



Federal Ministry
for Economic Cooperation
and Development



Organic waste, sanitation and composting

Lessons learned from a pilot project in Benin

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Urine-diverting dry toilet
(UDDT)





Market waste in Lokossa

List of abbreviations

BMZ	German Federal Ministry for Economic Cooperation and Development
CSWM	Concepts for Sustainable Waste Management sector projectGI Groupement intercommunal (intermunicipal association)
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
MoU	Memorandum of understanding
NGO	Non-governmental organisation
PEP	Programme Eau Potable et Assainissement (Drinking water and sanitation programme)
UDD(T)	Urine-diverting dry (toilet)

1. Introduction

When discussing the challenges of urbanisation, jargon phrases commonly arise. Things like ‘access to basic sanitation’, ‘improving urban living conditions’, ‘inter-relationship between urban and rural areas’, ‘resource efficiency’, ‘closing the nutrient cycle’, and so on. Waste management lies at the core of many of these challenges, having developed from its most basic form (cleaning the city) to an increasingly advanced service concept (the waste management chain), and now to its current position at the heart of the circular economy concept (material/nutrient cycle). As the paradigm shifts, we must now ask: How do we retain materials and nutrients in the system? How can we reuse and recycle them and avoid the depletion of natural resources when feeding our ever-hungry cities? How can cities not only profit from the surrounding rural areas but also return value?

This paper aims to outline one possibility for closing the nutrient cycle by composting waste material available in urban areas and reintroducing the compost into local farming. It summarises the lessons learned in and recommendations from a pilot project conducted by GIZ in Benin from 2012 to 2014.

In 2011 the Concepts for Sustainable Waste Management sector project (CSWM), commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ), set out to explore possible synergies between the sectors of solid waste management and sanitation. The objective was to look at the possibilities of combining these two hitherto largely disconnected sectors to promote resource efficiency. The two sectors have several commonalities – for example, their mutual goal of minimising health and environmental risks, the challenge of serving the entire population (especially in urban areas), the difficulties of financing their services, their low priority on the political agenda, etc. The challenge lies not only in finding a way to identify and benefit from possible synergies between the sectors, but also in getting the right people in administration and service provision to think beyond the scope of their own sector boundaries.



Demonstration gardens at a composting site in Lokossa



A sign in Lokossa

2. Project description

The pilot project was developed as a joint undertaking of two GIZ projects: the CSWM, which is based at GIZ headquarters in Eschborn, and the Programme Eau Potable et Assainissement (PEP) cooperation programme in Benin. Their **joint objective** for the project was to introduce a new approach to the combined management of compostable solid waste and human waste through a co-composting process, followed by the safe reuse of the resulting compost in urban and peri-urban agriculture in Benin. The project has planned, financed and built or rehabilitated infrastructure (urine-diverting dry toilets [UDDT]¹ and a simple composting facility), provided equipment (waste collection tools and containers, collection vehicles, composting equipment) and organised training, awareness-raising activities and marketing support. BMZ supplied the bulk of the financing via CSWM.

The choice of Lokossa as the location for the pilot project was based on the city's need for support, the existing links already established between PEP and the city council, and the enthusiasm the mayor expressed for the project concept when approached by GIZ.

Lokossa is the capital city of Mono Department in south-west Benin and, according to the 2002 census, has a population of 77,065.

The target stakeholder groups for the project were local authorities, waste management and sanitation stakeholders (including NGOs), households and market gardeners.

After initiating the pilot project and coordinating its activities over a period of two years, CSWM and PEP have handed the project over to the Municipality of Lokossa, which is the major Beninese partner and owner of the project.

Household UDDT



¹ The functional design elements of a UDDT are at-source separation of urine and faeces, waterless operation, and ventilated vaults or containers for faeces storage and treatment (Technology review of urine-diverting dry toilets [UDDTs], GIZ 2012).

2.1. Outline of the management structure

The Municipality of Lokossa had the official ownership of the project, but contributions of all stakeholders have been agreed on. To manage its day-to-day operations, the Municipality nominated a local coordinator. In their work to implement the project, GIZ, PEP and CSWM dispatched a project coordinator to Lokossa who was tasked with managing day-to-day activities and maintaining communications between stakeholders. Both PEP and CSWM have been on hand to provide technical and organisational back-up to this coordinator. The GIZ country office also provided support.

In order to secure local technical support and back-up capacity, the project involved other stakeholders who are active in the region to draw on their experience and expertise:

Another motive for involving local partner organisations was that these organisations would be able to contribute to the project's sustainability: their interest in the project and their physical presence in the city means that they can continue to support stakeholders after the project is fully handed over to the municipality.

These partners, together with representatives from the Municipality and the project coordinator, formed the steering committee of the pilot project.

PROTOS

This Belgium-based international NGO is, among other things, actively promoting UDDTs in Mono Department and it supported the pilot project by providing technical back-up and training.

DCAM Bethesda

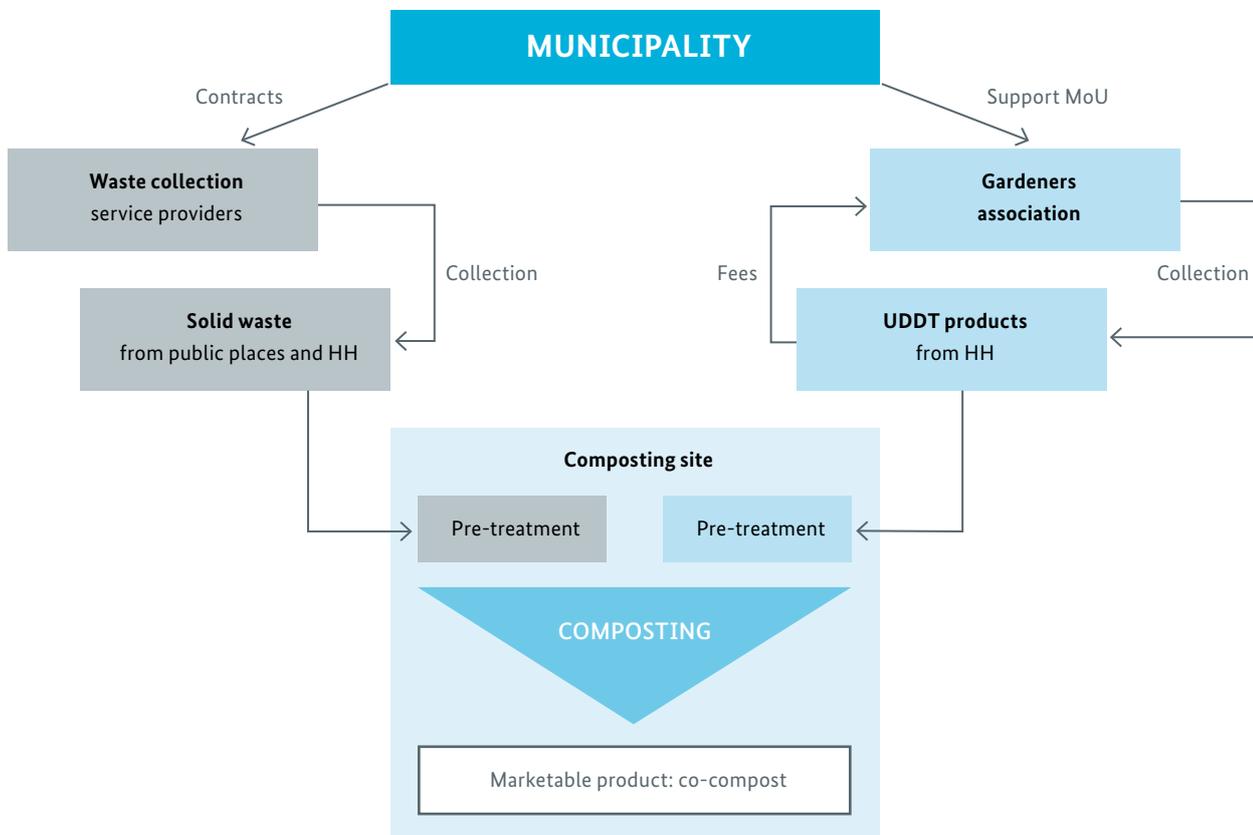
This Beninese NGO is active in the health and environment sectors and has previous experience of working on a composting project in Lokossa. During the project, DCAM Bethesda had an office in the city and their project role involved providing technical support on the planning of rehabilitation works, determining the composting process required, and identifying training needs.

GI Mono

The Groupement Intercommunal du Mono (intermunicipal association of the Mono region) has six member municipalities, Lokossa being one of them. The association was set up to promote collaboration on waste management and environmental issues and is supported by the French Department of Yvelines. In its role as a network and regional waste management stakeholder, GI Mono initially supported knowledge dissemination and networking efforts. Later on, however, it was also entrusted with delivering marketing support and training activities.

2.2. Main activities

The pilot project set out to identify and explore possible synergies in the treatment of waste from two sectors: (a) compostable solid waste from market and household waste collection and (b) human waste from UDD toilets. Image 5 below maps out the structure of the collection and treatment operation.



The Municipality, as the public authority, is the head of operations for both these sectors.

The system operated by Lokossa's existing solid waste collection service was largely retained. Here, local 'NGOs' (or, rather, tax-exempt small enterprises) offer door-to-door waste collection, while the Municipality manages secondary collection and the collection of market waste. For its part, the Municipality hires external workers to undertake these collections. Part of this waste is then delivered to the composting site where it is sorted and

prepared for composting (**pre-treatment**). Only non-compostable waste is taken to the unregulated municipal dump site.

The sanitation service had to be set up from scratch. In central Lokossa, up to 50% of the population has access to sanitation facilities, while only 20% of households have latrines (*Plan d'hygiène et d'assainissement de la commune de Lokossa, 2011*). This lack of sanitation facilities leads to widespread defecation in public or empty spaces and the misuse of school latrines.

The project has financed and built UDD toilets in 28 households as well as one public UDDT facility with two cabins in the town hall courtyard. These UDDT's collect faeces and urine in separate containers, which, when full, are transported by the gardeners' association to the composting site. The containers and their contents are pre-treated using the sun: the urine containers are exposed to the sun, so that the heat sanitises their contents, whereas the faeces containers are opened to allow moisture to evaporate and are later emptied into drying chambers where the faeces are sanitised through solar drying and the further loss of moisture (**pre-treatment**).

For the **co-composting**, the dried faeces and compostable waste fraction are piled into windrows that are regularly irrigated (with the sanitised urine and rainwater), aerated and monitored until the compost is mature. This process lasts approximately six months. After sieving, the compost is put into storage or packaged in sacks and sold.

The group responsible for the composting operation and collection of human waste containers is an association comprising eight local market gardeners who are experienced in using manure to fertilise their crops. This association, formed through a municipal initiative, has received training on composting, UDDTs and the safe treatment of human waste, marketing, and simple business skills, as well as support in the form of equipment from all project partners. The group must finance its activities by selling compost and vegetables and by charging fees for the collection of human waste from households and the Municipality.

Besides the infrastructure (UDDTs, rehabilitation of the composting site), the project has financed composting equipment, waste containers and bins, a waste collection truck, a motorised tricycle for UDDT container collections as well as training sessions, workshops, marketing support, and so on.



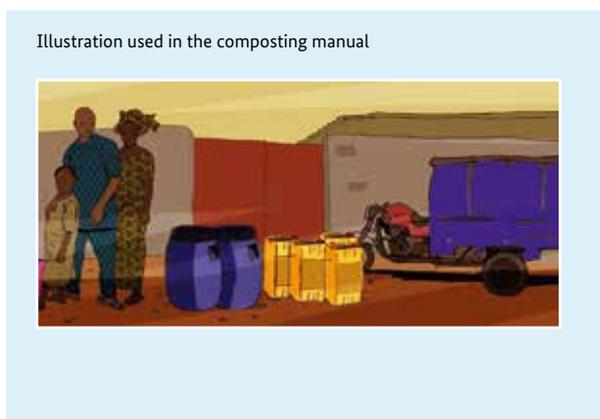
Drying chamber for faeces

The project comprised the following phases:

1. **Preparation phase** – This phase focused on establishing trust and building partnerships between all stakeholders, the signing of memoranda of understanding relating to the cooperation, the clarification of project activities, and the founding of the gardeners association.
2. **Investment phase** – During this phase, infrastructural works were put out to tender and ultimately completed. Also, equipment was purchased and beneficiaries trained in how to use the new tools. After a first round of UDDT building, BMZ granted the project additional funding. Therefore, the project's scope was enlarged, the number of toilets tripled and the rehabilitation of the composting site more comprehensively designed.
3. **Operation phase** – In this phase, the infrastructure and equipment was handed over to the beneficiaries and then put to use, so the UDDTs became operational and the waste collection and composting operations began.
4. **Consolidation phase**: After being given some time to get to grips with the new system, the gardeners then received additional support on running the composting initiative, including guidance on marketing, business skills and customer retention. Additionally, urban clean-up operations involving the removal of fly-tipping sites and the delivery of awareness-raising activities (radio broadcasts) were carried out.



During the transition from the investment phase to the operation phase, the project coordinator was assisted by a short-term consultant tasked with carrying out monitoring and evaluation. To support the sustainability of the project, additional activities were planned and implemented during the consolidation phase.



3. Analysis of results: objectives reached, successes, shortcomings

Two years into the project, it can be concluded that the project's objective has been achieved, in so far as the gardeners have successfully produced and sold compost, which is, as laboratory analyses confirm, a good-quality product.

A 2014 customer survey shows that product satisfaction is high – greater than 80% (Fiogbe, *Rapport mensuel d'activités*, October 2014). Demand for compost in the region is also high. While this popularity can be partly explained by the product's low price, it is certainly also due to the fact that GIZ's final few months of support focused on marketing the compost. Information about the project and the beneficial use of compost in agriculture has been disseminated through local radio broadcasts, site visits to the composting plant and visits to potential clients. Indeed, the campaign was so successful that the compost sold out and the composting initiative was left unable to satisfy the demand. Initially there was some doubt about the acceptability of the compost because of the use of human excreta, but this seems unfounded. Also, the campaign has taken care to avoid advertising the compost as a fertiliser – which it is not – to ensure users do not end up with unrealistic expectations about its effectiveness. It is therefore advertised as a soil conditioner and not as a substitute for chemical fertilisers.

In all, 28 UDD toilets have been installed for household use, each of which serves 10 people (although this is a conservative estimate, as one toilet is probably used by up to 20 people). There is also one public facility with two cabins at the town hall, which serves approximately 50 people. A conservative estimate of the number of people benefiting from these improved basic sanitation services is therefore 320 persons.



Despite these promising results, the sustainability of the project is doubtful for a number of reasons:

- The Municipality is not fully engaged and does not entirely recognise its role as the principal supporter of the gardeners' efforts or its obligation to pay for the collection of UDDT waste from the public facility. While support for the project among technical staff is relatively high, political support is volatile and is only really apparent when there is a prospect of further financial or technical support. Despite the possibility that the Municipality could roll out or replicate this project using its own finances, this initiative has yet to feature on the authority's political agenda. This is possibly because low-tech solutions generally fail to attract external donors and are not progressive or attractive enough to catch the attention of the electorate. Another factor is, of course, the chronic shortfalls in municipal finances, which hinder self-organised investments.
- The gardeners are not yet generating enough income from the collection fees or the sale of compost, which is partially due to the Municipality failing to meet its obligation to pay for its UDDT container collections in 2014.² As such, the gardeners may well decide to discontinue operations before the system is able to reach a satisfactory income threshold.

Even though training and awareness-raising campaigns were held, some of the households where UDDT facilities were installed refuse to pay regular fees for the collection of excreta. Since no punitive measures are available to the gardeners' association (apart from stopping collections, which deprives them of part of the feedstock for composting), the gardeners' only choice of action is to appeal to the Municipality for support. The Municipality also finds it difficult to enforce the payments and can only help by visiting the households in question and re-explaining the issues.

² The Municipality did not allocate any funds in its 2014 budget for the collection of excreta from the public facilities installed by the project. This omission is due to the fact that the decision in favour of installing these toilets was made after the finalisation of the municipal budget. For 2015 the municipality has pledged to incorporate these expenses in its budget.

- The entrepreneurial spirit and enthusiasm of the market gardeners, while very apparent at the beginning of the project, now seems to be waning and the president of the association now struggles to motivate members. This is partly due to the difficulties in raising revenues mentioned above and partly to the age of some members and their mostly low level of education.

The responsibility for nominating association members is left entirely to the municipal authorities. This association is therefore not a group founded by its members and for their interests but is, instead, determined by an external agent. While this can naturally lead to difficulties with group dynamics, it can also appear unfair, given that no selection criteria are in place to define and guide the selection of members. Putting these criteria in place would not only render the process more transparent, but would also help to ensure that those selected for positions are best suited to the tasks at hand.

- Product safety remains a concern. Even though laboratory tests have shown that no pathogens remain in the mature compost, operations have not been monitored over a sufficiently long period to guarantee that the gardeners will continue to adhere to the necessary safety precautions. The same is true for their personal health protection. The gardeners have received training and are always encouraged to wear protective clothing, but they continue to be reluctant to do so.

With West Africa’s recent Ebola epidemic fresh in people’s minds and the risk the virus still poses to the whole region, it is in any case questionable whether the handling of (almost) fresh faeces should be continued. Scientific data have not yet conclusively shown how long the Ebola virus can survive outside the human body. Some estimate up to six days but, as this is not proven, it might be advisable to stop the collection of excreta altogether. However, this might prove difficult as the gardeners’ discussions to this regard resulted in a vote to continue operations with human faeces because this gives their produce its unique selling point.

A problem affecting the overall project was the short implementation time and lack of time available to accompany the operation phase. The preparation phase of the project was very time consuming because of the number of stakeholders involved and the demanding nature of the coordination and negotiation activities. The length of time needed to secure the required finance led to delays, which meant more time and energy ended up being spent on the investment phase and the operation phase started later than planned.

The relative success of the project is to a large extent due to the coordinator and her unfailing commitment to the project as well as to the support of local partners. Even though the partners expenses were covered by the project, their support went beyond what was asked of them and continues to a certain extent. However, we also understand that these partners do not wish to invest their own time and money in the project.



Children by a UDDT in Lokossa



Training for households in Lokossa

4. Recommendations for similar approaches

While a number of the challenges encountered in this pilot project were closely related to its small scale and insufficient time frame, the following, more general recommendations and conclusions can be drawn from this experience for the benefit of similar projects.

1. Allow for a long preparation phase

If more than one sector is involved, it is highly likely that intensive communication and exchange on all the issues relating to the project will be required. If the project is to get off to a successful start, all stakeholders must first be made aware of the implications of the re-organised system and of their respective roles. There is also an increased need for transparency when sector boundaries are crossed – for example, when hitherto unconnected stakeholders are asked to cooperate or share information or assets. Time and effort is therefore needed to create successful relationships and to prevent jealousies arising between groups.

2. Include local stakeholders already active in the sectors

On the one hand, it is important to bring on board those organisations or associations that may already have valuable experience or can contribute knowledge to the project. On the other hand, stakeholders that are already active in the sectors in question might be disadvantaged by changes to the status quo. In the waste sector, the diversion of waste from its usual channels could affect vulnerable groups like informal recyclers or small-scale livestock farmers whose livelihoods – at least in part – depend on discarded materials (e.g. plastics recycling or the use of organic waste as feedstock). In the sanitation sector, service providers like manual cesspit emptiers might be affected.

3. Put dedicated staff in place on the ground

A diverse range of locally based stakeholders are implicated in trans-sectorial projects, so it is necessary to hold regular meetings and maintain communications to keep everyone in the loop. Moreover, when introducing new processes and technologies, handholding and monitoring is vital to be able to respond to difficulties as they emerge. These processes need constant attention and dedicated staff based in the region.

4. Get beneficiaries to contribute

In order to ensure that beneficiaries take ownership of and identify with the project, they need to be properly integrated. For example, if beneficiaries pay a contribution for the UDDT that is built for them, they are more likely to take good care of it, to use it correctly and to continue paying for the waste collection service. The process to develop an understanding of this issue will require time.

5. Create a market for your product

When a new product like co-compost is introduced in a region, it will take a fair amount of time and effort to establish a customer base large enough to make operations viable. To drive the development of the market, a number of promotional activities (radio/TV broadcasts, organised site visits, promotional offers and merchandise, etc.) should be built into the project design.

6. Create a business case

The sustainability of operations can only be guaranteed if they do not rely on external funding. Product sales and collection service fees should ideally cover the system's costs and also provide a margin of profit. Service fees can be collected from households directly or from the municipality acting as an intermediary. Note that municipal authorities are often in a stronger position than a private service provider when it comes to persuading households to pay for services. Avoided costs for the waste management system, such as collection, treatment and disposal costs saved through material diversion, should be taken into account. These savings can also be used to cofinance operations.



Public waste bin in Lokossa market

7. Ensure that the local authority takes ownership

Waste management and sanitation are, in many regions, the domain of the local authority. As such, the local authority should automatically be at the head of any official intervention in the sector. For both these sectors it is difficult to develop self-sustaining operations without public funding because people are rarely willing to pay directly for sanitation or waste treatment. Beneficiaries often adopt the view that, since valuable compost is produced using material they produce, they should be paid for this material rather than pay for its removal. In such cases the local authority should cover the costs required to make operations cost-effective.

8. Raise awareness about both sectors

People in general are prone to inertia when it comes to behavioural change. In order to build a business case for co-composting, it is vital to create an understanding of the advantages the project can offer to the people that participate in it. This understanding will lead to increased willingness to contribute financially and can prepare the ground for the wider roll-out of the approach. A lack of awareness endangers the sustainability of operations, which will continue to rely on external funding. In this case the quality of the process will quickly deteriorate due to cost-cutting measures and may even result in negative consequences (the deterioration of the collection service, a lack of personal protection gear for workers, reduced compost quality, etc.).

9. Offer appropriate capacity development to operatives

The system's operatives are the project's key stakeholders. As such, they must be provided with training tailored to their specific needs that not only covers the techniques they are to use, but also relevant organisational, economic and marketing topics. Hygiene education is vital to ensure the safe handling of excreta. As operatives, they must also engage with the population on topics related to their work and will thus need sufficient background knowledge to fulfil their role as ambassadors for the project. Over the first few years and as the need arises, operatives should be provided with ongoing guidance and handholding delivered through regular visits and additional support.

10. Allow for a long period of oversight and support in the operation phase

To ensure the end-product is safe for use and the feedstock is safely handled, the co-composting process must be well established and a functioning monitoring system must be in place. The latter should include the regular testing of compost samples at a certified laboratory to assess pathogen levels and ascertain the properties of the compost.

5. Conclusion

Solid waste management and sanitation are closely related sectors that offer the potential for developing synergistic approaches to achieve common goals. Co-composting, as one approach to combined treatment, is not a new invention trialled for the first time in this pilot project. The driving force behind this project was to try out this existing approach in a developing country context and to learn about the many issues that arise during the process. As always, the level to which local authorities and beneficiaries are aware and take ownership is a major issue that needs to be addressed. Co-composting operations will only be sustainable if a market for the product is available and when cost-efficiency is guaranteed.

This approach can support efforts to promote resource efficiency through the reuse of organic matter in farming. In this way, urban areas can retransfer valuable material to neighbouring peri-urban and rural communities and contribute to closing the nutrient cycle.



While we are conscious that the sustainability of the pilot project itself is still an unresolved issue, we hope that the lessons we have learned and captured here will help in building innovative and appropriate solutions to close the loop in similar projects.

Further information on the pilot project is available at: www.susana.org/en/resources/case-studies/details/2068

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