instance inconveniency for washing hands probably merits more focus to understand whether it relates to a lack of awareness of existing improper hygiene practices.

Experts and representatives of institutions also mentioned the need to elaborate more comprehensive planning of waste management and proper application of plans. Specifically on toilets, one expert emphasized a set of priorities not very different from those found in the earlier mentioned scholarly debate, i.e. cultural acceptability, affordability, efficiency, sustainability, accessibility, comfortability, hygiene, simplicity and users' involvement in design. The prevalence of pit latrines were seen positively, as progress from open defecation and the security from disease they provide is seen as an imperative priority. The participants in the expert interviews were asked to reflect upon and discuss what they would consider as being the diffused cultural meanings attributed to human waste and the possibility of reusing human excreta. From their responses, we realized there was a tension between negative associations related to local cultural and societal values against positive associations that were of a more practical nature. The exception was the widespread and obviously beneficial knowledge of excreta as a vehicle of disease. The prerequisites of training and availability of appropriate technology were once more emphasized and it was generally judged that attitudes in the community are changeable if clear benefits of it can be pointed out, even though *'new things are difficult'*, as was pointed out by one participant. As example of this, respondents presented a past experience in which simple biogas reactors (Fig.1B) were introduced in some schools as pilot projects, and some households consequently ordered new reactors, showing how cultural problems with treating human waste were balanced out by practical benefits (free cooking gas, diminished use of firewood). Several experts agreed that this was a completely new way of thinking in the community, treating it as proof of possibilities of change.

In terms of governance, experts and local representatives recognized that sanitation and its related risks cannot stay in the end of local groups and activist networks but shall be more strongly addressed by higher institutional levels. In fact, the institutional responsibility of sanitation in the area is within the county council and more specifically the local public health office (PHO) that implements the Public Health Act (PHA). In the expert interviews, the National Environmental Management Authority (NEMA) was also often mentioned as the institution monitoring sanitation practices. The PHA however focuses on the quantitative aspects of sanitation coverage, therefore keeping the pit latrine as a successful and recommended solution. This idea was almost without exception confirmed in both the expert and the households' interviews. Implementation

of public sanitation is mostly done through regulation of building works (Republic of Kenya 2012) and cannot be said to actively affect the quality and sustainability (at least in ecological terms) of sanitation, since the law only demands every compound to have a toilet. The relatively passive stance of the authorities towards sanitation development was reflected in the interviews where most respondents stated that each household is totally responsible of their own management, especially in the rural areas. This shows the reason why pit latrines are generally seen as the best possible toilets in the area.

Finally, a ranking exercise involved respondents in discussing different options of ecological toilets and making a choice. Table 1 shows the final league table generated from ranking exercise that involved the toilets presented in fig.1, plus the *urine-diverting dry toilet* (UDDT), a version of the composting toilet that separates urine from faeces, enabling more efficient treatment, and the pit (also ventilated) latrine.

Tab.1. Final league table resulting from the ranking exercise on sanitation choices in the Taita Hills.

The biogas reactor (Fig.1B) and alternating pit or *fossa alterna* (Fig. 1C) were deemed the most appropriate solutions. In comparison, the Pit/Vip Latrine that is the most used now in the study area, was ranked clearly last. This serves to show that the exercise and the discussions that took place during it were enough for the participants to conceive of the benefits of eco-sanitation. In the popularity of the alternating pit, the simplicity seemed the most important factor. It requires minimum training to work since it is used like a pit latrine. It also requires little labor to work properly, and gathered more favourable comments on its sociocultural acceptability.

The results show how possible sanitation solutions at the household's level can be defined on the basis of important basic principles like simplicity, security from disease, minimal contact with human waste and other practical reasons. The popularity of the *fossa alterna* also demonstrates that ecological sustainability is also in the interest of people and can be pursued with minor transformation from the current pit models in use. One participant summarized the alternating pit as being 'a better version of what we have now', underlining the appreciation of modest and non-disruptive changes in technology. However, this exercise also shows clear discrepancy between general recognition of ecologically sustainable options, with current societal priorities, plus weak engagement from the government authorities that simply considers the presence of pit latrines, no matter their conditions, as sufficiently safe provision.

## 4. Conclusions

This paper has focused on sanitation, which is a highly relevant but overlooked theme in development policy and research. After a general failure of the sanitation-related MDGs, sanitation goals are again proposed for the new post-2015 round of international aid. We argue that the approach must be changed towards the consideration of the sanitation and hygiene as interacting human, ecological cycles and livelihoods, rather than simply as a number of built toilets in large scale. It is true that the new goals are accompanied by stronger sustainability focus, but the risk is that programmes would continue along the same lines than in the past: mostly related to the technical side of toilet coverage (the *hardware*) and implemented by large-scale schemes and private companies, rather than considering the overall cycle of sanitation and hygiene (the *software*), looking at the more complex ecological, cultural and societal sustainability and multi-level governance in respect of the local and societal differences.

Some quantitative increase in toilet provision is shown in national statistics, but this does not prove either effectiveness or durability of toilets, or their hygienic use. Various researches report accounts of unsafe toilets, open defecation near toilets, sanitation-related problems in terms of health, access to education and

work, and ecological contamination, particularly striking vulnerable groups. Also in our case, the selection of respondents as households' members showed an important shortcoming, as it missed to include salaried workers in the fields, who were not able to use any toilet during the day. This demonstrates that studies and planning on sanitation cannot only focus on services for households and public offices, but need to consider all used spaces, including those characterized by human mobility.

From both the literature and our field research, institutions appear as having fundamental responsibilities in the governance of sanitation, but their roles are not often evident. Toilets are left to the responsibility of the users and programmes for hygiene promotion appear superficial and left in the hand of NGOs and activists.

Improved sanitation in Kenya and in our sample study is mostly represented by the presence of pit latrines, seen by public authorities as the most suitable toilets for the rural areas of the country and the district. However, more effort could be spent to make at least toilets ecologically sustainable. We have therefore oriented our field research in Taita-Taveta county towards questions of adaptability of local sanitation in ecological terms. The research has shown that in fact for households, local experts and field officers, basic ecological sanitation appliances could be technically and economically viable in Taita. In particular, the *fossa alterna* was considered a suitable tool, for its similarity in design and actual users' experience to the pit toilets currently in use. It was called an advancement of '*what is now*' and an 'upgraded pit latrine', the reference to the present dominating solution showing the need for familiarity of toilets in creating a comfortable end experience. However, no ecosan toilet has been introduced yet in Taita, and the reason seems to be mainly cultural and societal, with regard to dealing with human excreta and their reuse. There could be easier potential for fodder production, where other organic waste is already disposed by the local farmers; but more challenging would be its utilization in food cultivations, instead of other expensive and unsustainable chemical fertilizers.

So, the role of cultural sensitivity towards human excreta is still to be considered, although most local experts and officers we heard failed to recognize this as a cause restricting future adoption of ecological sanitation. According to them, perceptions could be changed through modest training and should therefore also not be treated as taboos:

*"We don't have those taboos, only that it takes long for people to accept something. Sometimes they might know, but until they can see and touch..."* (expert, male, 62 years, Mwatate, December 2013).

This lack of acknowledgement may be due to their positionality, with an interpretation of their role as distant from cultural traditions and popular behaviours. However, cultures and individual practices around sanitation need to be repositioned at the centre of any new plan; otherwise, new ecosan appliances could fail as it has been the case of many toilets abandoned in rural and suburban landscapes, leaving unsolved peoples' health and environmental risks.

Finally, this research reveals immediate needs in documenting the comprehensive and locally specific sanitation experience, especially in ecologically vulnerable regions and sanitation-wise underserved communities. This comprehensiveness involves shifting the focus towards the personal experience instead of spatially limiting research to the location of toilets and households since a considerable amount of excreting does not take place at home. It also calls for a more detailed disintegration of the sanitation experience between different user groups, e.g. women, children, disabled people, agricultural laborers. Another need is to investigate more closely what specifically shapes and changes cultural attitudes regarding for instance treatment of human waste or recycling on the small scale and ecological thinking at large on the large scale. Only after this can the focus be turned towards finding the best locally grounded technical solutions that will be sustainable in both cultural and ecological terms.

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