

# Improving traditional water mills

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Nepal is a mountainous country and Kavre district in the central region is blessed with many perennial streams, rivulets and rivers. Traditional water mills, called *ghattas*, are located along the banks of these streams and rivers and have been an important part of farmer's life for centuries. The *ghattas* use the energy of the flowing water to grind food grains and more than 700 traditional water mills are still operating in the district. In the absence of water mills, farmers have traditionally relied on the hand-operated stone grinders, called *jnatos*, which are present in every household.

Over time, however, the processing needs of farmers have increased and the low-efficiency traditional mills are rapidly being replaced by larger diesel mills. The diesel mills increase the dependency of the communities on imported machinery and diesel oil, reducing their self-reliance. In addition, the diesel fumes pollute the local environment. To counteract this negative development, an initiative was taken in the early 1990s to improve the traditional water mills in the district, to help develop efficient energy services for the grain millers and local farming communities.



Photo: CRT/N

A woman collecting her grain from an improved water mill.

The traditional water mills are improved using mainly local materials and the skills of village craftsmen. The main improvement is the replacement of the wooden runners and shafts with more durable and better designed metal parts. With exception of the metal parts, the other parts of the water mill such as stone grinder, canal and intake remain unchanged in the improved design. This strategy has helped interested entrepreneurs to improve their traditional mills with limited investments.

## Improved water mills

The first improved water mill was established in Panauti village, Kavre district, with assistance of *Centre for Rural Technology, Nepal* (CRT/N), supported by *German Appropriate Technology Exchange* and GTZ for the period 1991-1993. The efficient processing resulting from the improved mill has been a source of pride for the miller as well as for the farming communities who make use of the mill's grinding services. This first mill therefore had a significant demonstration effect and influenced other traditional water millers in the area. The traditional water mills are an indigenous technology and have been in operation for centuries, but the millers appreciated the increased efficiency and reduced effort in operations and maintenance that the improved mill has to offer.

The project established linkages with traditional water millers, organized orientation and demonstration activities for awareness creation, undertook feasibility surveys, organized trainings for skill development, and assisted in supplying the metal runners, as well as assisting with the installation of the improvements. Due to the positive demonstration effects, 16 improved water mills were installed in Kavre district during the project period, without any direct subsidy to the millers for the purchase of hardware.

The improvement of the water mills has led to increased income and improved grinding capacity for the millers, but it has also benefited the local farming communities, especially women, as their grains (maize, millet, wheat etc.) are now processed more quickly and efficiently, saving valuable time. Each mill serves 30 - 50 households and the improvements have doubled, or in some cases, even tripled the mill's grinding capacity. The power output now ranges from one to three kW and the grinding capacity is between 20 - 50 kg maize per hour. Repair and maintenance requirements are substantially reduced and the life span of the improved parts has increased to around 10 years compared with two to three years for the traditional wooden parts.

Demand for improved water mills in Kavre district from millers as well as users has continued to increase. In one village, Dhunkharka, all of the around 35 traditional water millers have now improved their mills. Mr. Sapta Man Shrestha, a local water mill owner, has been instrumental in this process. He has not only motivated the local millers but has also assisted them in procuring the metal runners from the workshop, transporting them to the site and installing them. Because of his efforts, he is now known in the village as *Ghatta Naike* or "leader of the water millers".

## Diversified end uses

In 1996, with the improved *ghattas* well established, the project undertook a number of orientation and demonstration activities on new end uses which could make use of the increased amount of energy now available, such as paddy hulling, oil expelling, saw milling and electricity generation. As there are many paddy fields in the district, a number of millers have added paddy hullers to their water mills. In the second phase of the GTZ-supported water mill improvement programme (1996 - 1999), there were about 39 improved water mills for grain grinding and about eight mills that also carried out paddy hulling in Kavre district. The paddy hullers, requiring at least two kW power, process about 50 - 70 kg paddy per hour. The attachment of paddy hullers to the improved water mills has increased the income of the millers as well as enhanced processing services to the community, reducing their drudgery substantially. In the absence of paddy hulling units, the farmers have to rely on a hand- and foot-operated hulling unit, locally called *dhiki*, or alternatively carry the grain long distances to access diesel mills.

Electrification of farm communities is another important end use of the improved water mills. Although there is a high demand for this service, so far only a few improved water mills have been used for producing electricity in the district, the main reason being the comparatively high investment needed for the generator and other equipment. The improved water mill belonging to Mr. Nir Bahadur Tamang in Pipaltar village was fitted with an electricity generator with a capacity of two kW on the initiative of the whole community. It provides electricity to 53 households and the electricity has made it possible to



Installation of a paddy huller.

increase and enhance evening activities. Before the electricity they depended on kerosene lamps that emitted noxious fumes. 30 percent of the cost of the electricity generator was subsidized by the project and the 53 benefiting households shared the remaining costs. Each household also pays a contribution for the electricity each month, which is used primarily for maintenance.

### Institutionalization

Although local water mill owners were actively participating in the improvement of traditional water mills in Kavre district, a number of issues arose that required larger scale, long-term solutions. Examples of such issues include the procurement of metal runners, water rights, financing, the quality of installation, and development of local capability for maintenance. The mill owners were therefore assisted by the project to organize themselves. First, the *Ghatta Owners' Groups* were formed at river basin level and then the *Ghatta Owners' Association* was formed at the district level. In Kavre district there are now 13 *Ghatta Owners' Groups* and the *Ghatta Owners' Association* in Kavre, formally registered with the district government administration, presently has 450 members.

### Scaling up the water mill improvements

The *Ghatta Owners' Association* in Kavre has played an instrumental role in intensifying the water mill improvement activities locally. Its activities were further enhanced through the support of the *National Improved Water Mill Support Programme* established in 2002. The programme aims to establish 4000 units of improved water mills throughout Nepal by 2007. The *Ghatta Owners' Association* in Kavre has been recognized as the district level Service Centre, responsible for providing technical services to the millers as well as undertaking the water mill improvement activities under the new programme. An attractive part of the programme is the direct subsidy; about 50 percent of the improvement cost is made available to the millers through the programme. Because of the support available, the water mill improvement activities are being scaled up substantially in the district and so far, about 238 traditional water mills have been improved as part of the current programme.

In total, 301 water mills have now been improved to provide more efficient energy services to the farm communities. These units provide energy to about 12 000 farm households to process about 25 000 tons of maize and 1500 tons of paddy annually. The improved mills have also helped to limit the establishment of diesel mills.

### Towards integrated energy services

Although water mill improvement activities have substantially helped to meet the agro-processing needs of local farm communities, other energy needs like cooking food, heating water, drying farm products and irrigating the farms, are still to be met. A pilot activity has therefore been initiated in Charangipedi village with the aim of introducing other environmentally friendly renewable energy technologies such as improved cookstoves, beehive briquettes, biogas plants, solar cookers, solar dryers, local water harvesting systems, and drip irrigation in an integrated manner. The effort is a co-operation between the *Ghatta Owners' Association* in Kavre, local service providers, mill owners, community members and CRT/N. The improved water mills programme that is presently being implemented has set aside some resources to undertake these kinds of integrated energy activities in the district on a pilot scale. Such integrated energy services will help the local farm communities fulfill their energy needs and thereby improve their livelihoods.

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