

Join the Wave with... Erik Nissen-Petersen

Are sand dams the solution for water harvesting?

In a video interview with TheWaterChannel Erik Nissen-Petersen shone his light on the popular water harvesting structures: sand dams. Erik Nissen-Petersen is a Dane, living in Kenya. He has 37 years of experience with water harvesting techniques in the driest parts of Africa. He developed the famous practical hands on manuals on water harvesting structures. In this interview Erik Nissen-Petersen explains other options for water harvesting and shows why sand dams are the most complicated structures to build.

Potential for water harvesting

In semi arid East Africa it rains on average 625 mm per year. In Denmark it rains 630 mm per year - a similar amount, but in Africa it all comes in 2 or 3 short intense showers. "You need to harvest the rain otherwise it is gone", stated Erik Nissen-Petersen.

In the early 60s harvesting techniques like sand dams, earth dams, and rock catchments were already built. We need to keep developing innovative rain and runoff water management technologies for domestic, livestock, and supplemental irrigation uses. Some of the technologies that have proven to be effective and sustainable in water resource development and management in dry land areas include: runoff regulation and storage techniques - like gully head dams, 'hafirs' or waterpans, micro dams, ground catchments ('djabias'), roof catchments, underground water storage tanks ('shui jiaos'), 'barkads', and macro and micro catchment systems; and ground water sources such as hand dug wells, shallow drilled wells, infiltration galleries of sand storage dams, and piped water from springs. There is a large potential for the development of these appropriate and affordable community water supply systems which is not exploited yet.

Bottleneck

Erik Nissen-Petersen explains that the Ministry in Kenya is not very fond of the small projects as they prefer large scale programs. Nowadays, there are a lot of NGOs helping with the construction of harvesting techniques and thereby using a lot of cement.

According to Erik Nissen-Petersen farmers can develop harvesting structures themselves in a very simple way. These structures can be built without cement or engineers and the only costs included are manpower and soil.

There are four techniques in a river bed that should be considered when developing a harvesting technique: a hand dug well, a subsurface dam, a weir and a sand dam.

The first option is to dig a hand dug well into the river bed where the water accumulates - this is the place where the sand is deepest.

If you do not get enough water from the well, then you build a subsurface dam downstream the river where the sand is shallow. The subsurface dam will raise the water level in the well. You can not see the subsurface dam directly, but you will notice its presence by the green riverbanks upstream and the dry riverbanks downstream.

If this structure is not giving you enough water, you build a weir. Weirs create underground water reservoirs that are recharged with floodwater. Compared to a sub surface dam building a weir is more complex as it needs concrete. A weir can be built about 60 cm above the sand. The floods bring the sand up to the level of the weir and provide you much more water due to the accumulated sand. Then finally, if this structure still does not provide enough water, you can build a sand dam. A sand dam is very complicated to build.

Building a sand dam

Sand dams can be up to 4 or 5 meter above the river bed and harvesting thousands of cubic meters of water, but it needs to be built in stages in order to function well. The spillway has to be raised 40 to 50 cm in order to collect coarse sand. From coarse sand you can catch 35% of water. With fine sand you do not get water at all. The rain will bring the coarse sand as it rolls along the bottom of the flow.

"Subsurface dams are cheap and most effective. I don't understand why other options are preferred."

By raising the spillway only with 40-50 cm you will catch coarse sand only as the silt flows over it. This process needs to be repeated.

The importance of building sand dams in a proper way was underlined when Erik Nissen-Petersen conducted a survey several years ago where he found out that 9 out of 10 sand dams were non-functional due to three problems.

- There was lack of time by donors during the construction phase causing silt accumulation in the reservoir instead of coarse sand;
- Change in the river course because the spillway was raised too much;
- When rainwater comes down the riverbed, it falls down after the sand dam and it rotates which can cause large damage to the foundation of the sand dam.

Sub surface dams do not have these risks, they are less complicated to build and they are much cheaper. But somehow subsurface dams are not preferred by donors and they are not as heavily promoted as sand dams.

Sub surface dams provide a little less water, but on the other hand you can develop many more of them and they can be built almost anywhere in a river bed. A sand dam costs around 40,000 Euro for engineering and construction materials, while sub surface dams only need a lot of hands, shovels and soil.

Learn more by...

- ✓ **Watching the complete interview with Erik Nissen-Petersen at www.thewaterchannel.tv;**
- ✓ **Watching Erik's short films "Water harvesting from roads" and "Introduction to water from dry riverbeds" at www.thewaterchannel.tv;**
- ✓ **Reading the hands on manual "Water from dry riverbeds" at www.waterforaridland.com.**