



Feed the Future Tanzania Kilimo Tija Activity

Technical Bulletin: Dam Liners

INTRODUCTION

Smallholder farmers in Tanzania rely on small dams and ponds to collect and store water for irrigation and livestock. However, many of these water storage structures experience high rates of seepage and evaporation due to their earthen construction, resulting in water losses of 30-40 percent annually.¹ Lining dams with an impermeable barrier is a low-cost solution to reduce these water losses and improve water availability for agricultural use, especially in areas where water resources are limited or where groundwater is of poor quality. This technical bulletin provides guidance on proper site selection, liner materials, installation, and maintenance of lined dams for smallholder farmers in Tanzania.



Figure 1: A dam liner retains the water supply for a drip irrigation system.

Photo: Fintrac Global Inc.

WHAT ARE DAM LINERS?

Dam liners, also known as pond liners or reservoir liners, are impermeable membranes used to prevent water loss in man-made water-retention bodies such as dams, ponds, or reservoirs. They can be made from various materials such as polyvinyl chloride (PVC), polyethylene, or geomembranes, designed to resist ultraviolet (UV) radiation, punctures, and adverse weather conditions. Dam liners are especially useful in agricultural irrigation, as they provide a reliable water source for crop watering, even in drought-prone areas.

¹ Sakthivadivel, R., Fernando, N., & Brewer, J.D. (1997). Rehabilitation planning for small tanks in cascades: A methodology based on rapid assessment. Colombo, Sri Lanka: International Irrigation Management Institute: [D:RRTemp_r13.PDF \(cgiar.org\)](https://www.cgiar.org/records/d:RRTemp_r13.PDF)



ADVANTAGES OF DAM LINERS

Dam liners provide several benefits for agricultural irrigation:

Water Conservation

- Prevent water loss due to seepage and evaporation.
- Enable the collection and storage of rainwater, contributing to water availability in dry seasons.

Improved Water Quality

- Prevent contamination of water from soil and underground pollutants.
- Reduced algal growth compared to retention ponds that do not have dam liners.



Figure 2: Installation of a dam liner.

Photo: Fintrac Global Inc.

Cost Effective

- Lower the need for water extraction and transportation, reducing energy and resource use.
- Provide a long-term water storage solution with minimal maintenance needs.

Flexible and Durable

- Available in various sizes and materials, adaptable to different terrains and water bodies.
- Resistant to UV radiation, punctures, and adverse weather conditions, providing a long-lasting solution.

DAM LINER COMPONENTS

A dam liner system typically involves the following components:

1. **Geomembrane:** The geomembrane is the primary waterproof layer that prevents water seepage into the ground. It is made from various materials like PVC, high density polyethylene (HDPE), or low-density polyethylene (LDPE), chosen based on the water body's size, the water quality, and the local climate.
2. **Geotextile layer:** The geotextile layer is a protective underlay placed beneath the geomembrane. It provides cushioning, protects the geomembrane from sharp objects, and helps in water drainage if any leaks occur.
3. **Anchor trench:** An anchor trench is dug around the dam's perimeter to secure the liner edges and prevent them from shifting due to water pressure or wind.
4. **Ballast:** Ballast (usually sand or gravel) can be placed over the liner (either around the perimeter or within the water holding area) to secure the liner, provide additional protection and prevent it from getting damaged by animals, falling objects, or heavy winds.

INSTALLATION GUIDELINES

Proper installation of dam liners is critical to ensure their effectiveness and durability. Here are some essential guidelines:



1. **Survey the Site:** Prior to the liner installation, it is crucial to survey the dam site. Check for any sharp rocks, roots, or debris that could potentially damage the liner.
2. **Prepare the Site:** Remove any debris, level the ground, and compact the soil. A layer of sand or geotextile can be added for additional protection.
3. **Lay the Liner:** Unroll the liner across the dam, ensuring it covers the entire surface and reaches into the anchor trench.



Figure 3: A backhoe is used to dig a retention pond.

Photo: Fintrac Global Inc.

4. **Secure the Liner:** Secure the liner in the anchor trench using sandbags, backfill, or large rocks. The liner should be taut but not overly stretched to prevent tears or punctures.
5. **Check for Leaks:** Once the dam is filled, monitor for any signs of water seepage or liner damage.

Extra care should be taken to not damage the liner during installation.

MAINTENANCE PRACTICES

While dam liners require minimal maintenance, it is important to ensure their longevity and effectiveness by following these practices.

1. **Regular Inspections:** Regularly inspect the liner for any visible damage such as tears, punctures, or loose edges.
2. **Leak Detection:** Monitor the water level in the dam to detect any potential leaks. If water levels drop unexpectedly, it likely indicates a problem with the liner.
3. **Prevent Overfilling:** Avoid overfilling the dam, which can put excessive pressure on the liner and cause it to tear or detach from the anchor trench.
4. **Animal Control:** To the extent practicable, protect the liner from damage by animals. This can be achieved by fencing the dam or using a cover net to prevent birds from pecking at the liner.

TRAINING AND FARMER EDUCATION

Successful adoption of dam liners for agricultural irrigation requires proper training and education for farmers. The following strategies can be used:

1. **Conduct workshops and training programs:** These programs should educate farmers about the importance of water conservation, the benefits of dam liners, and their proper installation and maintenance.
2. **Provide practical demonstrations:** Hands-on training is the most effective way to teach farmers how to install and maintain dam liners.
3. **Highlight financial and environmental benefits:** Emphasize the cost savings, increased water availability, and environmental sustainability associated with using dam liners.
4. **Offer continuous support and follow-up:** Maintain communication with farmers to offer technical assistance, troubleshoot problems, and ensure the successful adoption of dam liners.



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CONCLUSION

The use of dam liners for agricultural irrigation is an efficient and sustainable solution for smallholder farmers, particularly in regions facing water scarcity. With proper installation, maintenance, and farmer education, dam liners can significantly enhance water availability and quality for irrigation, ultimately improving agricultural productivity and sustainability. It is the responsibility of agronomists, extension workers, and input suppliers to support farmers in adopting this beneficial technology, driving the shift towards more resilient and sustainable farming practices.



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