Pond Liners to Save Water and Ease Maintenance

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Summary

Sheets of ultra-violet resistant polyvinylchloride, polyethylene or similar materials form an impermeable layer between the water and the soil which decreases water losses through seepage. It also reduces evaporation, improves temperature regulation, helps prevent algal blooms, and promotes nutrient cycling between water and sediment. Many soils require liners to hold water, particularly sands and silts. The technology is easy to install and maintain and is environmentally friendly. Liners are resistant to puncture, UV light, oxidation, and chemical reactions. Quality lining material that is properly installed has a low chance of leakage or breakage, making the technology an affordable solution for small-scale and commercial fish farming.

Technical Description

Pond lining is an adaptation strategy to preserve water, reduce the spread of pathogens, and realize higher biosecurity. Synthetic “geomembranes” keeps water cleaner and make ponds easier to maintain. Rubber or plastic liner material is affordable for smaller sized fishponds. They may last for more than ten years. Plastic liners for sealing tend to be stiff and more difficult to install in small ponds but they are stronger than rubber liners. Water in fishponds also serve as reservoirs for irrigation as a cushion against drought. Pond liners are most important in areas with sandy soils or locations away from water bodies.

Uses

Liners are installed into ponds constructed on flat or gently sloping land. This water conservation technology is most suitable for areas with porous soil and/or poor access to running freshwater. Liners can be fitted into any size or shape of pond. Rubber sheets are more flexible and conform to the contours of pond features quite easily but are not as strong as plastics.

Composition

Pond liner is available in different types of material including polyvinylchloride (PVC), reinforced polyethylene (RPE), ethylene propylene diene monomer (EPDM) or high-density polyethylene (HDPE). These come in different thickness ranging from 0.5 mm to

3.0 mm which are suitable for different sized ponds and surface roughness. Liners must be stable to exposure from UV light. RPE is usually recommended as it is stronger, lighter, and less expensive than EPDM and HDPE, but stiffer to work with. The PVC is least expensive but less puncture resistant. Under layers of woven polyester or polypropylene may be included as well to offer greater protection from sharp rocks, probing roots and burrowing rodents. High-density polyethylene liners are the most widely available. They are heavy duty, puncture resistant, can be connected into large sheets by “hot wedge welding”, flexible and UV stable. They have fish-safe properties and readily conform to pond surfaces. Their density is about 0.94 g/cm3 and they are nearly pure, with small amounts of carbon black added for UV protection and antioxidants added to increase durability. They are available in thicknesses from 0.5 to 1 mm, with thinner widths suitable for smaller ponds without stones.

Means of application

The amount of liner required depends upon the dimensions of the pond, its intended volume, and the slope of its walls. One can use a simplified formula: Volume = (d/6) x (At + Ab + 4 Am), where V is volume, d is depth, At is the area on top, Ab is the area at the bottom, and Am is the area at half the depth. An extra 50 cm must be added where sheets are overlapped to ensure watertight seals. For seaming two sheets, clean a strip of 25 cm along both edges with rubbing alcohol so the adhesives bond well, then apply primer in a 15 cm strip along the top of one piece of liner and lastly glue the two sheets with double-sided tape. Polyethylene may be heat sealed as well. Remove shoes when stepping on the liner to prevent it from getting pierced. When filling the pond with water, pull and tuck the liner into shape to ensure a neat finish.

Agroecologies	Dryland area, Highlands, Humid forest, Moist savanna.
Regions	Africa South of Sahara.
Developed in Countries	Zimbabwe, Zambia, Uganda, Togo, Tanzania, Sudan, South Sudan, Sierra Leone, Senegal, Rwanda, Nigeria, Niger, Mozambique, Mali, Malawi, Kenya, Ivory Coast, Ghana, Ethiopia, Democratic Republic of the Congo, Benin.
Available in	Zimbabwe, Zambia, Uganda, Togo, Tanzania, Sudan, South Sudan, Sierra Leone, Senegal, Rwanda, Nigeria, Niger, Mozambique, Mali, Malawi, Kenya, Ivory Coast, Ghana, Ethiopia, Democratic Republic of the Congo, Benin.
Solution Forms	Equipment.
Solution Applications	Fish Farming.

Agricultural Commodities	Fish.
Target Beneficiaries	Small-scale farmers, Commercial farmers.

Commercialization

Commercialization Category

Commercially available

Startup Requirements

Pond liners are being marketed by aquaculture supply companies in all Sub-Saharan countries, yet availability from local retailers is limited in many locations. Based upon the expansion of aquaculture in Africa, the pond liner industry is expected to exhibit a strong growth rate over the next decade.

Production Costs

Plastic lining materials are less expensive than rubber. Through local suppliers, the cost of sheet plastic is about US $2 per square meter for a thickness of 0.5 mm and increases to US $3.50 for a 1 mm thickness. A plastic liner of 0.5 mm together with sealing and installation for a pond of 15 m long, 10 m wide and 1 m deep is about US $500. Sealing the bed of a pond to save on costs of construction and water supply is money well spent.

Customer Segmentation

Pond lining tends to be sold more by hardware suppliers than agrodealers, and is offered as rolls alongside similar construction materials, and tend to be limited within any given location. In some cases, farm engineering companies offer full lines of products, including those with textured surfaces.

Potential Profitability

Lining a pond with a rubber sheet can decrease water loss through seepage and evaporation up to 50%, making it applicable to both smaller and large commercial operations. A comparative analysis of 700 fish farmers in south-western Nigeria that accounted for costs of stock, feed, water, utilities, and maintenance showed that ponds with plastic liners offer significantly greater net profits than unsealed earthen ponds.

Licensing Requirements

Pond liners are commercial products, and the different materials are protected by patents and trade secrets. One of those secrets relates to the form of trace addition to antioxidants that increase product durability.

Innovation as Public Good

The knowhow for installing pond liners is a public good disseminated by WorldFish.

Solution Images

Excavated pond with liner

Establishing a small fishpond (left to right): 1) excavating and smoothing the pond, 2) spreading the PCV liner and burying the edges, and 3) filling the pond

Institutions