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**Use of Stabilised Soil Blocks for latrine construction:
Experiences from Darfur, Sudan**

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Environmental degradation has increased rapidly in Darfur due to cumulative effects of climate change and human impact. Excessive clearing of forests to power kilns for bricks and firewood is quite rampant. The impact on the environment is quite enormous and requires urgent attention by all concerned parties. Tearfund has since 2008 started promoting the use of low cost environmentally friendly technology through the use of Stabilized Soil Blocks (SSB) in an effort to curb forest destruction as a result of excessive cutting down of trees to burn bricks. The organisation has purchased Stabilized Soil Block machines and has been training communities on the fabrication of the blocks and also promoting the use of these blocks instead of the fired bricks. SSBs have been used for latrine construction at schools, clinics and mosques in West and South Darfur. Tearfund has also extended the use of SSBs to the construction of classroom blocks at a number of schools in Darfur. The purpose of this paper is to promote the use of SSBs by sharing some experiences and lessons learnt from Darfur.

Introduction

Environmental protection is key to Tearfund's Water, Sanitation and Hygiene interventions. It is also one of the organisation's guiding 12 quality standards. Its determination to promote environmental mitigation in Darfur comes from having identified it as a priority in the course of managing three multidisciplinary Humanitarian projects in West and South Darfur (Tearfund, 2007). As a fulfilment to this, the organisation in 2008 started promoting the use of Stabilized Soil Blocks (SSBs) through its DFID WASH funding. The organisation is also mainstreaming the environment in all its WASH activities being guided by a do-no-harm approach.

Making bricks requires large quantities of wood to fuel kilns, which combined with domestic firewood needs, have resulted in highly unsustainable deforestation in Darfur (UNEP, 2008a). It is against this that the use and promotion of Stabilized Soil Blocks is quite ideal for all construction works which requires the use of fired bricks in Darfur. Stabilized Soil Blocks are building blocks made from ordinary soil mixed with little cement, little water and then highly compacted in a block press resulting in a very solid, dense and low cost building block (Makiga Engineering, not dated).

Tearfund started the fabrication and use of Stabilized Soil Blocks in 2008 in the Beida Locality, in West Darfur. Major key activities have been training of community members on fabrication of the blocks, construction of latrines and classroom blocks and also advocacy on the wider acceptance and buy in of this technology. Since 2008, Tearfund has adopted the use and promotion of SSBs in all its efforts to help communities on the construction of latrines and classrooms, and this has also spread to South Darfur to Kass and Ed Dain locations. Tearfund has purchased 20 Stabilised Soil Block machines, which have been distributed in its areas of operation. 12 in West Darfur and 8 in South Darfur. In April 2008, 10 staff from Tearfund were trained in the fabrication of SSBs. The training covered introduction to SSBs, the machine, why SSBs, Soil testing, block making, curing and constructing using the blocks.

The trained Water and Sanitation staff then cascaded the training to selected members in the communities. For Ed Daein and Kass in South Darfur, collaboration has been made with technical

colleges in those localities to train Tearfund Staff and also selected members from the communities on SSB making. To date, 99 community people have been trained on SSB fabrication.

Experiences

The use of Stabilised Soil Blocks in latrine construction at schools, clinics and mosques has been received as a noble move by all beneficiaries of such facilities. The use of SSBs has gone beyond latrine construction to include classroom blocks construction in West and South Darfur. To date, Tearfund has constructed 39 multi compartment latrines in both west and south Darfur. In addition to this, 53 classroom blocks have been constructed using the SSBs.

It is evident that through advocacy other NGOs have adapted the use of SSBs in their programmes, in Geneina, Catholic Relief Services have implemented schools building and shelter programmes using SSBs. A discussion with other NGOs such as Medair has also pointed to their interest in SSBs as a technology of choice in all construction activities which require the use of fired bricks. In Ed Daein and Kass, Tearfund has entered into partnership with local Technical colleges to train the local communities on SSB fabrication and this has been quite successful. For Kass, Tearfund supplied the technical college with materials such as the suitable soil and cement and the college used students as part of their practical work to fabricate more blocks which Tearfund later used for latrine and classroom construction. However, it has been noted that while these technical colleges have been doing these trainings on SSB making, graduates have not been able to use this knowledge after leaving college due to the unavailability of such machines at community level and even locally in the market. As such, their skills have not been used much.

While Tearfund is still gathering field based evidence to support the use of SSBs in comparison of fired bricks, research by UNHABITAT in 2009 has shown SSBs as a suitable alternative to traditional burnt bricks, both in terms of conserving water and firewood to be used in kilns during the fabrication process as shown in Table 1.

From Table 1 it is clear that there is huge consumption of water and also massive cut down of trees during production of burnt bricks. Assuming 10 houses, which are of the same size, then it would translate that one would approximately cut 140 trees and use approximately 120,000 litres of water. From this, it looks quite evident that SSBs are far much better than fired bricks not only in terms of conserving water and trees but other construction material like cement, sand and mortar.

For the construction works in Darfur where there has been the use of SSBs supported by Tearfund, the buildings have not been plastered. Tearfund has made this deliberate move so that the SSBs can be seen quite visibly. Aesthetically, SSBs look quite beautiful, therefore no need to plaster them otherwise; their natural beauty will not be seen. This also cuts on plastering costs. However, for classrooms, they have been painted without plastering, which is also a big advantage which is not possible with fired bricks.

Table 1: Cost comparison for a 4x4 meter house

Required Inputs	Burnt Bricks	Stabilized Soil Blocks
Number of Bricks	13,824	1,644
Price/brick	\$0.8	\$0.36
Size	18x9x5cm	29x14x12cm
Total price of bricks	\$1.105	\$599
Cement, sand and mortar	\$750	\$142
Water	12,000litres	6,000litres
Trees cut	14	0
Construction labour cost	\$400	\$300
Total Cost	\$2.255	\$1.041
Cost comparison	100%	46%

Adapted from UNHABITAT (2009).

Why Stabilised Soil Blocks

Apart from conserving the trees, water and also reduced labour costs; discussions with beneficiaries in Darfur, technical colleges and also the contractors hired by Tearfund for the construction of latrines and classroom blocks have expressed the need to use the SSBs. Data collected through questionnaires on the

use of SSBs as compared to fired brick as well as discussions held with beneficiaries and key authorities at schools and other government departments in Darfur indicate greater benefits when SSBs are used.

Discussions with the technical colleges indicated that, if well supported, this enhances the skills base of the students, who will then cascade these fabrication skills to their communities and start the production of these SSBs as a livelihood activity after leaving college. The advice was that organisations and government should invest in communities by training them and also acquiring such machines for their use so that they can do the production and then organisations and others from the locality can buy the blocks for all construction activities.

From the Contractors and other builders' point of view, they indicated that SSBs are water proof. As such, they need no plastering if well fabricated. It was also gathered that during fabrication little water and cement is needed, making this a cheaper and water conserving process. From their experience, they also indicated that SSBs are far much better than fired bricks in terms of evenness, thus making construction easy and aesthetic. The beauty of SSBs is shown in Figure 1.



Fig 1. Latrine constructed with SSBs

Challenges

Much has been said about the beauty of SSBs. However, experience from Darfur has indicated that some communities need to continually use the SSB machines to improve on their skills. As such, there is need to make the machines readily available in the communities. This is a call to NGOs promoting this technology to promote this as a livelihood activity and make these machines readily available to community groups. SSBs despite being an environmentally friendly technology, they have the following weaknesses as a building material, they have a low resistance to water penetration resulting in crumbling and structural failure. They also have a very high shrinkage/swelling ratio resulting in major structural cracks when exposed to changing weather conditions. They also have low resistance to abrasion and require frequent repairs and maintenance when used in building construction especially mud and wattle houses. Against this, it is advisable to ensure good mixing ratios during fabrication and plastering of structures is also encouraged. In some communities, suitable soils were also highlighted as a major challenge. Good SSBs are produced from soils which contain high sand content with the most ideal soils being; sand and laterite soils. Top soil, containing vegetable matter and black cotton should never be used. Laterite soils are quite ideal. This type of soil is found at sub-levels and one should first remove the top soil to reach it. In some communities where it is difficult to get the ideal type, people end up travelling for kilometres to get the suitable soils. During training, it is very important to train communities on how best to identify good soils for this purpose and what to do if the soil is not good enough for the intended purpose. Unavailability of cement on the local market was also cited in some communities as a problem. Cement, although not much is needed during the production of SSBs with the use of little cement and good soils being the key ingredients in ensuring the good quality of the bricks. Making cement available on the local market at a subsidized price can ease this problem while further research is needed to explore the use of locally available lime to make pozzelana cement, which is an adequate

binder for SSBs. Curing the blocks was cited as labour intensive. The curing process involves covering the blocks with grass or leaves to protect them from direct sunlight and also ensuring they are kept damp. In the process, the blocks are supposed to be watered daily in the morning and in the evening for a minimum of 7 days. Students at technical colleges also indicated that unavailability of SSB production machines in the local market was hindering the use of their skills after college, and availability of the machines would aid their livelihoods.

Conclusion

While the use of Stabilised Soil Blocks has proved to be a favoured and environmental friendly construction technology, great care must be taken to ensure quality of the blocks. This calls for empowering communities with the necessary skills during training and constant follow up and monitoring during the fabrication process. Awareness raising campaigns should be carried out at grassroots levels so that the communities appreciate the effects of excessive tree removal for firing bricks. SSB machines should be made available to community groups so that they are readily available to those who are in the business of brick making for sale. Communities should be encouraged to make the production of the blocks a livelihood activity. Documentation of the use of Stabilised Soil Blocks and sharing of such information remains quite critical for the scaling-up and buy in of this environment friendly technology. There is need for dialogue with the relevant ministries in Sudan to discuss the need to consider the use of Stabilised Soil Blocks as a nationally supported initiative. There is also need for the production of maintenance and construction manuals to be made accessible to community based groups and many more vocational schools to offer the training. The improved access to Stabilised Soil Blocks machines locally is equally important so that the communities have easy access to this technology. The United Nations and other Non Governmental Organisations need to support the use of SSBs by ensuring that this is a technology of choice in all WASH related construction activities among other infrastructural development efforts and be exemplary.

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Key Words

Environment, protection, Stabilised Soil Blocks, aesthetic, burnt bricks

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