HYDROPOWER WATER PUMP

A SUSTAINABLE IRRIGATION SOLUTION IN THE APPLE VALUE CHAIN OF HIMACHAL PRADESH

Green Innovation Centres for the Agriculture and Food Sector – India

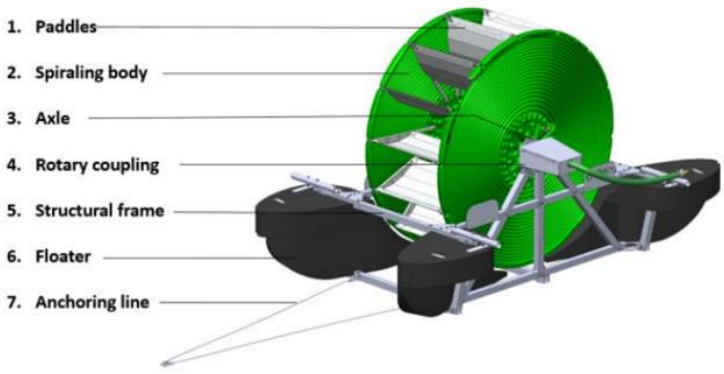
1 Background

Apple is the principal cash crop of Himachal Pradesh grown products in the districts of Shimla, Kinnaur, Kullu, Mandi, Chamba and some parts of Sirmaur and Lahaul-Spiti. Its average annual production reaches five lakh tons and 8 to 10 tons per hectare. The apple cultivation constitutes 49 percent of the total area under fruit crops and 85% of total fruit production in the state with an estimated economy of ₹3500 crore. This sector involves around 1.5 lakh families and provides gainful employment to thousands of people in the region. The Agricultural and Processed Food Products Export Development Authority (APEDA) refers to Himachal Pradesh as “the fruit bowl of the Nation”. Apple crops need a certain degree of moisture content in the soil. Most apple orchards are in hilly terrain where irrigation facilities are not adequate or completely non-existent. Uniform distribution of rainfall and irrigation during critical periods is needed for the better growth of apples as the fruit requires about 114 cm of water during the whole year. Most orchards depend on natural conditions (without irrigation) for their crop. However, rainfall became increasingly volatile in recent years due to the global climate change. Lack of irrigation is a major problem for farmers in the state which eventually results in lower productivity.

Therefore, access to irrigation is the key to ensure that apple value chains become more independent from weather conditions. So far, this challenge is mainly being tackled by CO_2-polluting fuel pumps in boreholes that are draining Indian groundwater levels over the long-term. Innovative and sustainable solutions are needed to overcome this challenge.

2 The Barsha pump

One solution is the Barsha hydro pump, a water-wheel propelled pump that uses energy from flowing water to lift water to an elevation without the need for any external sources of energy. The pump works on the spiral pumping principle, where air is compressed in between water columns and the resulting pressure helps lift water without the need for any active mechanical parts. As a result, such pumps require virtually no



maintenance, making it perfectly suitable for application in remote areas. The hydro pump does not need any fuel or electricity to be operated, thus it does not involve any operating expenses, nor does it emit any polluting greenhouse gases. Furthermore, it does not create any noise, oil spills or causes harm to aquatic life.

In geographically feasible areas of implementation, the hydro pump provides the most cost-effective alternative over its lifetime compared to other conventional irrigation techniques.

Other renewable energy pumping technologies such as solar or wind are more difficult to operate and maintain as the hydro pump which has no electrical or electronic components and up to 2 times lower capital costs. In addition, hydropower is a much more reliable source of energy as it is available 24/7, unlike solar or wind, which can fluctuate based on daily weather conditions.

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- Virtually no maintenance and repair due to few moving parts and no electronic components
- Less capital intensive than competing renewable energy pumping technologies, due to 24/7 capacity factor
- Does not drain groundwater levels and withdraws sustainable water amounts from river
- No need to convert into electricity and back to a mechanical action. More cost efficient than any other energy source for pumping
- No fuel or electricity is required
- No emission of polluting greenhouse gases

3 Technical details of the pump

River floating hydropower water pump		
Parameters		**Values**
[Pipe size: -1.5 inches (40 mm) for distance greater than 200 meters -1.25 inch (32 mm) otherwise]	Max. Height	20 meters
	Max. Distance	2 Kilometres
	Max. Flow rate	0.5 liters / second 40,000 liters per day
Input conditions required	Min. width required	160 cm
	Min. depth required	30 cm
	Min. speed required	1m/s
	Min. flow rate required	300 litres/second
Dimension	Width	155cm

	Length	286cm
	Height	159cm
	Weight	92kg

Cost savings

Hydro-powered pumping is the most cost-effective irrigation technology in geographically feasible areas (FAO). The Barsha Pump allows for up to 70% overall savings compared to diesel pumping and electrical pumping considering infrastructure, operating and maintenance costs. It can payback itself in 3 to 4 years for farmers switching from diesel or electric pumps.

Simplicity

The Barsha Pump is simple to maintain and repair, as there are no electronic components, and it's ideal for rural farm settings. The system is relatively easy to use, and regular maintenance at the beginning/end of an irrigation season can easily be performed by the farmers, which translates into a significant reduction in costs.

Environmental friendliness

The system employs renewable energy as a source of energy for propulsion. The Barsha Pump is completely integrated in the river/stream/canal and it does not harm the environment, also allowing to significantly reduce the energy footprint compared to electric and fuel pumps.