2011 iDE PRODUCT CATALOG

IDE PRODUCT CATALOG

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DESIGNING FOR EXTREME AFFORDABLITY

Opportunities for small scale farmers to increase their income often require specialized technological solutions that the market hasn't yet found. Why do these solutions remain hidden if there is a need? Because the status quo in design innovation is to focus only on the wealthiest ten percent of the world's population. IDE has expertise in identifying and developing these unnoticed technologies for the other 90 percent of the world's population—our customers—and disseminating them through market channels.

Our approach to techologies is twofold. IDE works with small scale farmers to identify and develop low cost tools that can increase productivity and generate cash income. And, we train and equip local, small scale enterprises to manufacture, distribute, install, and service those technologies at a fair market price.

"$1.0 BILLION IS THE TOTAL AMOUNT OUR CUSTOMERS HAVE EARNED SINCE OUR FOUNDING."

WATER
LIFTING

TECHNOLOGY

WATER LIFTING FOR SMALL SCALE FARMERS

Treadle Pump (Portable and Fixed) | Pressure Treadle Pump | Hand Piston Pump | Rope Pump

There are many ways of lifting and moving water, ranging in expense and output from the manual rope and bucket method to a motorized submersible pump. Primary selection factors include budget, depth to water, location of fields, amount of water required, and method of irrigation.

SOLUTION SELECTION

CONSIDER THE FOLLOWING BEFORE SELECTING WATER LIFTING SOLUTIONS:

- What is the farmer customer's rough budget for a pump?
- If accessing groundwater, how deep is it during the crop cycle?
- Is the well recharge rate sufficient for irrigation needs?
- How much labor is readily available for moving and applying the water?
- Will delivery pressure be required for water storage or irrigation?
- Approximately what quantity of water will need lifting?

Water Lifting Solutions	Max. Depth to Water for Irrigation Use*	Output Pressure	Potential Irrigated Area Under Same Conditions**	Cost of 5-Year Ownership***
SUCTION PUMPS				
Portable Treadle Pump	7m			
Fixed Treadle Pump	7m			
Pressure Treadle Pump	7m			
AC Electric Surface Pump ₸	7m			
3.5 hp Diesel Engine Pump	7m			
DEEP-SET PUMPS				
Rope Pump	15m (35m for domestic uses)			
Hand Piston Pump – Deep-set	60m (recommended for domestic uses only)			
Solar Steam Pump (prototype) ₸₸	30m			

Products in colored type have accompanying product sheets.
*Suction conditions at sea level. For every 1000m above sea level, maximum depth decreases by 1m
**Assumes one pump operator, typical pumping duration, same crop, and soil type.
***Product-only cost + product maintenance + fuel + repair parts. Assumes well exists. Excludes cost of labor, land.
₸ ITT Self-priming Pump Model 12210 with rubber impeller
₸₸ Solar Steam Pumpset expected to be available Summer 2011.

WATER LIFTING

PORTABLE TREADLE PUMP

SOLUTION SELECTION

DEPTH TO WATER

0 – 7m

OUTPUT PRESSURE

COST OF OWNERSHIP

IRRIGATION CAPACITY

SYSTEM COMPATIBILITIES

- Flood/furrow irrigation
- Manually drilled tube wells
- Rivers, ponds, other surface water

SYSTEM INCOMPATIBILITIES

- Pressurized irrigation systems

The Portable Treadle Pump is a leg-operated, low-cost option for accessing large quantities of water when the depth to water is less than 6 or 7 meters. Portable models have an inlet pipe that can be extended to surface water or down a well, and can be used for larger or multiple fields. Metal-only treadle pumps have been made cheaper using bamboo, eucalyptus, and/or other local materials for treadles and ground supports.

IDEAL APPLICATIONS

- For depth to water less than 7 meters, this pump is suitable for irrigating 1,500 square meters, and is useful for livestock and other domestic water uses
- Portable pumps are ideal for shifting among multiple users and water access points
- Can be used to fill a header tank for drip irrigation if raised on a platform, as long as total lift does not exceed 7 meters
- For long treadles of local material, foot position can be varied to provide flexibility in stroke and power for users of different heights and weights

Limitations

- Not suitable for irrigating plots located at a higher elevation than the pump outlet
- Treadles on portable and fixed treadle pumps are not connected as is the case on pressure treadle pumps. Gravity, not body weight, is responsible for returning treadles. Therefore, pumping rate is reduced when gravity is insufficient. Adding counterweights to treadles can improve performance.
- Piston cups need replacement after three or four growing cycles, depending upon water quality.

MATERIAL COMPONENTS

MATERIALS

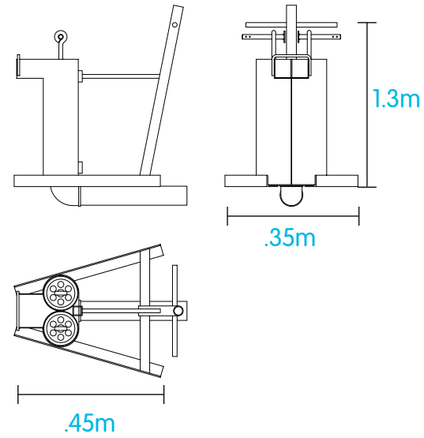
Steel cylinders (plastic is also found in some regions). Treadles are generally steel but these and the frame and handle can be local materials. Piston cups are rubber or plastic. 1.5” rigid inlet hose recommended.

OVERALL DIMENSIONS (PUMP AND FRAME ONLY)

0.5m tall, 0.45m long, 0.35m wide

WEIGHT

~15 kg



Portable treadle pump and bamboo frame

PORTABLE TREADLE PUMP OUTPUTS

Depth to Water	Maximum Water Output* (liters/min)	Daily pumping** to irrigate 200m² (minutes)
1m	90	18 – 25
4m	60	30 – 40
7m	34	50 – 70

• Assumes single adult focused on the task **Daily pumping time will vary based on quality of well, strength of operator/s, soil / crop type, irrigation method, and environmental conditions.

Option	Application	Weight	Water Interface	Regions used
PORTABLE TREADLE OPTIONS				
Surface Pump	Lifts surface or well water to furrows	17 – 18kg	Inlet hose	**India:** *KB Surface Pump*, **Bangladesh:** *Mobile Treadle Pump*
Superior Surface Pump (prototype**)	Similar to Surface Pump, but less metal used	~ 8kg	Inlet hose	Market testing in **India:** *KB Superior Surface Pump*
River Pump	Lifts surface or well water to furrows	8 – 10kg	Inlet hose	**Zambia, Ethiopia Bangladesh:** *Semi-Mobile Treadle Pump*
Plastic Treadle Pump	Lifts surface or well water to furrows	~ 2kg	varies	India, other
Other Local Models	varies	varies	varies	Most
OTHER INNOVATIONS				
Pump raised on a platform	Lifts water to header tanks	See Surface Pump	Inlet hose	Most

*Does not include weight of local materials (Bamboo, Eucalyptus) as these components are typically collected on site, and left on site.
**KB Superior Surface Pump is expected to be available in early 2011

WATER LIFTING

FIXED TREADLE PUMP

SOLUTION SELECTION

DEPTH TO WATER

0 – 7m

OUTPUT PRESSURE

COST OF OWNERSHIP

IRRIGATION CAPACITY

SYSTEM COMPATIBILITIES

- Flood/furrow irrigation
- Manually drilled tube wells

SYSTEM INCOMPATIBILITIES

- Pressurized irrigation systems
- Rivers, ponds, other surface water

The Fixed Treadle Pump is a foot-operated, low-cost option for accessing large quantities of water when the depth to water is less than seven meters. Fixed models are mounted on a well casing and use the casing pipe as the pump support. They are easily installed by a trained well-driller at the time of well installation. Fixed treadle pumps are generally cheaper than portable models, since local materials (like bamboo) can be used for every component except the cylinders.

IDEAL APPLICATIONS

- For depth to water less than 7 meters, this pump is suitable for irrigating fields as large as 1,500 square meters, and is useful for livestock and other domestic water needs
- Can be sold as a package with the installation of a manually-drilled tube well
- Can be used to fill a header tank for drip irrigation if raised on a platform, as long as total lift does not exceed 7 meters
- Foot position can be varied to provide flexibility in stroke and power for users of different heights and weights

Limitations

- Not suitable for irrigating plots located at a higher elevation than the pump outlet
- Treadles on portable and fixed treadle pumps are not connected as is the case on pressure treadle pumps. Gravity, not body weight, is responsible for returning treadles. Therefore, pumping rate is reduced when gravity is insufficient. Adding counterweights to treadles can improve performance.
- Piston cups need replacement after three or four growing cycles, depending upon water quality.

MATERIAL COMPONENTS

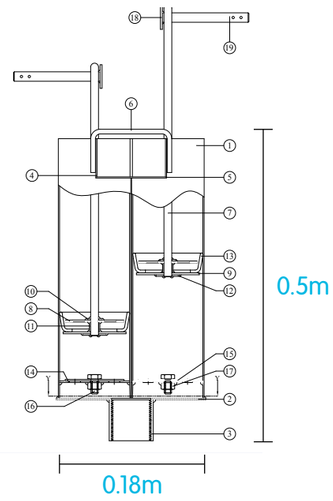
MATERIALS

Steel cylinders. Treadles, frame, and handle are of local materials. Piston cups are rubber or plastic.

OVERALL DIMENSIONS (KB BAMBOO PUMP)

Fully assembled: 1.5m × 2.0m × 0.75m

Pump head only: 0.5m × 0.18m × 0.16m



FIXED TREADLE PUMP OUTPUTS		
Depth to Water	Maximum Water Output* (liters/min)	Daily pumping** to irrigate 200m² (minutes)
1m	90	18 – 25
4m	60	30 – 40
7m	34	50 – 70

• Assumes single adult focused on the task ** Daily pumping time will vary based on quality of well, strength of operator/s, soil / crop type, irrigation method, and environmental conditions.

Option	Application	Weight	Water Interface	Regions used
FIXED TREADLE PUMP OPTIONS				
IDE Bamboo / Eucalyptus Pump	Lifts well water to furrows	3 – 6kg	Attached to tube well	**India:** *KB Bamboo Pump,* **Ethiopia, Bangladesh, Nepal**
Other Local Models	varies	varies	varies	Most
OTHER INNOVATIONS				
Double-cylinder Deep-set Treadle Pump	Two cylinders with very long casings access water down to 18m	NA	Attached to well	Bangladesh
Single-cylinder Deep-set Treadle Pump	Two pistons are used in series to access water down to 12m	NA	Attached to well	Bangladesh

*Does not include weight of local materials (Bamboo, Eucalyptus) as these components are typically collected on site, and left on site.

WATER LIFTING

PRESSURE TREADLE PUMP

SOLUTION SELECTION

DEPTH TO WATER

0 – 7m

OUTPUT PRESSURE

COST OF OWNERSHIP

IRRIGATION CAPACITY

SYSTEM COMPATIBILITIES

- Pressurized irrigation systems
- Manually dug or drilled wells
- Rivers, ponds, other surface water

SYSTEM INCOMPATIBILITIES

- No significant incompatibilities

The Pressure Treadle Pump is a foot-operated option for delivering pressurized water for depth to water less than seven meters. These pumps are especially versatile and can be used for a large variety of irrigating conditions. Most models have an inlet pipe that can be used to draw water from the surface or under ground. Available water output is inversely proportional to the height the pump is lifting the water: the deeper the water, and the higher or further the water is pushed, the less water output is available for the same energy expended.

IDEAL APPLICATIONS

- For depths to water less than 6 meters, can be used for irrigating fields up to 1,000 square meters, and is useful for livestock and other domestic needs
- Can move water to elevations higher than the water source, or along the ground up to 50 meters away from the water source
- Most models are portable, enabling use on larger fields or from multiple water sources
- Can be hooked directly to drive a sprinkler or drip irrigation system, or to fill a header tank for an irrigation system. Can also be used with a hose for spray irrigation.
- Ideal for use with pre-existing natural water sources or irrigation ditches, and where drilling of tube wells is not feasible.

Limitations

- Priming is more difficult than for fixed and portable treadle pumps. When the vertical distance from the pump to water is more than 2 or 3 meters, a check valve may be required at the bottom of inlet pipe.
- Foot positions are not as adjustable as on fixed or portable treadle pumps, allowing less flexibility of stroke and power for users of different heights and weights.
- Precision is required for several pump components, making manufacturing more difficult than for fixed or portable treadle pumps and rope pumps.
- In many models, the piston cups fit tightly, increasing effort required to pump.
- Piston cups need replacement after 3 or 4 growing cycles, depending upon water quality.

MATERIAL COMPONENTS

MATERIALS

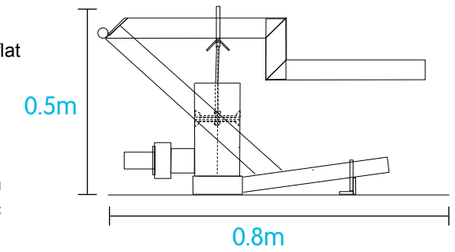
Steel frame and valve box, with treadles of steel, wood or plastic. Handle can be steel or local materials. Piston cups are rubber or plastic.

1.5” rigid inlet hose and 1.5” lay-flat outlet hose recommended.

OVERALL DIMENSIONS (MOSI-O-TUNYA)

With handle: 1.1m × 0.8m × 0.3m

Pump head & frame only: 0.5m × 0.8m × 0.3m



PRESSURE TREADLE PUMP OUTPUTS			
Depth to Water	Maximum Water Output* (liters/min) at 3m pressure	Daily pumping** to irrigate 200m² (minutes)	Available delivery pressure***
1m	80	20 – 30	14m
4m	75	22 – 32	11m
7m	30	55 – 80	8m

• Assumes single adult focused on the task. **Daily pumping time will vary based on quality of well, strength of operator/s, soil / crop type, irrigation method, and environmental conditions. ***Maximum pressure achievable. The more pressure required the lower the water output.

Option	Weight*	Water interface	Regions used
PRESSURE TREADLE PUMP OPTIONS			
IDE Metal Pressure Treadle Pump	17 – 22kg	Inlet hose	**Zambia:** *Mosi-O-Tunya*, **Bangladesh**, **Ethiopia:** *Zamio*
Plastic Pressure Treadle Pump	~10kg	Inlet hose	India, other
Other Local Models	varies	varies	Most

*Does not include weight of local materials (Bamboo, Eucalyptus) as these components are typically collected on site, and left on site.

WATER LIFTING

HAND PISTON PUMP

SOLUTION SELECTION

DEPTH TO WATER

0 – 35m

OUTPUT PRESSURE

COST OF OWNERSHIP

IRRIGATION CAPACITY

SYSTEM COMPATIBILITIES
- Small drip kit or bucket irrigation
- Manually drilled wells

SYSTEM INCOMPATIBILITIES
- Pressurized irrigation systems
- Irrigation for fields > 200m^2

The Hand Piston Pump is a low-cost option for accessing water through the smallest category of drilled boreholes, greatly reducing the expense required to use the well. These pumps work well when water table depth is out of reach of suction pumps—up to 30 or 35 meters. This pump's water output is more suited to domestic water uses, but its cost makes it feasible for ownership in households whose members otherwise might need to walk long distances to access water.

IDEAL APPLICATIONS

- These pumpsbecome a great alternative when well-drilling a 40 mm borehole, and discovering the water table to be out of reach for fixed or portable treadle pumps.
- The 40mm piston pump is best suited for domestic use. Irrigation would be limited to dense agriculture such as seedling nurseries.
- Pump requires only a 40mm diameter well tube. (The rope pump requires a 75mm well tube, which adds significantly to the cost of a well.)
- Pump is designed so that the parts that wear can be easily replaced.
- Suitable for multiple use / shared use for domestic applications.

Limitations

- Water output is not pressurized: water will need to be elevated to use drip or sprinkle irrigation, or will need to be transported to the field.
- Arm power is less efficient than leg power- thus more effort is required per unit water than for a treadle pump. Up-and-down pumping motion is less efficient than a cranking motion, making this pump less efficient than the rope pump.
- For depth to water beyond 30m, this pump will not yield much water.
- Piston rings need periodic replacement.

HAND PISTON PUMP OUTPUTS

Depth to Water	Maximum Water Output* (liters/min)	Daily pumping** to irrigate 200m² (minutes)
10m	12	140 – 200
20m	10	170 – 240
30m	7	240 – 340

• Assumes single adult focused on the task ** Daily pumping hours will vary based on quality of well, strength of operator/s, soil / crop type, irrigation method, and environmental conditions.

WATER LIFTING

ROPE PUMP

SOLUTION SELECTION

DEPTH TO WATER

0 – 35m

OUTPUT PRESSURE

COST OF OWNERSHIP

IRRIGATION CAPACITY

SYSTEM COMPATIBILITIES
- Small Drip Kit or Bucket Irrigation
- Manually Dug or Drilled Wells

SYSTEM INCOMPATIBILITIES
- Pressurized Irrigation Systems
- Well Bores less than 75mm Diameter

The Rope Pump is a hand-operated, low-cost option for accessing water when the water table depth is out of reach of suction pumps, up to 35m. It is made from low-precision parts, making it cheaper, more reliable, and easier to repair than piston pumps. Washers of locally-available material are tied some distance apart along a long loop of rope, which is threaded down into a well and back up through a pipe. As the rope leaves the pipe it passes over a wheel and back down into the well. As the wheel is turned, the washers bring water up in a continuous stream through the pipe.

IDEAL APPLICATIONS

- For depth to water up to 18m, the rope pump can be used for irrigating small plots in addition to other domestic water uses
- For depth to water beyond 18m, the rope pump is best suited for domestic use. Irrigation would be limited to dense agriculture like seedling nurseries
- If the rope pump's drilled well has a casing, it can be sealed to protect the water, as opposed to wells with treadle pumps
- Repairs can be done with local materials, as opposed to many imported piston pumps
- Suitable for multiple use/shared use for domestic applications

Limitations

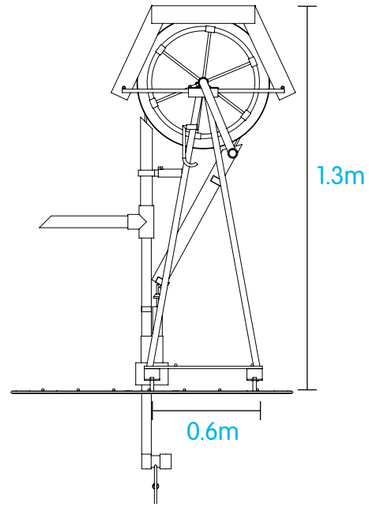
- Water output is not pressurized: water will need to be transported to the field, or be elevated to use drip or sprinkle irrigation.
- Arm power is less efficient than leg power- thus more effort is required per unit water than a treadle pump
- For depth to water beyond 30m, the strength of two operators may be necessary.
- Needs a trained village mechanic to install.
- Rope and washers need periodic replacement

MATERIAL COMPONENTS

MATERIALS
Sheet metal, tire, rebar, PVC handle, rope and washers of local material

OVERALL DIMENSIONS
1.3m × 0.6m

WEIGHT
~15 kg



ROPE PUMP OUTPUTS		
Depth to Water	Maximum Water Output* (liters/min)	Daily pumping** to irrigate 200m² (minutes)
6m	24	70 – 100
9m	18	90 – 130
12m	12	140 – 200
18m	9	180 – 270

• Assumes single adult focused on the task **Daily pumping time will vary based on quality of well, strength of operator/s, soil / crop type, irrigation method, and environmental conditions.

Option	Option Description	Application	Advantages	Limitations	Regions used
ROPE PUMP OPTIONS					
IDE 1" Pump	1" I.D.* pipe and washers	1 – 10m water depth	Smaller pipe diameters enable deeper water access. See "Application" table.	Smaller pipe diameters lessen water output.	Nicaragua, Honduras, Ethiopia, Zambia, India
IDE ¾ " Pump	¾ " I.D. pipe and washers	10 – 20m water depth			
IDE ½ " Pump	½ " I.D. pipe and washers	20 – 35m water depth			
OTHER INNOVATIONS					
Elephant Pump	Two handles, concrete well box.	0 – 35m water depth	Well is sealed, water is protected.	Very large, permanent structure	Various
Practica A – H model	Rope goes straight up and down into a hand-dug well	For hand-dug wells		Need modification for use on 4" well borehole	Various
Alternative power sources	Leverage the power of wind, animals, engines, or bicycle	0 – 35m water depth	Stronger than human arm	More expensive	Various

*I.D. = Inside Diameter

WATER STORAGE

TECHNOLOGY

WATER STORAGE FOR SMALL SCALE FARMERS

Pond Lining Fabrics | Ferro-Cement Lined Tank | Header Bags | Earth Mound Bag | Jumbo Thai Jar

Water storage for small scale irrigation serves two primary purposes:
1. To provide water continuity where water supply is uncertain.
2. To provide pressurized supply to irrigation systems.

In-ground storage products are larger tanks that collect water from low-flow and/or intermittent sources, such as rainfall runoff, springs, or even water trucks. Typically, water is pumped from in-ground storage to header tanks unless site conditions permit a gravity feed to header tanks, or to taps for domestic use.

Header tanks are smaller, and are generally filled on demand to irrigate and monitor the amount of water applied to a field. Header tanks are raised above the field using a platform, frame, or earth mound in order to provide adequate water pressure. For larger irrigation systems, a farmer can pump directly into the irrigation lines, but this can be more challenging when using a manual pump, and it can also conceal the amount of water applied.

SOLUTION SELECTION

CONSIDER THE FOLLOWING BEFORE SELECTING WATER STORAGE SOLUTIONS:

- What is the farmer's rough budget for water storage and irrigation?
- How long might a farmer go without access to water during the crop cycle?
- What is the water requirement for the crop?
- Will delivery pressure be required for irrigation?

Water Storage Solutions	Maximum Water Capacity	Cost of Ownership (for 2 years and 10,000 liters of storage)	Typical Filling Method	Typical Method of Water Access
IN-GROUND STORAGE				
Pond Lining Fabric	●●●●	●○○○	Rain-fed or Spring-fed	Pumped into header tanks; or can gravity feed header tanks or taps for domestic use.
Ferro-cement-lined Tank	●●●○	●●○○	Rain-fed or Spring-fed, or Pumped in.	
Locally-sourced Plastic Tank	●●●○	●●●○		
Cement In-ground Tank	●●●◒	●●●●		
HEADER TANKS				
Header Bag	◒○○○	●○○○	By hand, 1 – 3 times per day	Mounted on frame; gravity feeds drip lines
Earth Mound Bag	●●◒○	●○○○	Manual or motorized pump, or gravity fed by in-ground storage. Can be rain-fed (except earth mound bag).	Generally mounted on a platform, frame, or hill. Gravity feeds drip lines, hoses, or micro-sprinklers.
Jumbo Thai Jar	●◒○○	●●●○		
Water Basket	●○○○	●○○○		
Locally-sourced Plastic Tank	●●●○	●●●●		

Products in colored type have accompanying product sheets

WATER STORAGE

POND LINING FABRICS

SOLUTION SELECTION

COST OF OWNERSHIP

MAXIMUM WATER CAPACITY

FILLING

Rain-fed or spring-fed

EMPTYING

Pumped out or gravity-fed to field or header tank.

SYSTEM COMPATIBILITIES

- Header tank
- Drip or sprinkler irrigation

SYSTEM INCOMPATIBILITIES

- Flood/furrow irrigation
- Manual pumps for filling

Constructing an irrigation pond can be a significant project. If sited and built correctly, ponds can collect intermittent or slow rain and spring water, and save it for irrigation and livestock during dry periods. Challenges with using ponds include insufficient water runoff, evaporation, and water seepage. Pond lining fabrics address water seepage by sealing soils which are naturally too permeable to hold water. Pond lining fabrics are constructed from a ruggedized plastic that withstands the harsh conditions of installation and of everyday use. Ponds can range in capacity from 10,000—200,000 liters for community use ponds, and are typically built one to three meters deep.

IDEAL APPLICATIONS

- Topography, land ownership, and field requirements dictate where a pond can be situated. Most customers place their pond at the lowest land point to catch maximum available run-off. Pumping is then required to move the water to crops.
- Some customers build ponds at an elevation higher than fields, and use gravity to feed water to fields or through irrigation systems.
- Irrigation ponds can provide daily irrigation for crops, but can also serve to get smaller fields through a dry period of up to several weeks.
- Pond lining fabrics can be transported more easily than concrete and cement tank components.
- Repairs can be made locally on HDPE fabrics using tire-repair materials.

Limitations

- Water is unprotected and can become contaminated. Water filters can be used to make drinking water safe.
- Evaporation can be a problem in arid climates, as ponds are difficult or impossible to cover.
- Requires a large parcel of land, with suitable topography.
- Fabric can be damaged by livestock.
- Lifetime expectancy of pond lining fabric is 3 – 5 years.

POND OPTIONS			
Pond capacity	Fabric required	Field size (m²)	Irrigation water supply
50,000 liters	~100m²	1000	10 days
	(32 kg)	2000	5 days
		5000	2 days
200,000 liters	~250m²	2000	20 days
	(80 kg)	5000	8 days
		10,000	4 days

• Assumes use of drip irrigation and 5mm of water per day. Water requirement will vary based on soil and crop type, crop stage, and environmental conditions. For "survival irrigation" through long dry spells, multiply days of water supply x 4. This assumes 1.25mm of water per day.

Option	Material	Region Sourced	Weight (kg/m²)	Relative Cost (same conditions)
POND LINING FABRIC OPTIONS				
IDE India HDPE Pond Lining Fabric	5-layer High Density Polyethylene, with 3% carbon content and 2% UV for ruggedness. 12 X 12 threads per square inch.	IDE India	0.325	
LDPE Pond Lining Fabric	Triple-layered liner with a core of Low Density Polyethylene, which is then coated on both sides with a UV/Rot resistant laminate.	Various	0.25	
Butyl Pond Lining Fabric	0.75 – 1mm sheet of Butyl rubber. Commonly used in tire inner tubes, bladders for sports balls.	Various	0.9 – 1.2	

WATER STORAGE

FERRO-CEMENT LINED TANK

SOLUTION SELECTION

COST OF OWNERSHIP

MAXIMUM WATER CAPACITY

FILLING

Rain-fed, spring-fed, or pumped in.

EMPTYING

Pumped out or gravity-fed to header tank.

SYSTEM COMPATIBILITIES

- Header Tank
- Drip or Sprinkler Irrigation

SYSTEM INCOMPATIBILITIES

- Flood/Furrow Irrigation

Ferro-cement Lined tanks are in-ground storage tanks made of cement and iron wire mesh. They collect water from low flow and/or intermittent sources, and are typically pumped into header tanks for irrigation purposes. If the tank is built at a higher elevation than the field (up a hill, for instance), a pump may not be required to extract the water. These tanks can support daily irrigation of fields up to 2,000 square meters, or can support a smaller field through a dry period.

IDEAL APPLICATIONS

- Can store water from many sources: rain, ground, surface water, even water delivery trucks or other in-ground tanks.
- Supplies water for livestock and/or irrigation systems. Can be pumped into a header tank, or feed a system directly when situated above field.
- Ferro-cement lined tanks can provide daily irrigation for growing crops, but they can also serve to get smaller fields through a dry period of up to several weeks.
- Simple to construct in 7 – 10 days with assistance of local trained mason. Tank repairs can be done with cement and wire mesh.
- A useful component for Multiple Use Water Systems and shared use for domestic applications.

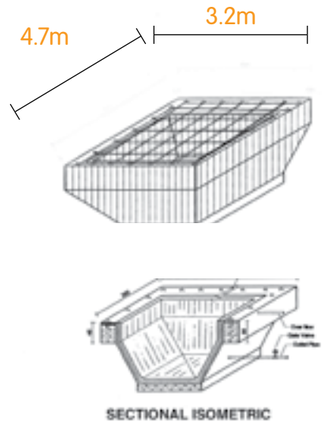
Limitations

- Water is unprotected and can become contaminated. Water filters can be used to make drinking water safe.
- For pressurized water output without use of pump (drip or sprinkler irrigation), tank must be elevated above field.
- Not appropriate for areas with unstable ground or risk of landslides.
- To minimize evaporation, tanks can be covered with plastic or metal.
- Tank should last 15 years, but gate valve may need replacement after 4 – 6 years.

Tank Capacity	Field Size (m^2)	Irrigation Water Supply
FERRO-CEMENT LINED TANK OPTIONS		
6,000 liters	100	12 days
	500	2 days
10,000 liters	100	20 days
	250	8 days
	1000	2 days

• Assumes use of drip irrigation and 5mm of water per day. Water requirement will vary based soil and crop type, crop stage, and environmental conditions. For “survival irrigation” through long dry spells, multiply days of water supply x 4. This assumes 1.25mm of water per day.

Pictured is the 10,000 Liter Tank



MATERIALS

Cement, chicken wire mesh, filter, pipe fittings, wire, corrugated steel, stone, sand

OVERALL DIMENSIONS

6,000 liters: 3.2 × 3.2 × 1.4m
10,000 liters: 3.2 × 4.7 × 1.4m

WATER STORAGE
HEADER BAGS

SOLUTION SELECTION

COST OF OWNERSHIP

MAXIMUM WATER CAPACITY

FILLING
By hand; or a pump with an outlet hose

EMPTYING
Mounted on frame; gravity fed to drip lines

SYSTEM COMPATIBILITIES
- Drip Irrigation

SYSTEM INCOMPATIBILITIES
- Flood/furrow irrigation
- Sprinkler irrigation

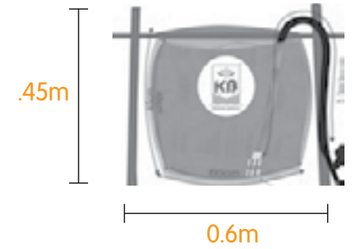
Header bags are used to supply water to a drip irrigation system. They are suspended above field level by a locally-made platform or frame. The higher they are suspended, the greater the pressure that will feed the drip system. Header bags were designed to replace more expensive buckets or tanks, which can be twice as costly. Header bags are also easier to store and ship, as they are made from a collapsible plastic exterior with an interior plastic liner.

IDEAL APPLICATIONS
- Supplies water for smaller drip irrigation systems.
- Construction makes it easy to suspend from a bamboo or eucalyptus frame.
- Very portable and easy to store when not in use.
- Repairs can be made locally using tire repair materials.
- Standard sizes are 25 and 200 liter; other interim sizes can be custom ordered.
- Siphon tube reduces seams in the bag. Filter at end of siphon tube is easy to clean without emptying bag.
- Generally filled by hand from bucket or using siphon tube. If filling with manual pump, pressure or a platform is needed.

Limitations
- Bottom of bag must be elevated at least 0.5 meter (for the 25 liter bag) or 0.75 meter (for the 200 liter bag) above field to operate drip systems.
- Steps or a dirt mound are needed to fill the 200 liter bag.
- Does not hold enough water to effectively operate drip systems larger than 150 – 200m².
- Gravity pressure is not adequate for sprinkler irrigation.
- Bag is open at top, permitting evaporation.
- Lifetime expectancy is 3 years with proper minimal maintenance.

MATERIAL COMPONENTS

MATERIALS
Custom sacking material with HDPE lining, filter, siphon pump



BAG SPECIFICATIONS			
	Siphon / Filling Tubing (sourced locally)	Dimensions (flat bag)	Weight (empty bag)
25 Liter Bag	14mm rigid tubing	0.45 × 0.6m	0.24kg
200 Liter Bag	25mm rigid tubing	1.5 × 0.8m	0.85kg

Bag capacity	Lift Required for Gravity Feed	Field size (m²)	Fillings required per day
BAG OPTIONS			
25 liters Included with 20m² Family Nutrition Kit	0.5m	20m²	2 – 4
200 liters (prototype) will be included in the IDEal Drip Kit 100	0.75m	100m²	1 – 3
	1.0m	200m²	2 – 6

• Assumes use of drip irrigation and maximum 5mm of water per day. Water requirement will vary based soil and crop type, crop stage, and environmental conditions. For “survival irrigation” through long dry spells, multiply days of water supply x 4. This assumes 1.25mm of water per day.

WATER STORAGE

EARTH MOUND BAG

SOLUTION SELECTION

COST OF OWNERSHIP

●○○○

MAXIMUM WATER CAPACITY

●●◒○

FILLING

Pumped in, or gravity-fed by higher storage sources.

EMPTYING

Gravity-fed or to drip lines or hoses.

SYSTEM COMPATIBILITIES

- In-ground storage tank
- Drip irrigation systems

SYSTEM INCOMPATIBILITIES

- Flood/furrow irrigation
- Sprinkler irrigation

Earth mound supported bags supply drip irrigation systems for 1000-2000 square meter plots. These bags can also be used to get smaller fields through dry periods of up to several weeks. They are designed from a rugged plastic to withstand the harsh conditions of installation as well as years of direct sunlight. A pump or hose can fill bags from surface water, wells, or other storage tanks.

IDEAL APPLICATIONS

- A collapsible non-evaporative large storage option.
- Supplies water for drip irrigation systems, and other domestic water uses.
- Multiple bags can be used for larger fields or longer dry spells.
- A good storage solution for slow steady water sources such as a solar pump or a natural spring.
- Can be placed on top of an earthen mound or into a trench.
- Repairs can be made locally using tire repair materials.

Limitations

- Bag must be elevated at least 0.75m above field to operate drip systems.
- Because it is above ground, it can be damaged if handled roughly.
- Typically difficult to install at elevations required by sprinkler irrigation systems.
- Requires a pump or hose for filling. Rope pumps and fixed or portable treadle pumps can be used if elevated above the bag and if fitted with outlet pipe.
- Requires a sizeable parcel of land due to its footprint.
- Lifetime expectancy is 5 years, though release valve may need replacement more regularly.

Bag capacity	Field size (m^2)	Irrigation water supply
EARTH MOUND BAG OPTIONS		
5,000 liters	100	10 days
	250	4 days
	1000	1 day

• Assumes use of drip irrigation and 5mm of water per day. Water requirement will vary based soil and crop type, crop stage, and environmental conditions. For “survival irrigation” through long dry spells, multiply days of water supply x 4. This assumes 1.25mm of water per day.

BAG SPECIFICATIONS

MATERIALS

Geo membrane HDPE with LDPE, carbon infused to provide UV protection. 3” inlet, 2” outlet, 1.5” release valve.

OVERALL DIMENSIONS (LAYING FLAT)

6.2m long × 2.0m wide

WEIGHT

13kg

WATER STORAGE

JUMBO THAI JAR

SOLUTION SELECTION

COST OF OWNERSHIP

●●●○

MAXIMUM WATER CAPACITY

●◒○○

FILLING

Pumped in, rain-fed, or gravity-fed by higher storage sources.

EMPTYING

Gravity-fed or pumped to drip lines, hoses, or micro-sprinklers.

SYSTEM COMPATIBILITIES

- In-ground storage tank
- Drip or sprinkler irrigation
- Pressure treadle or motorized pump

SYSTEM INCOMPATIBILITIES

- Flood/furrow irrigation
- Suction-only treadle pump

Jumbo Thai Jars are large hand-built cement and mesh tanks that provide an affordable and durable water storage solution in areas where water access can be scarce or intermittent. The shape minimizes evaporation and the material minimizes seepage while remaining easy to construct and repair from local materials. Jumbo Thai Jars have a relatively small footprint compared with similarly sized storage options, making them ideal for closely spaced small scale farmers.

IDEAL APPLICATIONS

- Can store water from many sources: rain, ground, surface water, in-ground storage tanks.
- Supplies water for drip irrigation systems, and sprinkler irrigation systems if elevated high enough.
- Simple to construct in 3-5 days with assistance of local trained mason. Repairs can be done with local materials.
- Durable, and can withstand even hailstorms.
- A useful component for Multiple Use Water Systems and shared use for domestic applications.

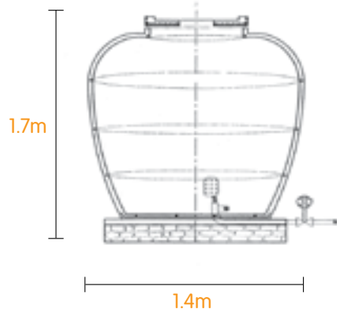
Limitations

- For pressurized water output without using a pump (for drip or sprinklers), tank must be elevated above field.
- Not appropriate for areas with unstable ground or risk of landslides.
- Lifetime expectancy 8-12 years, though gate valve may need replacement or repair more regularly.

Pictured: 1,000 liter Jumbo Thai Jar

Jar capacity	Field size (m²)	Irrigation water supply
JUMBO THAI JAR OPTIONS		
1,000 liters	100	2 days
	250	0.8 day
1,500 liters	100	3 days
	250	1.2 days
3,000 liters	100	6 days
	250	2.4 days
	1000	0.6 day

• Assumes use of drip irrigation and 5mm of water per day. Water requirement will vary based soil and crop type, crop stage, and environmental conditions.
For "survival irrigation" through long dry spells, multiply days of water supply x 4. This assumes 1.25mm of water per day.



MATERIALS

Cement, steel rod, chicken wire mesh, filter, plastic sheet, jute bags. For base: stone, sand, gravel, bamboo, rope.

OVERALL DIMENSIONS

1000 liter: 1.4 × 1.7m
1500 liter: 1.6 × 1.8m
3000 liter: 2.0 × 2.0m

WATER
APPLICATION

TECHNOLOGY

WATER APPLICATION FOR SMALL SCALE FARMERS

Microtube Irrigation | Pre-Punched Drip Tape | Button Emitter Irrigation | Baffle Pre-Punched Drip Irrigation | Sprinkler Irrigation

Choosing the best irrigation method for crops depends on the reliability of water supply, the overall solution budget, whether water can be pressurized, the type and quantity of crops, and the topography of the site. Drip systems offer an efficient method to get each drop of water to a plant's roots. Farmers of lower value crops with reliable water access and flat plots can dig trenches and let the water flow. For hilly sites, mini-sprinklers offer a method to deliver water to crop roots while causing minimal soil erosion.

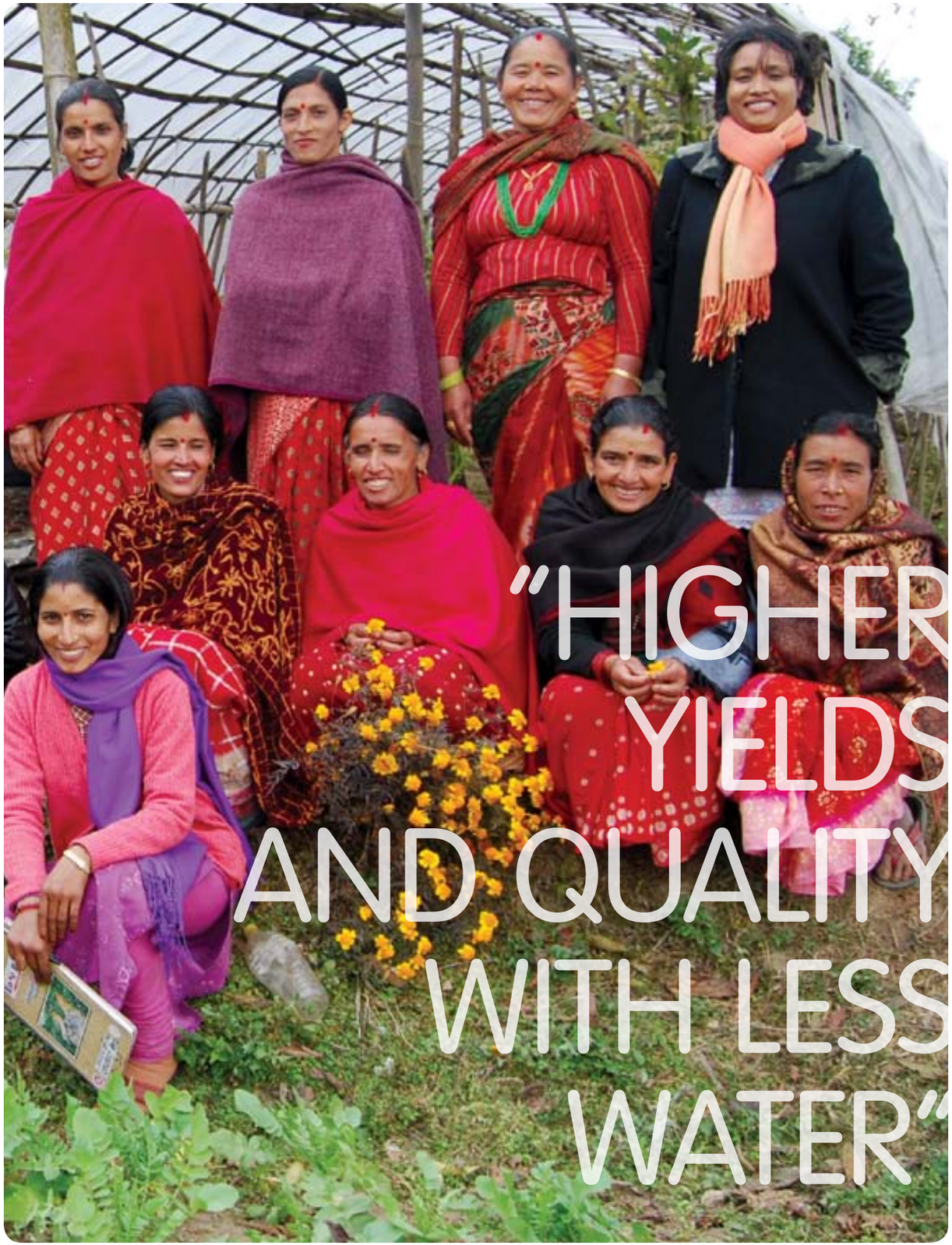
SOLUTION SELECTION

CONSIDER THE FOLLOWING BEFORE SELECTING WATER APPLICATION SOLUTIONS:

- What is the farmer's rough budget for an irrigation solution?
- Is the field flat, hilly, or sloping?
- Is the source of water for irrigation plentiful or scarce during the entire growing season?
- What will be the planting arrangement: rows, paddies, wide beds, seedling nursery? Different arrangements will require varied agronomic practices.
- What is the size of the area needing irrigation? Are the crops high or low value?
- Can the water be pressurized and/or filtered for delivery?

Water Application Solutions	Water Application Efficiency	Pressure operating range (meter head)	Topography*	Ease of installation	Types of crops	Cost of ownership
Microtube Drip Irrigation	●●●○	0.75 – 10m		●○○○	Row crops, orchards, generally high value crops	●●◔○
Pre-punched Drip Tape	●●●○	0.75 – 10m		●●●●	All crops except orchards	●○○○
Button Emitter Irrigation	●●●○	0.75 – 10m		●○○○		●●○○
Baffle Pre-punched Drip Irrigation	●●●○	0.75 – 3m		●●●○		●●◔○
Mini Sprinkler Irrigation	●●●○	5 – 10m		●●●○		●●○○
Impact Sprinkler Irrigation	●●●○	8 – 15m		●●●○		●●○○
Piped Row/Basin Surface Irrigation	●●○○	0.3 – 1m		●●●●		◔○○○
Commercially Available Drip Tape	●●●◔	3 – 10m		●●●●	Row crops, orchards, generally high value crops	●●●●
Flood/Furrow Irrigation	●○○○	0m		NA	All crops	NA

Products in colored type have accompanying product sheets. * All drip lines can be used on terraced plots with proper pressure valves.



WATER APPLICATION

MICROTUBE DRIP IRRIGATION SYSTEMS

SOLUTION SELECTION

COST OF OWNERSHIP

WATER APPLICATION EFFICIENCY

TOPOGRAPHY

CROP TYPES

Row crops, orchards,
Other high value crops

SYSTEM COMPATIBILITIES

- Pressure treadle pump
- Motorized pumps
- Header tank
- Crops in rows

SYSTEM INCOMPATIBILITIES

- Closely spaced crops
- Heavily undulating land
- Unfiltered water with impurities/solids

Microtube drip irrigation systems bring water efficiently to the roots of row crops, trees, and other high value crops. Water pressure is required (the bigger the system, the more pressure needed) but typically a header tank height of 0.75 to three meters is sufficient for gravity feed. Pumps with head pressure of up to 10 meters can also be used. Narrow micro-tubes bring water to the base of each plant from soft flat water lines. Inserting these micro-tubes into the water lines and ensuring that they remain unblocked takes effort; however, the system offers many advantages, including water savings of 30 – 70 percent as compared to traditional surface irrigation methods, improved yield and quality of crops, and reduced irrigation labor.

MATERIALS

- Plastic lay-flat tubing, plastic microtube emitters, screen filter, plastic valves and fittings. Various water header tanks (such as a bucket, header bag, drum, or water basket).

PACKAGED WEIGHT

- Family Nutrition Kit: 0.6kg
- IDEal Drip kit 200: 5.2kg
- Yetagon Drip set: 5.0kg
- IDEal Drip kit 1000: 35kg
- Drip system 1,750: 50kg
- Drip system 7,000: 200kg

MICRO-TUBE DRIP SPECIFICATIONS	
Emitter Flow (at 1m head)	5 liter/hour (20cm long tube)
Emitter Spacing	30 – 60cm typical. Determined by user.
Pressure Operating Range	0.75 – 3m head
Water Filter needed	100 mesh screen filter
Maximum field undulation	3 – 5% slope. Shut-off valves and pressure clamps can be deployed on steeper slopes. Rises no taller than 15 – 20% of total meter head.

INFORMATION

IDEAL APPLICATIONS

- Kits containing required components are available for field sizes up to 1,000m². For field sizes above this, customers purchase multiple kits or components separately.
- Easiest on flat land, but drip lines can be placed along terraced plots.
- Family Nutrition Kits for 20m² gardens, are available at very low price points and can establish family food security and a start to cash crop production.
- Less filtration is required compared to baffle pre-punched irrigation systems.
- Components are easy to repair and replace, and can be rolled up and laid out for multiple crop cycles.
- Reduces weed growth, and spaces between crops remain dry for easy crop access
- Soluble fertilizer and nutrients can be passed through the drip system, increasing irrigation efficiency.

Limitations

- Drip irrigation is not suited for closely spaced crops such as wheat, rice, rape/canola, or seedlings.
- Lateral line length is limited to about 30 meters.
- Microtube drip lines cannot be moved to irrigate additional fields.
- Microtube drip irrigation systems do not regulate pressure, so they do not bring water over rises efficiently, but placing irrigation lines over rises of less than 15 – 20% of operating pressure head is possible.
- Microtube placement becomes cumbersome for plots larger than 1,000m²
- System must be checked frequently for blocked tubes.
- Components typically need replacement after 4 – 6 crop cycles.

Kits	Plot size	Water storage	Number of microtubes	Daily water requirement*	Regions used
MICROTUBE DRIP IRRIGATION OPTIONS					
IDE Family Nutrition Kit	20m²	25 liter header bag or bucket	44	100 liters	**India:** *KB Drip,* **Honduras, Nicaragua**
IDEal Drip kit 100	100m²	200 liter drum or header bag	220	500 liters	**India:** *KB Drip,* **Honduras, Nicaragua**
IDEal Drip kit 200	200m²	500 liter tank or drum	500	1,000 liters	**India:** *KB Drip,* **Honduras, Nicaragua**
Yetagon Drip Set	350m²	950 liter water basket	600	1,750 liters	**Myanmar:** *Proximity Design*
IDEal Drip kit 500	500m²	1,000 liter tank	1,200	2,500 liters	**India:** *KB Drip,* **Honduras, Nicaragua**
IDEal Drip kit 1,000	1,000m²	5,000 liter tank or earth mound bag	2,500	5,000 liters	**India:** *KB Drip,* **Honduras, Nicaragua**
MICROTUBE CUSTOM-BUILT SYSTEM EXAMPLES					
Coffee drip system 1,750	1,750m²	Large tank, well, or surface water	3,000+	8,750 liters	Honduras, Nicaragua
Coffee drip system 7,000	7,000m²	Well or surface water	10 – 15,000	35,000 liters	Honduras, Nicaragua

* Assumes 5mm of water application per day. Will vary based on type of crop and soil, crop stage, as well as climate.

WATER APPLICATION

PRE-PUNCHED DRIP TAPE

SOLUTION SELECTION

COST OF OWNERSHIP

WATER APPLICATION EFFICIENCY

TOPOGRAPHY

CROP TYPES

Row crops, orchard,
Other high-value

SYSTEM COMPATIBILITIES

- Pressure treadle pump
- Header tank
- Motorized pumps
- Crops in rows

SYSTEM INCOMPATIBILITIES

- Closely spaced crops
- Heavily undulating land
- Unfiltered water with impurities/solids

Pre-punched drip tape is a simple technology that offers easier installation and lower cost than systems with button, baffle, or microtube emitters, but with less uniformity in water application. IDE drip tape (KB Drip) is factory punched with 0.9 millimeter holes, with four spacing options available to accommodate different crop types. Water pressure is required but typically a 0.75 – three meter header tank height is sufficient for gravity feed.

IDEAL APPLICATIONS

- Pre-punched drip tape irrigation systems are feasible in plots 20 – 10,000m². The system is purchased by component to fit the plot.
- Suitable for crops planted in rows. The field can slope away from the water source.
- Easiest on flat land, but drip lines can be placed along sloping terraces. Care should be taken not to over water in areas prone to soil erosion.
- Easy to repair and replace, and can be rolled up and laid out for multiple crop cycles.
- Less filtration is required compared to baffle pre-punched irrigation systems.
- Suction-only treadle pumps (fixed or portable) can be used to fill elevated header tanks.
- Soluble fertilizer and nutrients can be passed through the drip kit, increasing application efficiency

Limitations

- Water can be carried only so far down the lateral lines, limiting row length to 20 – 25m.
- Lateral line length is limited to 20 –25m.
- If a pump is used, pressure may be too strong for proper drip function.
- Micro-tube drip irrigation systems do not regulate pressure, so they do not bring water over rises efficiently, but it is possible to move water over rises that are shorter than 10 – 15% of operating pressure head.
- Lines typically need replacement after 2 – 5 years, depending on wall thickness chosen.

Punch Spacing	Wall Thickness
PRE-PUNCHED DRIP TAPE OPTIONS	
30cm	Vegetable crops in sandy soil
45cm	Vegetable crops with 45cm spacing
60cm	Vegetable crops with 60cm spacing
75cm	Vegetable crops with 75cm spacing
100cm	Orchards, widely spaced vegetables
WALL THICKNESS	
125 micron	1 – 3 years useful life
250 micron	3 – 5 years useful life
PACKAGED WEIGHT	
100kg (1 hectare 125 micron system)	

PRE-PUNCHED DRIP TAPE SPECIFICATIONS	
Emitter Flow (at 1 meter head)	6 liters per hour
Hole Spacing	Options: 45, 60, 75, 100cm
Pressure operating range	0.75 – 3 meter head
Water Filtering needed	100 mesh filter
Material	LLDPE and LDPE, carbon loaded for UV protection
Other key system components	Plastic connectors & fittings, sub main lines, water storage
Maximum field topography	2% slope. Shut-off valves and pressure clamps can be used on steeper slopes. Rises no taller than 10 – 15% of total meter head.

WATER APPLICATION

BUTTON EMITTER DRIP IRRIGATION SYSTEMS

SOLUTION SELECTION

COST OF OWNERSHIP

WATER APPLICATION EFFICIENCY

TOPOGRAPHY

CROP TYPES
Row crops, orchard,
Other high-value

SYSTEM COMPATIBILITIES
- Pressure treadle pump
- Header tank
- Motorized pumps
- Crops in rows

SYSTEM INCOMPATIBILITIES
- Closely spaced crops
- Heavily undulating land
- Unfiltered water with impurities/solids

Button emitter drip irrigation systems bring water efficiently to the roots of row crops, trees, and other high-value crops. Water pressure is required to operate the system but typically 0.75 – three meter header tank height is sufficient for gravity feed. Pumps with up to 10m head pressure can also be used. The button emitters are an optional add-on to pre-punched drip irrigation tape, and when installed they direct a steady flow of water to the desired spot. Inserting these button emitters into the water lines and ensuring that they remain unblocked takes effort; however, the system offers many advantages, including water savings of 30 – 70% compared to surface irrigation methods; improved crop yield and quality; and reduced labor.

BUTTON EMITTERS
- Small plastic plug with side channel to direct water flow. Two channel options permit either 3.0 or 4.5 liter / hour water flow.

DRIP TAPE COMPATIBILITY
- 125 micron pre-punched drip tape, 16mm

OTHER COMPONENTS
- 500mm diameter lay-flat sub main, water storage (such as earth mound supported bag)

PACKAGED WEIGHT
- 105kg
(for a 1 hectare system)

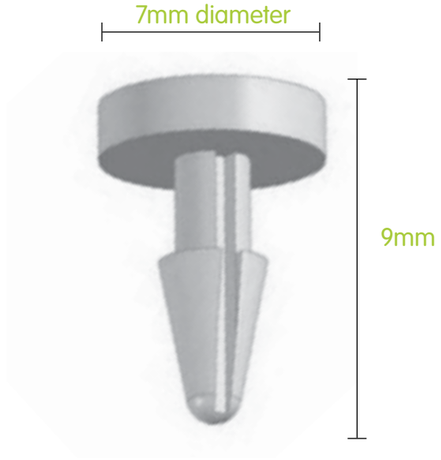
INFORMATION

IDEAL APPLICATIONS
- Button emitter drip systems are feasible in plots ranging from 20 to 10,000m². The system is purchased by component to fit the plot.
- Easiest on flat land, but drip lines can be placed along sloping terraces
- Less filtration required compared to baffle drippers.
- Best to install before planting seeds and seedlings.
- Components are easy to repair and replace, and can be rolled up and laid out for multiple crop cycles. Storage is easier than for systems with micro-tube emitters.
- Reduces weed growth, and spaces between crops remain dry for easy crop access.
- Suction-only treadle pumps (fixed or portable) can be used to fill elevated header tanks.
- Soluble fertilizer and nutrients can be passed through the drip system, increasing application efficiency.

Limitations
- Drip irrigation is not suited for closely spaced crops such as wheat, rice, rape/canola, or seedlings.
- Lateral line length is limited to about 30 meters.
- Micro-tube drip irrigation systems do not regulate pressure, so they do not bring water over rises efficiently, but it is possible to move water over rises that are shorter than 10 – 15% of operating pressure head.
- Emitters are added to pre punched drip tape by hand. This can become cumbersome for plots larger than 1,000m².
- System must be checked frequently for blocked button emitters.
- Button emitter systems typically need replacement after 3 – 4 crop cycles.

BUTTON EMITTER SPECIFICATIONS	
Emitter Flow (at 1 meter head)	Two options: 3.0 and 4.5 liters / hour
Button Spacing	Options: 45, 60, 75, 100cm
Pressure operating range	0.75 – 3 meter head
Water Filtering needed	100 mesh filter
Maximum field undulation	3 – 5% slope. Shut-off valves and pressure clamps can be deployed on steeper slopes. Rises no taller than 15 – 20% of total meter head.

Pictured: the 3.0 liter / hour button.



WATER APPLICATION

BAFFLE PRE-PUNCHED DRIP IRRIGATION SYSTEMS

SOLUTION SELECTION

COST OF OWNERSHIP

WATER APPLICATION EFFICIENCY

TOPOGRAPHY

CROP TYPES
Row crops, orchard,
other high-value crops

SYSTEM COMPATIBILITIES
- Pressure treadle pump
- Header tank
- Crops in rows

SYSTEM INCOMPATIBILITIES
- Closely spaced crops
- Heavily undulating land
- Unfiltered water with impurities/solids

Baffle pre-punched drip irrigation systems bring water efficiently to the roots of row crops, trees, and other high-value crops. Water pressure is required but typically 0.75 – three meter header tank height is sufficient for gravity feed. This product comes assembled with small plastic sleeves, or baffles, which localize water flow from pre-punched holes in the drip lines. Baffle pre-punched drip irrigation can provide water savings of 50 – 70% compared to surface irrigation methods, with improved crop yield and quality and reduced labor.

MATERIALS
Flexible PVC tubing, plastic baffles (sleeves) for holes, screen and nylon filters, plastic valves and fittings. Water storage (plastic drum).

BAFFLE PRE-PUNCHED DRIP SPECIFICATIONS	
Emitter flow (at 1 meter head)	2 – 2.5 liter / hour
Emitter spacing	60cm standard (other spacing can be custom-ordered)
Pressure operating range	0.75 – 3.0 meter head
Water filter needed	2mm screen filter + 2 x 100 mesh nylon filter at head tank
Maximum field undulation	3 – 5 percent slope. Shut-off valves and pressure clamps can be deployed on steeper slopes. Rises no taller than 10 – 15 percent of total meter head.

INFORMATION

IDEAL APPLICATIONS
- Kits containing required components are available for field sizes up to 500 m². For field sizes above this, customers purchase multiple kits or purchase components separately.
- Easiest on flat land, but drip lines can be placed along sloping terraces (see photo)
- System can be shifted to accommodate larger fields
- Quicker to install than micro-tube drip systems
- Components are easy to repair and replace, and can be rolled up and laid out for multiple crop cycles.
- Reduces weed growth, and spaces between crops remain dry for easy crop access.
- Soluble fertilizer and nutrients can be passed through the drip kit, increasing application efficiency

Limitations
- Drip irrigation is not suited for closely spaced crops such as wheat, rice, rape/canola, or seedlings.
- Only one emitter spacing is available, except by special order.
- Drip systems such as this one do not regulate pressure, so they do not bring water over rises efficiently, but it is possible to move water over rises that are shorter than 10 – 15 percent of operating pressure head.
- System must be checked frequently for blocked baffle emitters, which can clog easier than micro-tubes.
- Components typically need replacement after 5 years

Kits	Field size	Water drum capacity	Pressure operating range (meter head)	Number of baffle drippers	Daily water requirement*	Packaged weight		Regions currently used
						with drum	without drum	
BAFFLE DRIP KIT OPTIONS								
Baffle System – Very small	80m²	50 liter	0.75 – 1.2m	80	320 liters	3.2kg	2.2kg	Nepal
Baffle System – small	125m²	50 liter	0.75 – 1.2m	120	500 liters	4.3kg	3.3kg	Nepal
Baffle System – medium	190m²	50 liter	1.0 – 1.5m	160	760 liters	5.2kg	4.2kg	Nepal
Baffle System – large	250m²	100 liter	1.5 – 2.0m	240	1,000 liters	8.3kg	6.5kg	Nepal
Baffle System – Very large	500m²	100 liter	2.0 – 3.0m	480	2,000 liters	14.0kg	12.3kg	Nepal

• Assumes 4mm of water application per day. Will vary based on type of crop and soil, crop stage, and climate.

WATER APPLICATION

MINI SPRINKLER IRRIGATION SYSTEMS

SOLUTION SELECTION

COST OF OWNERSHIP

WATER APPLICATION EFFICIENCY

TOPOGRAPHY

CROP TYPES

All crops except orchards

SYSTEM COMPATIBILITIES

- Pressure Treadle Pump
- Feeder tank or pond
- Motorized pumps
- Closely spaced crops
- Heavily undulating land

SYSTEM INCOMPATIBILITIES

- Suction-only treadle pump

Sprinkler Irrigation Systems are a good option for closely-spaced crops in areas of water scarcity where surface flooding is not an option. They can also bring water to the roots of crops that are on inclined or undulating fields. Sprinklers can be shifted to different locations to irrigate larger fields, or alternatively higher pressure casts a wider irrigation circle. Mini sprinklers are ideal for use with pressure treadle pumps, and their relatively low flow allows them to be used in erosion-prone areas where higher-flow sprinklers like impact sprinklers would not work.

IDEAL APPLICATIONS

- Bring water to roots of closely spaced plants where flood-irrigation is not desired.
- Can irrigate on sloping and undulating fields, but lower flow sprinklers are a better option where soil is prone to erosion.
- These sprinklers can irrigate crops of medium height, up to approximately 0.5m.
- Some sprinkler systems come in kits, while other are purchased by component to fit the plot.
- Systems smaller than 2,000 m² can be operated using a Pressure Treadle Pump.
- Minimizes soil erosion in sloping areas.

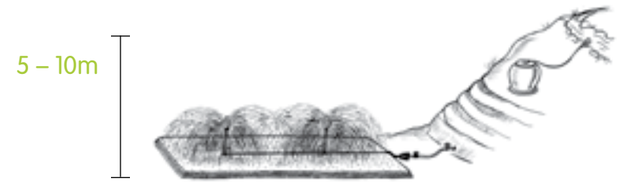
Limitations

- Filtration required, but not as much as for drip systems.
- More pressure is required than for drip lines – 5-10m, as opposed to 0.75-3m for drip systems.
- Application uniformity is influenced by wind direction and water pressure.
- Entire field is wetted: more difficult crop access and higher weed growth than for drip systems. And, wetting of crop leaves can lead to fungal growth.
- Sprinklers may require multiple shifts to cover ground, which can mean more labor than for drip systems
- Not efficient use of water for widely spaced plants such as orchards, and cannot be used for tall crops such as sugarcane or bamboo.
- Expected lifespan is 3-4 years

MATERIAL COMPONENTS

MINI SPRINKLERS		
Operating Pressure (meter head)	Sprinkler spacing	Water flow per sprinkler
5m	4.0m x 4.0m	120 liter / hr
8m	5.0m x 5.0m	150 liter / hr
10m	5.5m x 5.5m	170 liter / hr

SPRINKLER SYSTEM COMPONENTS	
Sprinkler heads	Plastic spinner head: 45 x 60mm
Stakes	Plastic or other local material (bamboo)
Feeder lines	Lay flat tubing (25mm dia, 500 micron for KB Rain)
Other components	Plastic valves, filters (100 mesh), and connectors.



Field size	Number of mini sprinklers	Number of shifts required	Daily water requirement	Packaged weight of system
MINI-SPRINKLER SYSTEM SCENARIOS				
200m²	12	No shifting	1,400 liters	3.5kg
800m²	25	0ne shift	5,600 liters	6kg
* Assumes 7mm of water application per day. Will vary based on type of crop and soil, crop stage, climate.				

WATER APPLICATION

IMPACT SPRINKLER IRRIGATION SYSTEMS

SOLUTION SELECTION

COST OF OWNERSHIP

WATER APPLICATION EFFICIENCY

TOPOGRAPHY

CROP TYPES

All crops except orchards

SYSTEM COMPATIBILITIES

- Tank or pond
- Motorized pumps
- Closely spaced crops

SYSTEM INCOMPATIBILITIES

- Suction-only treadle pump
- Pressure Treadle Pump
- Heavily undulating land

Low pressure Impact sprinklers are powered by motorized pumps. They have a high discharge with a greater throw diameter than mini sprinklers at same pressure head, so are suitable for larger fields of closely-spaced crops, where water scarcity prohibits flood irrigation. They are also a good option on lightly undulating fields where drip systems and flood irrigation are not feasible, but cast off too much water for heavily undulating land. Impact sprinklers can be easily shifted to different locations to irrigate larger fields.

IDEAL APPLICATIONS

- Brings water to roots of closely spaced plants where flood-irrigation is not desired.
- Can irrigate on sloping and undulating fields, but not where soil is prone to erosion.
- These sprinklers can irrigate crops of medium height, up to approximately 0.5m.
- KB Rain's metal tripod and quick-couplers make shifting an easier operation than with mini sprinklers.
- Sprinkler systems are purchased by component to fit the plot.

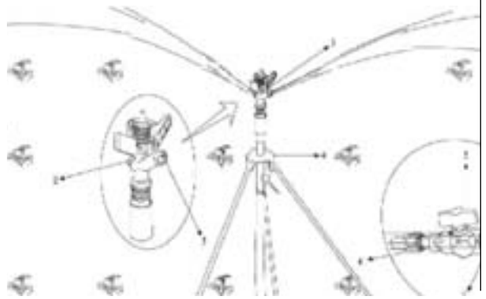
Limitations

- Water must be filtered, but not as much as for drip systems or micro/mini sprinklers.
- In cases where soil erosion is a risk, drip irrigation may be the better choice.
- Significantly more water pressure is required than for drip systems and for mini sprinklers.
- Application uniformity is influenced by wind direction and water pressure.
- Entire field is wetted: more difficult crop access and higher weed growth than for drip systems. And, wetting of crop leaves can lead to fungal growth.
- Not an efficient use of water for widely spaced plants such as tomatoes, orchards.
- Expected lifespan 10 years for impact sprinklers.

MATERIAL COMPONENTS

IMPACT SPRINKLER SYSTEM		
Sprinkler spacing	Operating pressure (meter head)	Water flow per sprinkler
12m X 8m	8 – 12	1,250 liter / hr (at 10 m head)

SPRINKLER SYSTEM COMPONENTS	
Sprinkler heads	Metal rotary impact head: 150mm x 95mm
Feeder lines	Main lines (50mm dia, 900 micron for KB Rain) Lateral lines (25mm dia, 500 micron for KB Rain)
Other components	Filters, stakes, and plastic connectors and valves for all sprinkler systems. For KB Rain: metal tripod stands and plastic quick couplers.



Field size	Number of impact sprinklers	Number of shifts required	Daily water requirement	Packaged weight of system
IMPACT SPRINKLER (KB RAIN) SCENARIOS				
1,000m²	5	2	7,000 liters	35kg
2,000m²	10	2	14,000 liters	60kg
10,000m²	50	2	70,000 liters	200kg
• Assumes 7 mm of water application per day. Will vary based on type of crop and soil, crop stage, climate.				

GROUNDWATER ACCESS

TECHNOLOGY

GROUNDWATER ACCESS FOR SMALL SCALE FARMERS

After rain, the most convenient sources of water for irrigation are rivers and ponds. But when these surface sources are seasonal or not easily accessible, groundwater becomes a fundamental part of the crop production equation. Rainwater catchment is insufficient for larger fields or for dry periods longer than a few days. **Mechanically drilled wells** are expensive and are often not available for rural small scale farmers.

Manual well digging is done in many parts of the world today. Unlined hand-dug wells are simple to construct, and can be useful in low yielding aquifers as they also provide day-long storage. Lined hand-dug wells may overcome problems with collapsing walls and low yield, but are much more expensive than unlined wells and in many cases unaffordable for small scale farmers.

Manual well drilling provides the best of drilled wells with the affordability of manual dug wells. A decision on which drilling technique to use depends on soil type, likely depth to groundwater, amount of water needing extraction, intended uses for the water, and access to skilled labor. Data should be collected and analyzed to identify favorable zones for manual drilling.

PRACTICA FOUNDATION

IDE and its collaborator, PRACTICA Foundation, recently evaluated feasibility of manual well-drilling in Ethiopia. PRACTICA's mission is to facilitate research, development, and commercial application of technology in the fields of water and energy in developing countries. For more information on PRACTICA visit www.practicafoundation.nl. The following table summarizes options in accessing groundwater, and for those manual drilling options for small scale farmers, the links will take you directly to our partner's copious materials on this technology.

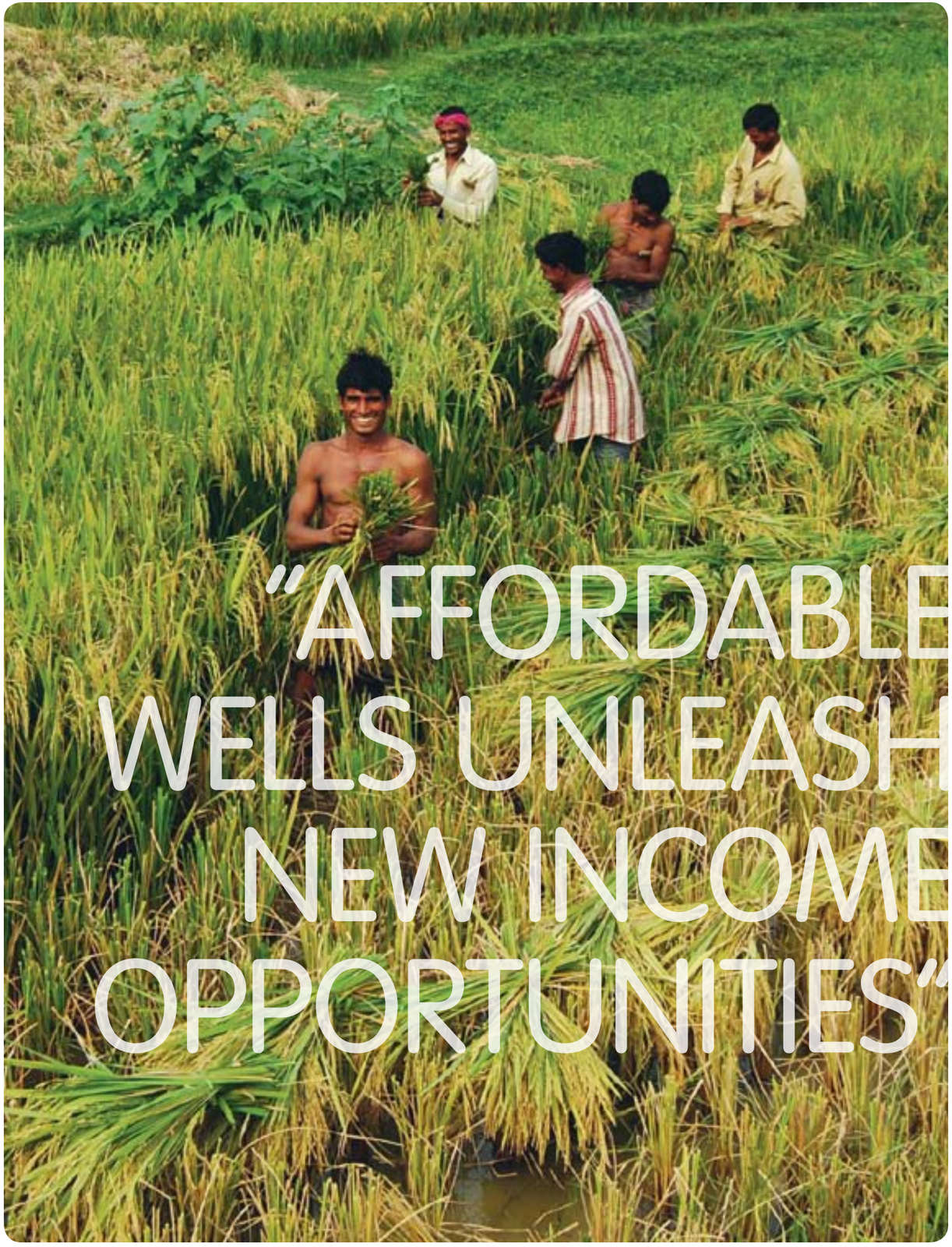
SOLUTION SELECTION

CONSIDER THE FOLLOWING BEFORE SELECTING GROUNDWATER ACCESS SOLUTIONS:

- What will be the uses and demand for the water?
- If used for irrigation, what is the farmer customer's rough budget for an irrigation solution?
- How will the customer be lifting the water?
- What soil layers are likely present in the area?
- What depth will the water tables likely be in the area?

Groundwater Access Solutions	Average drilling depth	Skill required or equipment required?	Toughest geological application	Potential yield	Cost per 30 meters
MANUAL DRILLING					
Hand Augering	15 – 25m	●●○○	Sand, silt, soft clay	●●●○	●●◒○
Sludging	35m	●●○○	Consolidated formations	●●●○	●●◒○
Jetting	35 – 45m	●●○○	Sand, silt, soft clay	●●●○	●●◒○
Percussion	25m	●●○○	Weathered rock	●●●○	●●◒○
MANUAL DRILLING					
Hand Digging - Unlined	10 – 20m	●○○○	Consolidated formations	●○○○	●○○○
Hand Digging - Lined	10 – 30m	●●●○		●●○○	●●●◒
MECHANICAL DRILLING					
	50 – 150m	●●●●	Nearly any geological formation	●●●●	●●●●

Products in colored type have accompanying product sheets



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