TECHNICAL ENQUIRY

RAINWATER HARVESTING IN SUDAN

DEW Point
DEVELOPMENT RESOURCE CENTRE
ENVIRONMENT – WATER – SANITATION

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Enquiry A00133 – Rainwater Harvesting in Sudan

Background

I am working for the NGO Medair on a project in North-Sudan. In this area we started rainwater harvesting projects one year ago. Right now only community institutions with GI-roofs are targeted, as it is easier to collect water from these buildings. But as this does not solve the problem for local people, we are considering starting rainwater collection from the local houses. These houses are circular of form and have thatched roofs.

Enquiry for Dewpoint

- How much will the thatched roof influence the water quality?
- Is there any experience with rainwater harvesting of thatched roofs?
- What kind of guttering is most suitable for circular houses?

Response

- **Is there any experience with rainwater harvesting of thatched roofs?**

In a survey if 150 households in 3 Botswana villages, many families were found to collect water in from roofs in an informal way by placing buckets , basins or oil drums under the eaves but this was most common for households where there was an iron roof. Only one person with a thatched roof said that they drank the water. In Lesotho guttering was only used by more wealthy families as it was too expensive for most families living in traditional round housing (Pacey & Cullis, 1986, Gould & Nissen-Petersen, 1999).

Only certain types of grasses e.g. coconut and anahaw palm (Gould and Nissen Peterson, 1999), thatched tightly, provide a surface adequate for high quality water collection. Most palms and almost all grasses do not produce thatch suitable for high-quality rainwater harvesting. They should only be used when there is no alternative source.

The water from thatched houses can be collected with a layer of polythene sheet spread on to the roof http://www.chennaimetrowater.tn.nic.in/Main.swf. Plastic sheeting can be used independently from roof by suspending the sheet between poles and directing the water to the storage tank.
http://www.physics.harvard.edu/~wilson/arsenic/conferences/Feroze_Ahmed/Sec_3.htm

Alternatively, families with thatched roofs use other nearby buildings for water collection.
http://www.srcf.ucam.org/enghana/challenges_Water.html

- **How much will the thatched roof influence the water quality?**

It seems as through there is not a great amount of definitive research on the water quality of rainwater from thatched roofs. The following is an extract from Pacey & Cullis, 1986.

> *"Caution is advised in many texts regarding thatched roofs, which are said to harbour sources of contamination, but there seems to be no evidence that water from a well thatched roof presents significantly greater hazards to the consumers than water other roofs. Greater precaution may be advisable to ensure that debris form the roof does not enter the tank, and the water should usually be boiled before drinking."*

Also of relevance is an on line document from IRC
http://www.irc.nl/content/download/128067/348520/file/TP49Roofwater_07.pdf

The following is an extract from the above document;

"The run-off from thatch roofs is by contrast quite seriously contaminated. Where thatch water is harvested, it is commonly then improved by processes such as alum-accelerated sedimentation, boiling, SODIS (solar water disinfection) or other disinfection

If the roof is made of decayed materials, the roof itself can contribute to the dirt load. This is particularly true of low-quality roof materials such as thatch or tar sheets, though asbestos sheeting and galvanised iron (particularly if it is rusty) can also add material to incoming water.

If an impermeable roof is not available, one can sometimes be built in the compound just for rain harvesting. Either a galvanised iron (GI) sheet roof can be built on a frame (possibly doubling as a shed or even the cover for a water tank) or a less permanent structure can be made of polythene sheet or a tarpaulin, anchored against being blown away in high winds. If plastic materials are used, they should be demountable so they can be sheltered from wind-borne dust and sunlight in weeks when the rain isn't falling. Generally, covering an organic roof with plastic sheeting is not advisable: the sheeting will prevent natural ventilation."

Type	Runoff coefficient	Notes
Sheet metal	> 0.9	Excellent quality water. Surface is smooth and high temperatures help to sterilise bacteria.
Tile (glazed and unglazed)	0.6 – 0.9	Good quality water from glazed tiles. Unglazed tiles can harbour mould. Contamination can exist in tile joins.
Asbestos	0.8 – 0.9	New sheets give good quality water. No evidence of carcinogenic effects by ingestion. Slightly porous so older roofs can harbour moulds and moss.
Organic (thatched)	0.2	Poor quality water (>200 FC/100 ml) Little first-flush effect High turbidity due to dissolved organic material which cannot easily be filtered or settled out If an impermeable roof is not available, one can sometimes be built in the compound

However, there is an article comparing the quality of rainwater harvested from different roof materials. The research was conducted by by the Department of Geography and Regional Planning Delta, State University, Abraka, Nigeria which. The abstract is printed below;

Abstract This paper assess the level of potability of rainwater samples harvested from catchments roofs in 6 rural communities of Delta State, Nigeria to achieve this goal a stratified sampling technique was adopted in the establishment of 90 sterilized cans into the 3 senatorial districts of Delta; on the basis of one can for thatch, aluminium, asbestos and corrugated iron sheets, and open surfaces. Six rural communities each were chosen from the three senatorial districts, making a total of 18 rural communities that were chosen for the study. The harvested rainwater samples were analysed with the most appropriate equipment and analytical techniques as recommended by World Health Organisation (WHO) and federal ministry of environment in Nigeria. Kruskal—wallis H'test statistical techniques was employed to ascertain whether differences exist amongst the rainwater samples collected from thatch, aluminium, asbestos and corrugated iron roofing sheets, and open surfaces. The result revealed that most of physiochemical and biological characteristics of rainwater samples were generally below the WHO threshold, as such the rainwater characteristics showed satisfactory concentration in these rural communities. Thus, the rainwater from these rural communities should be harvested, stored for human consumption and for other uses by the inhabitants. But treatment is needed in terms of their pH, TSS, Fe and colour. Similarly, significant differences exist amongst the rainwater samples collected from the 5 roofing types, most especially low quality of rainwater were observed in thatch and asbestos roofing sheets. Thus, rainwater from these sources should be purified before consumption.

Perceptions of quality

In West Africa, rainwater has been collected off thatched roofs and there appears to be no strong objection on the grounds of its use for drinking (Novieku 1980) In other places, with thatch of other types, water from roofs is often discoloured and although it may be fit to drink , people may dislike it.

In northeast Thailand, where the groundwater, the only readily available source of water, is highly saline, the local people are aware of the water quality benefits to be had by using rainwater. During a field visit to the area, the local people stated they preferred water from the thatched roofs because of sweet taste. But after the Thai government launched the rainwater harvesting program in 1986, many villagers in this region replaced the thatched roofs with metal sheets to increase the volume of rainwater harvested. http://www.unep.or.jp/ietc/publications/techpublications/techpub-8e/rainwater2.asp

- **What kind of guttering is most suitable for circular houses?**

Generally round houses have not been fitted with guttering although there is some rainwater collection from thatched roofs.

The only reference to a design of guttering for rondavals is from a design project in South Africa but it may not have been put into practice.

"Integral to the concept is the roof flushing system. In the case of regular roofs, the focus was on excluding sediment and extraneous matter such as leaves, while for thatched homes, a flexible gutter made of plastic pieces was proposed. The latter could be made by semi-skilled members of the community."
https://www.sabs.co.za/Business_Units/Design_Institute/Publications/pdf/BRO10-19.PDF

Guttering comes in a wide variety of shapes and forms, ranging from the factory made PVC type to home made guttering using bamboo or folded metal sheet. In fact, the lack of standards in guttering shape and size makes it difficult for designers to develop standard solutions to, say, filtration and first flush devices. All the documentation to low cost guttering refers to straight guttering for rectangular building plans. It is possible to collect roof water without gutters by using instead glides, ground level troughs or sheeting (Gould & Nissen-Petersen, 1999; Qiang & Fuxue, 1995) and some house geometries concentrate run-off from adjacent roofs into gulleys/valleys. Again these methods apply to straight guttering.

Lack of guttering is sometimes said to be one of the primary limiting factors restricting the wider adoption of rainwater collection (Pacey & Cullis, 1986).

Some of the common types of guttering and fixings are shown below in the Practical Action Technical brief on rainwater harvesting and in the UNICEF Rainwater harvesting chapter Installation of rainwater gutters but has no reference to guttering for circular buildings. http://www.unicef.org/eapro/Harvesting_the_rain_p_29-42.pdf

References

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