Measuring the Volume of dams

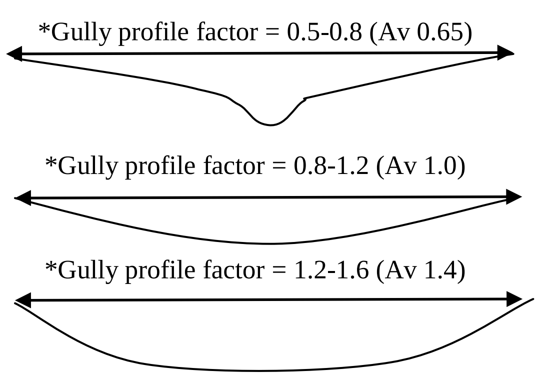
The measurement of dam volumes is an essential part of efficient water management. Firstly, knowledge of how much water a dam holds is needed to ensure that there are sufficient quantities available for the production area available through the driest times. This information should form part of the data collected when determining the size of production areas. Secondly, an accurate measurement of the volume remaining as dam levels fall allows management decisions to be made about where water is best used in the business e.g. reducing irrigation on mother stock areas. Thirdly, if the dam is used to collect runoff water to minimise impacts from nutrient run off, or catching the first 25mm of runoff from the site to retain the majority of pollutants, the maximum height that the dam must be held at needs be known.

There are broadly four dam shapes – gully dams (triangular), rectangular dams, round dams and irregularly shaped dams. The first step in determining dam volumes is to collect information on the dimensions of the dam. The length, width and depth as well as the shape of the surface area and the cross section profile of gully dams are required – see Figures 1 and 2.

There are three components to calculating dam volumes – surface area, depth and a reduction factor to allow for the sloping base and sides of the dam. The surface area is calculated by multiplying the length (L) by width (W) of the dam and then applying a factor depending on the shape of the dam surface. The surface area is multiplied by the depth (D), and finally, this is multiplied by a reduction factor to account for the sloping sides of the dam. When measuring the depth, it is important to only measure to the top of the sediment layer to give an accurate figure. All measurements are made in meters and then converted into megalitres in the final calculation. Volumes of irregular shaped dams can be difficult to calculate, but can be made easier by dividing the dam into a number of smaller regular shapes and adding the results together. Table 1 can be used as an aid to calculating the volume of dams of different shapes.

Dam shape	**Width (W) X**	**Length (L) X**	**Factor X**	**Depth (D) X**	**Reduction factor =**	**Volume M^3 ÷**	**1000 = Volume ML**
Gully and triangular			See Fig 1 *		0.22		
Rectangular and square			1		0.45		
Round and Oval			0.8		0.45		

Table 1: Dam volume calculator



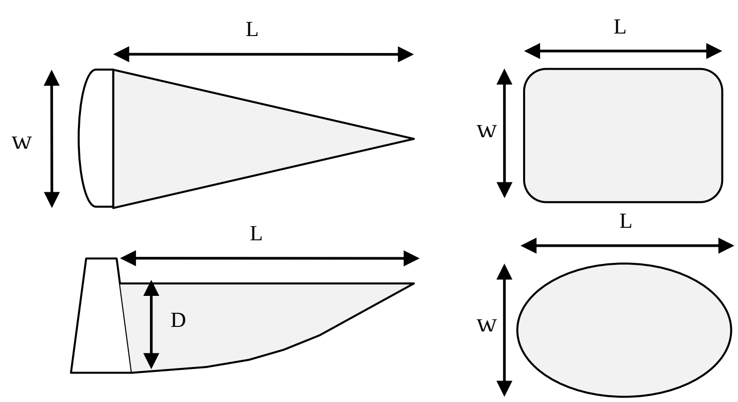


Figure 1: Gully dam profile factors

Figure 2: Dam shapes and measurements

Once a maximum storage volume has been calculated, volumes for different depths of water should be calculated to enable the volume of water remaining to be measured. This calculation needs to take into account that the length and width of the water surface will also change as the dam level falls.

When calculating available water, allowances must also be made for evaporation and usable water. Estimates of evaporation losses can be made by accessing local evaporation data from the Bureau of Meteorology website http://www.bom.gov.au/jsp/ncc/climate_averages/evaporation/index.jsp and multiplying the dam surface area by the average evaporation/annum (1mm from $1m^2$ = 1L).The amount of usable water takes into account water in the bottom of the dam that may not be accessible or usable when the dam falls to very low levels. In some instances, this may only be possible to determine when dam levels fall, as the quality of water in the lower levels may not be suitable for irrigation.

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