A newly constructed drought reserve dam near Elmhurst. When full this dam is 11 m deep and holds about 8 ML of water

PURPOSE

A drought reserve dam is a large deep dam that can store enough good quality water for 2-3 years supply with little or no replenishment.

Many Victorian landholders rely on small paddock based dams to provide water for stock and domestic use. Over recent years these dams have become less reliable due to a hotter and drier climate, more severe droughts and increasing areas of the state being sown to crops or improved pastures. A small reduction in rainfall or change in land use can significantly reduce the amount of runoff available for farm dams.

Small dams often go dry over summer due to their limited storage capacity and very high evaporation losses. Where no other sources of water are available, such as a groundwater bore, drought reserve dams can provide landholders with a more reliable and resilient water supply.

A number of surveys have been conducted into the impact of drought on Victorian farms over the last 40 years. These surveys highlighted the importance of having at least one large, deep dam to maintain water security.

A strategically located large dam can be a valuable investment. It allows a wider range of management options during periods of low rainfall and runoff.

LEGAL CONSIDERATIONS

Most larger dams built in Victoria require a license or permit from the relevant water authority and a planning permit from the local council. It is strongly recommended that you discuss any plans for a new dam with these organisations early on in the planning process. These organisations have strict policies and guidelines on new dams to ensure safety, environmental issues and impact on downstream users is considered during the planning process.

Farm dam owners are legally responsible for the safety of their dams and accountable for the damage these dams may cause if they fail. There are significant safety issues associated with large dams. All large dams need to be designed and the construction supervised by a suitably qualified engineer. They also require regular inspection and maintenance.

ECONOMIC ISSUES

Constructing a drought reserve dam can easily cost in excess of $20,000. It is important to consider other alternatives before deciding to proceed with a new dam. These may include de-stocking during periods of drought, tapping into a local pipeline, constructing a bore or even carting water, assuming a suitable supply is available within a few kilometres.

SITING

Drought reserve dams have quite specific siting requirements due to their size and depth. As a minimum they require a large catchment area, a deep clay based soil and a good site for a spillway. Ideally the site should have the following characteristics:

- A catchment area of 5 – 10 hectares (ha) for each megalitre (ML) of storage
- A stable, waterproof, strong and deep soil for the foundations and embankment
- A wide, flat, well grassed area for the spillway
- No evidence of salting or high groundwater tables
- A gently sloping valley with well-defined banks that offers a good storage to excavation ratio
- Elevated location to facilitate gravity reticulation to the entire farm
- Free of native vegetation and no evidence of cultural heritage issues
- Away from utility services such as power, communications and gas
AG1400 Drought reserve dams

DESIGN

It is important that advice is sought from a range of sources when planning a new dam. This could include your local water authority, Agriculture Victoria staff, private consultants and experienced earthmoving contractors. As mentioned previously a suitably qualified engineer should be engaged to prepare the final design and supervise construction.

Dams lose a significant amount of water due to evaporation and seepage. Evaporation rates in Victoria vary from 1.5 m per annum in the north to 0.6 m per annum in southern areas. Evaporation has a major impact on small, shallow dams. A small dam with a depth of 3 m and a volume of 1 ML will lose around 60% of its volume due to evaporation. In comparison, a medium sized dam 5 m deep with a volume of 4 ML will lose around 40% of its volume due to evaporation. An ideal drought reserve dam would be more than 8 m deep.

For a dam to be an efficient storage facility, it needs to have an appropriate storage to excavation ratio. That is, the ratio of the volume of water which will be stored to the volume of soil moved to construct that storage. An ideal site will have a storage to excavation ratio of 2:1 or better. Topography of the land plays a key role in achieving a satisfactory storage to excavation ratio.

Larger dams usually require an outlet structure such as a pipe to protect the spillway from soil erosion. An outlet structure may also be required to pass summer flows or to pipe water to other parts of the farm. Special care is needed to ensure these structures do not cause bank instability. Contact your local water authority for advice on the size, design and installation of such structures.

CONSTRUCTION

Soil test holes should be excavated beneath the embankment and throughout the dam site to ensure the soils and the bank foundation materials are suitable for dam construction. These materials need to be stable, waterproof and strong.

It is also important that you engage a contractor who has the correct equipment and appropriate experience in the construction of large dams. Typical equipment for dam construction could include a scraper, bulldozer, excavator, sheepsfoot roller and water truck.

It is essential that all topsoil and overburden is removed prior to commencing construction. A suitably designed core trench should be excavated along the centreline of the embankment. The best material should be used to construct the bank core. The bank core should extend the entire length and height of the embankment.

To ensure optimum compaction the bank material should be moist and have a consistency similar to plasticine. It should be placed in layers no thicker than 150 mm and compacted thoroughly with a sheepsfoot roller or similar compacting implement. The top of the finished bank should be well rounded to avoid ponding of surface water.

On completion, all disturbed areas above full supply level should be covered with topsoil and sown down using an appropriate mixture of pasture and fertilizer.

MANAGEMENT

Fencing of the new dam is essential to avoid stock damage, prevent soil erosion and ensure optimum water quality. A 10 m wide strip of grass at the dam inlet will act as a trap for debris, manure and soil. Crash-grazing can be used sparingly to control the excessive growth of vegetation. Crash-grazing is a strategy where large numbers of stock are used to graze out an area in a short period of time.

Trees and shrubs can be planted around the dam to reduce evaporation losses, however they need to be kept well away from the water’s edge. Trees and shrubs should never be planted on or near the dam bank.

Regular inspection and maintenance is essential to ensure dams are safe, waterproof and structurally sound. The inspection needs to cover all areas on the dam including the embankment, spillway and any outlet structures.

ACKNOWLEDGEMENTS

This AgNote replaces AG1400 (March 2010).

ISSN 1329-8062

For more information or to obtain a copy of the relevant Drought Feeding and Management book contact your local Agriculture Victoria Officer, or call our Customer Service Centre on 136 186.

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