



Water and sanitation for Mahaweli

R.L. Haturusinha (Ms), K. Theivasagayam and D.T. Dayarathne Perera, Meca, Colombo

MAHAWELI GANGA development project, the largest multipurpose river basin development project ever undertaken by Sri Lanka, involves production of 508 MW of power and development of 364,000 Ha. of land for irrigated agriculture and human settlement. The number of settler families in the entire development area would amount to about 250,000. The settlement is mostly confined to the dry zone area of the country which has a dry spell from April to September. The project area has been divided into 13 irrigation systems from system A to M, with natural features forming the boundaries. These systems have been further divided into zones and each zone into management blocks of extent ranging from 1000-1500 Ha. for the convenience of proper irrigation and settlement management. The smallest settler unit is a hamlet consisting of 200 - 400 families. The social infrastructure facilities for the settlers are provided through service centres at different levels namely hamlet centres, village centres, area centres and town Centres. Each hamlet has a hamlet centre and each 3-4 hamlet centres are served by a village centre. Each block has an area centre and each system has one or more town Centres according to the population distribution.

Provision of safe drinking water and sanitation facilities is a key area in the quest for raising the quality of life in the Mahaweli settlements. The aim of this paper is to highlight our achievements in meeting this objective within the limits of affordability. The approach to affordable water supply has been to go for appropriate methods to suit the population distribution, the topography and the available sources of supply, keeping it economical while ensuring safety.

Each hamlet under the Mahaweli settlement consists of 200-400 farmer families each provided with 0.2 ha of homestead area. Thus the population in the hamlets is thinly spread. These hamlets are usually surrounded by the agricultural lands with high water table. Ground water which does not need treatment and found to be safe for consumption, forms the source for household consumption. The most affordable system of water supply for hamlets are dug wells. Each household is encouraged to construct their dug wells by providing a subsidy.

The farmers are supplied with precast concrete rings of 1 m diameter, 0.05m thickness and 0.75 m height for the construction of the wells. They carry out the construction of their own wells, by excavating up to the required depth of ground water and placing the rings up to the ground level. After the backfill a brick wall ring is constructed above the ground level up to about .75 m above the

ground level. The bottom ring is a special one with porous surface to allow seepage of water. A typical well is shown in fig. 1. The average depths of these wells are around 5-6 m which needs around 7 to 8 rings. As the rings are produced for this mass requirement in bulk at a central supply station, the cost is considerably low and is convenient, quick and easy to construct. The cost of 8 units of these rings needed for an average well and a bag of cement supplied for the masonry work cover the subsidy of US\$ 50 provided for each household for this purpose.

In places where the water table was deeper and below rock level the individual wells are unaffordable for the farmer, and larger community wells are provided at one per 6 families. They are about 3 m in diameter up to about 9 m in depth and with 225 mm. rubble masonry wall up to 0.75 m above the ground. The cost of a community well is around US \$1500. Farmers contribute to the construction by providing the labour required.

In areas where the ground water table is much deeper, tube wells fitted with simple Indian made hand pumps have been provided. Water Resources Board of Sri Lanka and a few private firms are engaged in its construction. Average depth of these tube wells are 40 m. most of which is in rock strata. One or two such wells are provided per settlement where it is necessary, at appropriate locations. The overall cost of a tube wells is around US \$ 2000.

The quality of the ground water is good in most of the hamlet areas and is safe for consumption. But in certain high land areas the individual wells go dry during the driest months of August- September when ground water table drops to levels deep below the rock strata. Also there are locations where the water is hard with CaCO₃ content. In such situations, presently there is no affordable alternative for the settlers other than surface sources such as irrigation canals and minor reservoirs, the water from which is used for consumption after boiling well.

For the bulk needs of the settlers such as washing and cattle bathing, minor reservoirs are used. They are continuously supplied by the irrigation canals and are reliable sources of water, having water round the year.

The service centres which provide social infrastructure facilities are more confined and closely packed compared to the hamlets.

The most basic one, the hamlet centre, has a few offices, a minor school, a few shops and staff quarters, have individual wells as the most appropriate and affordable system for such a small population.

The village centre which serves three or four hamlets as stated earlier, has a larger population and it is intended to

serve the water supply needs of the population by a large dug well constructed at a location where the general demand of about 100 cu.m. per day could be met by ground water which does not need any treatment. The water will be pumped to a 50 m, capacity overhead tank from where it will be distributed through a PVC pipe distribution system.

The area centre which is the centre of administration for the management block holds a substantial population numbering around 3000 (including floating population) and is also a centre of minor commercial activities. As the estimated demand of 300 cu.m. per day could not be met by ground water, surface water sources are used, which need treatment. To make it affordable, a simple treatment process of biological filtration using slow sand filter units and chlorination is adopted. An overhead tank of capacity 150 cu.m. and a PVC distribution net work complete the scheme. Even though the capital cost for the scheme is around US \$ 200,000 the operational cost is very low, amounting to US \$ 600 per month, spent on operation of intake and clear water pumps and the wages of six unskilled labourers who are needed to maintain it.

The town centre which is the main centre of activities of the Mahaweli settlements has a population of around 10,000 on the average, including floating population. The average demand of a typical town centre such as Dehiattakandiya in System C of the Project area is around 1500 cu.m. per day. Inevitably, in such a case as that of Dehiattkandiya township, where the source of water is the Mahaweli river with widely fluctuating sediment content, a process of chemical treatment (coagulation & flocculation using alum), sedimentation, rapid sand filtration and chlorination had to be adopted. However, effort was taken to make it affordable by using an energy saving hydraulic flocculator, gravity methods for aeration, sludge removal in sedimentation tank and drainage, and using PVC pipes for raw water main and distribution net work. A tariff in line with that of National Water Supply & Drainage Board of Sri Lanka is imposed on the

consumers who are mostly nonfarming population with better income to afford this tariff, to cover the operational cost.

The capital cost of the Dehiattakandiya Township Water Supply Scheme is around US \$ 1.2 million and the operational cost is around US \$ 2000 per month.

Sanitation facilities for hamlets too are provided on an individual basis, considering the dispersed nature of the population. A subsidy of US \$ 9 is given to each household which construct a latrine. To make this possible within the subsidy provided, a design of latrine in the form shown in fig. 2 is suggested to the settlers and precast concrete slab as shown in fig. 2(a) is supplied at US \$ 4 each. These slabs are precast on a large scale at a central location and hence the cost is very low and is convenient and quick for construction. The farmers themselves could do the construction and the shelter on top could be a simple one with jungle pole frames and palm leave claddings or 110 mm. thick brick work, according to the affordability of the farmer. The slabs provided earlier did not have a water seal arrangement and the opening above the pit is kept covered by a plank when not being used. This arrangement is found to be unpopular with the settlers. Now a water seal arrangement with a two piece precast concrete slab and squatting pan unit is supplied at US\$ 5.5. A sketch of this arrangement is shown in fig.2(b). This is more popular with the settlers as it seals off the pit below, and could be relocated over a new pit once a pit has to be closed. There is no health hazard with these simple systems as the households have a lavish area of 0.2 ha each and the latrines could be located at a safe distances away from the water sources.

For the service centres the common arrangement is to have latrines with a septic tank and soakage pit with a capacity to suit the number of occupants for each individual household. A combined system of sewage lines and a common septic tank for several households together was thought about for the town centres but later abandoned, considering the relative advantages of indi-

Table 1: Information on wells in sample Hamlets in system C of Mahaweli Project areas

Zone	Block	Hamlet	No of families	Permant wells	Temporary wells	% Having wells	Community wells	Tube wells
2	202	Millettewa	435	15	189	43	2	—
	204	Hembarawa	350	167	15	52	2	1
3	303	Wewagama	393	54	114	43	2	—
	304	Medagama	308	109	26	44	1	—
4	401	Sandunpura	311	55	20	24	—	—
	404	Bakmeedeniya	313	204	10	68	—	1
5	501	Suriyapokuna	230	76	20	42	1	—
	503	Nikawatalanda	255	70	20	28	1	—
6	601	Gal-Eliya	246	7	—	32	—	—
	603	Kekuluwela	267	26	3	11	—	—

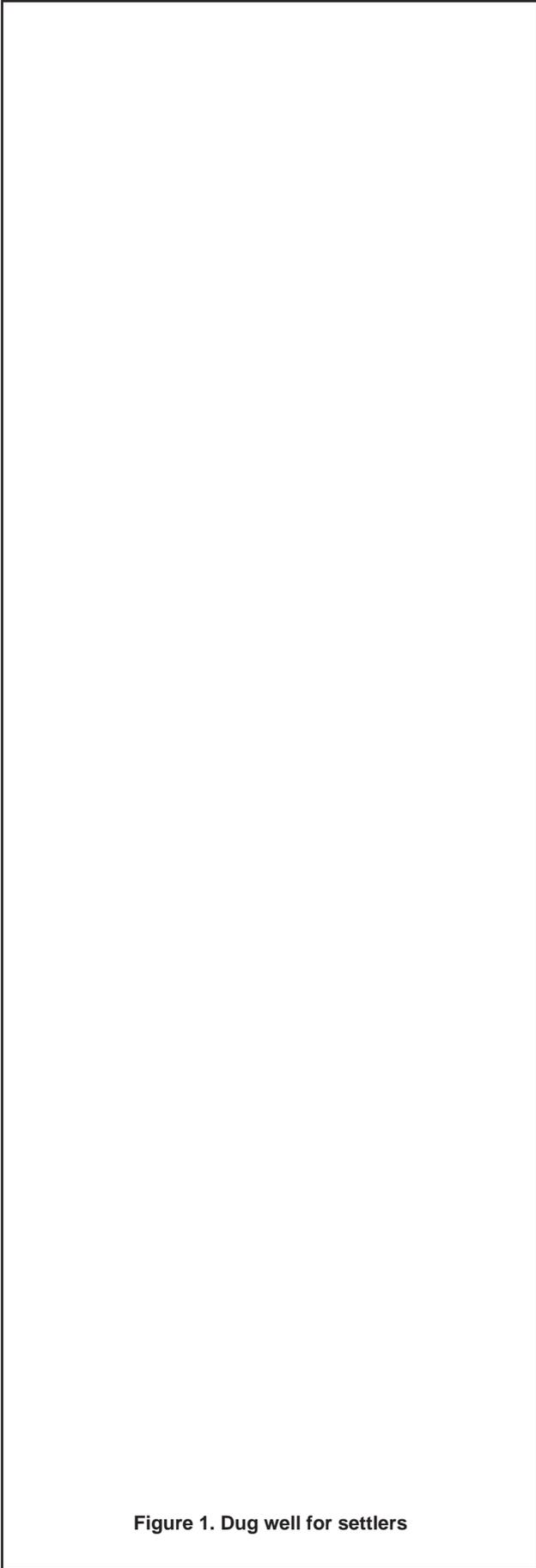


Figure 1. Dug well for settlers

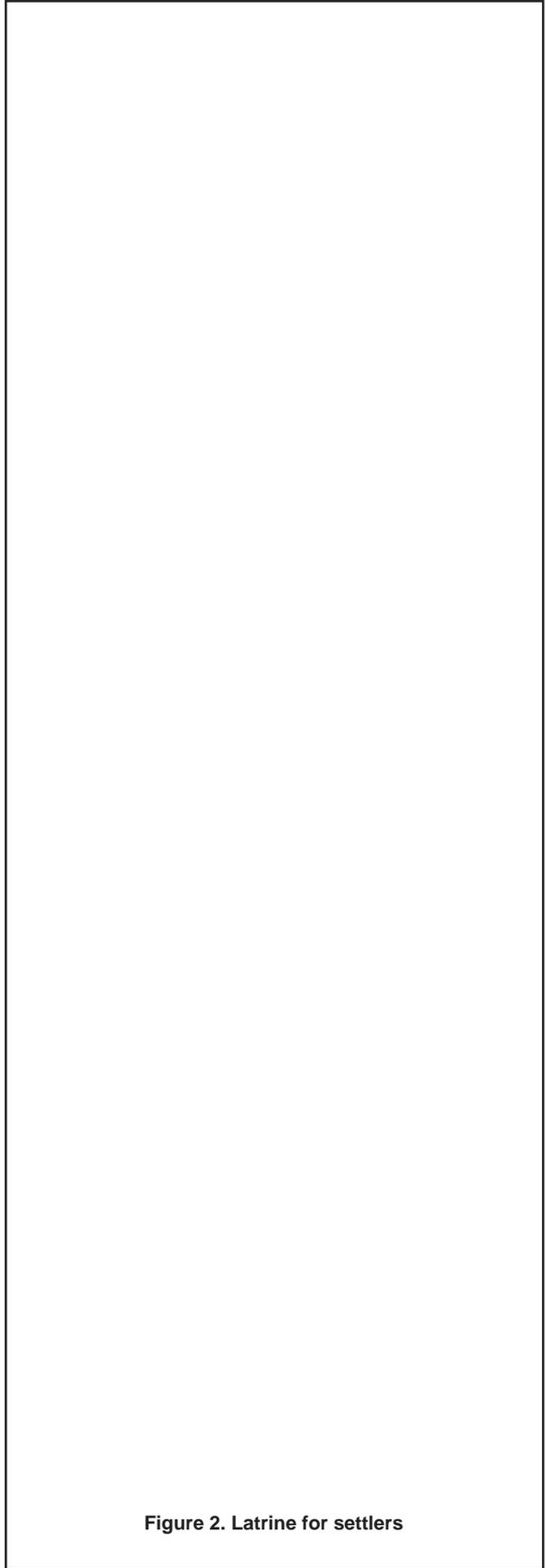


Figure 2. Latrine for settlers

vidual septic tanks which could be maintained easily by the respective owners.

There were special situations in certain areas where the rock level was very high and the construction of septic tank was not possible. A typical case was the Welikanda town centre in System B of the project area where the earth overburden is very shallow, varying from 1 to 2m in the entire area. Hence an integrated sewerage system consisting of a pipe network leading into a stabilization pond with a detention period of one month located away from the township was found to be an appropriate solution. As the entire system was designed to work on gravity flow the operational cost is negligible.

A survey was done by the authors of the paper with the assistance of the staff of the Resident Project Manager, Mahaweli Economic Agency in System C of the project area which could be considered as a representative sample for the Mahaweli Systems, to review the situation of the water supply arrangements specifically in the settlements (Hamlets). Two representative hamlets in each zone from zone 2 to 6 was surveyed and the information obtained is given in table I.

During our survey and interviews with the settlers and the project staff, we were able to observe the following:

- With the decrease in subsidies for individual dug wells from the earlier value of US \$ 50 to the present US \$ 20 the percentage of individual dug wells constructed have significantly dropped. (see from Table I as in the case of recently completed zones 5 and 6 where the subsidies have been reduced)
- In the case of many individual wells, excavation was stopped at a level when they encountered rock. Most of these wells go dry during the driest spell in August - September. In such cases if the settlers are helped in blasting the rock to sufficient depth, it would ensure continuous supply of water.
- In certain areas the ground water contains salts causing hardness, colour and taste. Investigations have not been done to ascertain the ground water quality and depth of water table in the settlement areas before deciding on these locations.
- The progress in construction of tube wells, which would have been a boost to the settlers during the period when most of the individual wells go dry, lags very much behind the schedule due to lack of funds

for this purpose. This programme does not get much priority.

- In certain cases, there is lack of response from the settlers for community wells even though funds are available for this purpose. This may be due to lack of group effort.

Based on the above observations we would like to make the following recommendations for consideration in future human settlement projects of this nature.

- Provision of safe drinking water and sanitary facilities must be a priority item in the human settlement projects. The development agencies must either provide these facilities or encourage settlers to do it by providing subsidies up to realistic levels.
- In the planning stages, investigations regarding ground water quality and depth too has be done and the results be taken into consideration in identifying settlement areas, except in cases where alternatives for affordable and safe water for consumption are available.
- In settlements where the ground water table fluctuates heavily so that the dug wells dry up for a period, tube wells have to be provided to ensure availability of safe drinking water during dry periods as well. The aid programmes for safe water and sanitation should cover tube wells too.
- Assistance should be provided to settlers for rock blasting in the process of excavating the dug wells in cases where it will ensure continued supply of water at reasonable depth.

References

- ¹ Mahaweli Ganga Irrigation and Hydro-Power Survey - Ceylon, Volume 1- General Report, Phase 1 - Ad Hoc Report, UNDP/FAO.
- ² Instruction notes to settlers for construction of Dug Wells and Latrines- Mahaweli Economic Agency of Mahaweli Authority of Sri Lanka.
- ³ Type plans, Estimates and construction records for water supply and sanitation works for settlers, kept at the Resident Project Manager's Office (System C), Mahaweli Economic Agency of Mahaweli Authority of Sri Lanka.