



## Household rainwater harvesting – Thailand

*T.V. Luong and Panya Luckmuang, Thailand*

THE SURVIVAL AND development of human beings depend on water, its quality and quantity. But all over the world, the absence or scarcity of potable water continues to be a growing problem. Today about 1.1 billion people - nearly one out of every three people in the developing world - can not gain access to a safe water supply for their basic daily needs. Although clean freshwater may still be readily available in many other places; there are serious concerns about the increasing contamination of rivers, streams, lakes and ground water. Furthermore, wells that are drilled deeper and deeper to extract groundwater have resulted in groundwater depreciation in many continents. Improvements are urgently needed for water conservation, collection, storage, treatment and reuse to meet the demands of ever-increasing population.

Collecting rainwater as it falls from the sky seems immensely sensible in areas struggling to cope with potable water needs as well as contamination issues. Harvesting the rainwater is an old and traditional practice. Roof catchment with container storage is a practical way to collect rainwater, largely because it is easy and inexpensive, requiring low maintenance but household cleanliness is necessary. In regions where there is a lack of water, roof catchment works both as a stand-alone supply and as a supplement to a limited ground or surface water supply. Such a system is independent of any centralised or localised water system and helps to foster an appreciation for water as an essential and precious resource. And a roof collection system can address both water quality and water quantity issues.

Rainwater collection by roof top catchment using large volume wire-reinforced cement jars and tanks has proven to be sufficient for household use in most rural families in Thailand and for promoting family self-management of household water security. Rain is abundant in Thailand with annual rainfall from 1200 to 1800 mm in all regions in the country. The rainy season is from April to October with much of the rain occurs as heavy shower or thunder-showers mostly in the early morning and/or late afternoon. Rainwater harvesting is perceived as being effective in narrowing the gap in drinking water availability between the "haves" and the "have-nots". Household rainwater collection can also play an important role in managing the severe public health problems, such as arsenic and fluoride contamination in wells or groundwater in Bangladesh, Cambodia, China, India and Vietnam.

Many advantages of utilising rainwater to supply household needs and ensue household water security: Women

and children benefit first; quality can easily be maintained; the system is simple to construct; there is no negative environmental impact; it helps reduce problems such as soil erosion and flood hazards; and the reduced reliance on groundwater allows replenishment of groundwater tables.

### The Thai rainwater jar and tank programme

The Government of Thailand initiated a Rainwater Jar Programme in the 1980s. The programme began officially in November 1985 when a national committee was established to implement it. The programme's objective was to provide an alternative and supplementary water supply in rural areas with emphasis on self-sufficient and conservation. The planned programme strategy was aimed at involving villagers in financial management and construction with government financial support for training, providing loan for establishing revolving fund, administrative cost and research. It was intended to mobilise resource from households in the form of free labour and contribution to the revolving funds. Government offered start-up loans for village revolving funds at US\$250 per village. The programme gradually gained finance support from donors, NGOs and private sector. One company donated, for example, 2500 tones of cement.

Rural job Creation was one of the rainwater jar programme activities. Villagers formed technical groups and were trained in the skills of jar and tank construction at a central location and distribute them to households. Such being the case, many villagers acquired the skills of jar and tank construction. As the demand increase rapidly, small private enterprises making rain jars and tanks began to flourish. Many villagers, having been trained through the government-funded programme, landed jobs with small contractors or set up their own business. These enterprises catered for private demand and were sub-contracted by many districts to produce jars and tanks for distribution to households under the programme.

As the project gained momentum with widespread support and readily available community-based revolving funds, the programme shifted from the government initiative to commercial jar-manufacturing enterprises. During 1986 alone, approximately 1.7 million one- and two-cubic metre jars were built in Northeast Thailand. During this fervid construction phase, revolving funds were seen by many as a hindrance to rapid implementation of the programme. Increasingly, the private sector assumed re-

sponsibility for production, as it was possible to turn out good-quality jars at ever-lower prices due to the economies of scale. And they did well with two-cubic metre jars for sale at around US\$20, thereby enabling many families to purchase the jar when they could afford it.

The programme proved to be extremely successful. Some 300 million wire-reinforced cement rainwater storage jars and tanks were constructed between 1980 and 1991 and have been used by millions of families until today. The programme was an unusual initiative involving a broad range of stakeholders, including households, communities, NGOs, universities and the private sector with support from the Government at local, provincial and central levels. The result of this “bottom-up” meeting “top-down” approach was a programme unprecedented in the way it facilitated the access of rural people to potable water supply, especially in Northeast Thailand.



**Figure 1. A modern rural household is collecting rainwater for drinking and domestic purposes**



**Figure 2. Household collects rainwater from rooftop and stores in a tank built on the ground**



**Figure 3. Rural household collects rainwater from the rooftop in several jars**

Several factors greatly favoured the rapid progress and development of the rainwater jar programme in Thailand. These included:

- A genuine need for water and a preference for the taste of rainwater by most people;
- Strong political will and commitment for rural development at all levels of government and the contribution and hard work displayed by successive technical personnel and administrators at different levels;
- A period of national economic growth and increasing private affluence; and
- The availability of low-cost local cement and skilled artisans with experience in making a similar Thai traditional jar.

A major study by Wirojanagud et al. of rainwater quality was conducted in Northeast Thailand in 1989 where several million people use household rainwater jars. The study examined the route and cause of bacteriological, pathogenic and heavy metal contamination. The study concluded that, potentially, rainwater is the safest and most economical source of drinking water in the region with no major health implications to users, as compared to the highly contaminated conventional water sources. The study recommended improved hygienic handling and storage of the rainwater at home, good sanitary practices and the possible use of chlorine or boiling for disinfecting the water. Many families in rural Thailand now boil the rainwater for drinking.

To collect rainwater for domestic use, families are advised to strictly follow the code of practices mentioned below so as to ensure that the rainwater collected is safe for human consumption and no mosquitoes breed in the tanks and jars.

- Drain away the first and the second rain falling on the rooftop collected in the gutter at the beginning of the rainy season each year, as the first and the second rain in the gutter invariably contain the dirt and the bird droppings deposited on the rooftop during the dry season.
- Keep the connecting pipe between the gutter outlet and the tank inlet, or the jar mouth, movable for easy draining away the first and the second rain when the rainy season starts.
- Clean the tank and jar annually, prior to the start of the rainy season, for ready storage of the fresh rain.
- Cover the tank inlet with a piece of nylon net to prevent mosquitoes from entering into the tank.
- Keep the mouth of tank and jar covered to avoid mosquitoes and dirt from getting into the rain tank and jar.
- DO NOT empty the tank and jar completely at any time. Maintain a level of water inside the tank and jar at the bottom up to the tap level during dry season to prevent cracking of the tank and jar.



**Figure 4. Household collects rainwater in a series of four tanks**



**Figure 5. Even a thatch roof can be used as the catchment for rainwater collection**

### Construction of Thai rainwater jars and tanks

The construction of a Thai jar or tank is not expensive and not the least technically sophisticated. It requires only some common construction materials, such as cement, sand and iron wire etc., and some masonry skills. There are several similar procedures for making the Thai rainwater jar and tank. The material requirements listed in Table 1 (Appendix) are based on the design and technique developed by the Accelerated Rural Development Department (ARD), Ministry of Interior, Thailand. ARD is one of several agencies in Thailand implementing the Government’s rural water supply programme and has played an important role in promoting the use of rainwater jars and tanks in rural areas. The ARD technique adopts the use of ironmould for making rain jars and tank. A rain jar of 2000 litres and a tank of 3200 litres currently cost about Thai Bahts 900-1000 (US\$ 20-25) and Thai Bahts 1100-1200 (US\$ 25-30) respectively, including the delivery charge through waterways in many rural areas.

### Construction of Thai rainwater jars and tanks

The construction of a Thai jar or tank is not expensive and not the least technically sophisticated. It requires only some common construction materials, such as cement, sand and iron wire etc., and some masonry skills. There are several similar procedures for making the Thai rainwater jar and



**Figure 6. Production of rainwater jar and tanks in the yard of a local private entrepreneur in a village**

tank. The material requirements listed in Table 1 (Appendix) are based on the design and technique developed by the Accelerated Rural Development Department (ARD), Ministry of Interior, Thailand. ARD is one of several agencies in Thailand implementing the Government’s rural water supply programme and has played an important role in promoting the use of rainwater jars and tanks in rural areas. The ARD technique adopts the use of ironmould for making rain jars and tank. A rain jar of 2000 litres and a tank of 3200 litres currently cost about Thai Bahts 900-1000 (US\$ 20-25) and Thai Bahts 1100-1200 (US\$ 25-30) respectively, including the delivery charge through waterways in many rural areas.

### Cross-broader transfer of the Thai rainwater jar and tank technologies

The positive aspects of the Thai rain jar and tank make them an ideal solution that could benefit millions of rural people in developing countries.

During the early 1990s the Thai rainwater jar and tank technologies were introduced for the first time to Africa and South Asia with support from UNICEF offices in Tanzania and Bangladesh in collaboration with ARD in conducting training courses for the construction of jar and tank for local technical personnel and skilled masons. The technologies were well accepted and appreciated by the respective government counterparts, local masons and community members. The same technology was subsequently transferred to Vietnam. It was quickly picked up by some small private enterprise to make the jar for sale in the local market. Similar technique for making rainwater jars was taken up by local village masons in Cambodia and Lao PDR. The Thai rain jars are well appreciated by the East Timorese families during the emergency period, 1999-2000 and now in transition time for rebuilding their communities and homes.



**Figure 7. Training on construction of rainwater jar and tank in Tanzania**

### The transformation of Thai rainwater jar Programme

Due to rapid economic development in the country in the recent years, people expect better quality of life including the demand for piped water supply. Government shifted the investment to finance piped water in rural areas. Starting in early 1990s, the rainwater jar and tank programme was gradually faced out and ended in 1995. Most

significantly, the construction of the rainwater jar and tank had been commercialised in production to satisfy the demand. Many rural households are still collecting rainwater from rooftop for domestic consumption. With piped water reaching the villages, some households use some of the old rain jars and tanks for its storage. Today, one can see those jars and tanks made many years ago are still in use by millions of rural families. Local small enterprises are continuing making the jars for sale in local markets and along the country roadside. The technologies would remain with the Thai people for many years. The Thai rain jar is hitherto a symbol as one of the people's ways of life in rural Thailand.

**References**

LUONG, T.V. (2002) Harvesting the Rain - A Construction Manual for cement Rainwater Jars and Tanks, UNICEF East Asia and Pacific Regional Office, Bangkok, Thailand.  
 GOULD, J. and NISSEN-PETERSEN, E. (1999) Rainwater Catchment Systems for Domestic Supply, Design, Con-

struction and Implementation, intermediate Technology Publications Ltd, London, UK  
 WIROJANAGUD, W. et al (1989) Evaluation of Rainwater Quality: Heavy Metals and Pathogens, IDRC, Ottawa.  
 WIROJANAGUD, P. and VANVAROTHORN, V. (1990) Jars and Tanks for rainwater Storage in Rural Thailand, Waterlines, Vol. 8, No.3.

T.V. LUONG, MSc, Ph.D.(IC), MCIWEM, Consultant, Water, Environment and Sanitation Programme, UNICEF, East Asia & Pacific Regional Office, 19 Phra Arit Road, Bangkok, Thailand and former Senior Advisor Water, Environment and Sanitation Section, Programme Division, UNICEF New York HQ.  
 PANYA LUCKMUANG, Director, Water Resource Division, Accelerated Rural Development Department (ARD), Ministry of Interior, Thailand.

**Appendix**

**Table 1. Material requirements for making rainwater jars and tank adopting the ARD technique of using ironmould**

Material requirements	1,000-litre jar	2,000-litre jar	3,200 –litre tank
Cement	3 bags	4 bags	7 bags
Sand	2 cubic metres	3 cubic metres	4 cubic metres
Aggregate	0.3 cubic metre	0.3 cubic metre	o.4 cubic metre
Wire, 1mm diameter)	3 kilograms	4 kilograms	5 kilograms
PVC elbow, 3 inch	--	--	1 piece
PVC pipe, 3 inch	--	--	0.2 metre
GS pipe, ¾ inch inner diameter)	0.8 metre	0.8 metre	0.8 metre
GS socket, ¾ inch inner diameter)	2 pieces	2 pieces	2 pieces
Tap, ¾ inch inner diameter)	1 piece	1 piece	1 piece
GS plug, ¾ inch inner diameter)	1 piece	1 piece	1 piece
Nylon net	1 square metre	1 square metre	0.04 square metre
Jute cloth (like that used for rice sacks)	4 square metres	6 square metres	--
Big iron sewing needle	1 piece	1 piece	--
Wooden or aluminium cover	1 piece	1 piece	--
Skilled mason	2 days	2 days	3 days
Unskilled labourer	2 days	2 days	3 days

**Note:** Costs of jars and tank can be calculated using local prices.