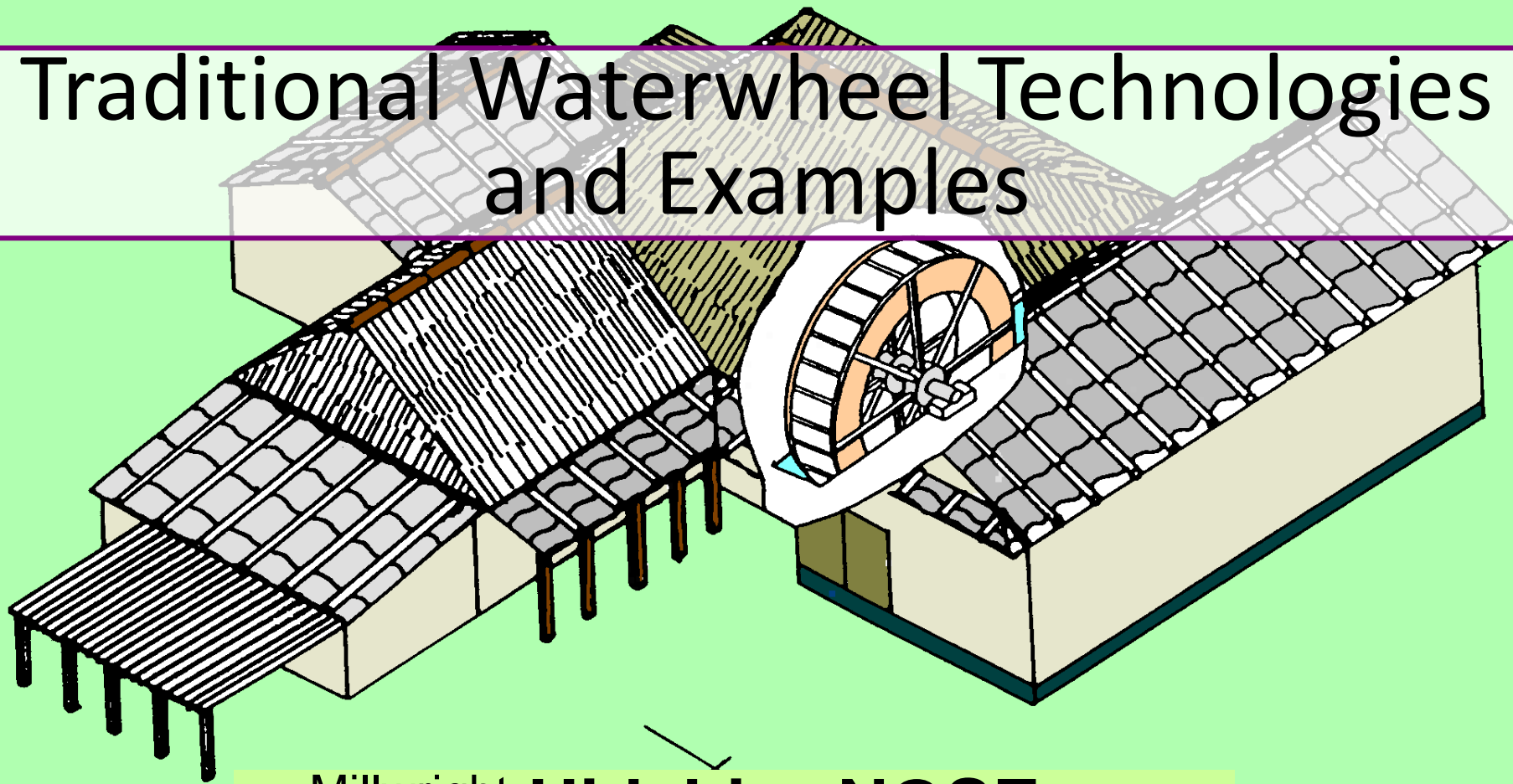


Traditional Waterwheel Technologies and Examples



Millwright

Hidehiro NOSE

NOSE KENSETSU CO.

Photos and Figures
offered by Prof. Dr. Hiroshi IKEMORI & Hiroshi MIZUNO

Importance of Waterwheel

Environmentally Friendly Technology

Waterwheel has two types, one is to harness water currency and the other is to pump water with manpower

- **Wooden Waterwheel is easy to build and re-build by environmentally friendly process**
- **Uses river water without affecting environment**
- **Easy to build by acquiring proper knowledge**
- **Waterwheel produces power in a place where it is needed**
- **Waterwheel can be built with locally available materials, local tools and local constructors**

The Historical Processes of Waterwheel as power in Japan

Roles of Waterwheel

- Rice field Irrigations, rice polishing and flour milling(flour and buckwheat)
- Oil squeezing (rapeseed oil and cotton oil)
- Brewing, mining sites and production of cannons
- Cotton-spinning in the Meiji era

The most popular era: Period of the end of Edo era to the beginning of Showa era(about 100 years)

Large-scale waterwheels



Overshot wheel for polishing rices.
14m in dia. Built in 1992

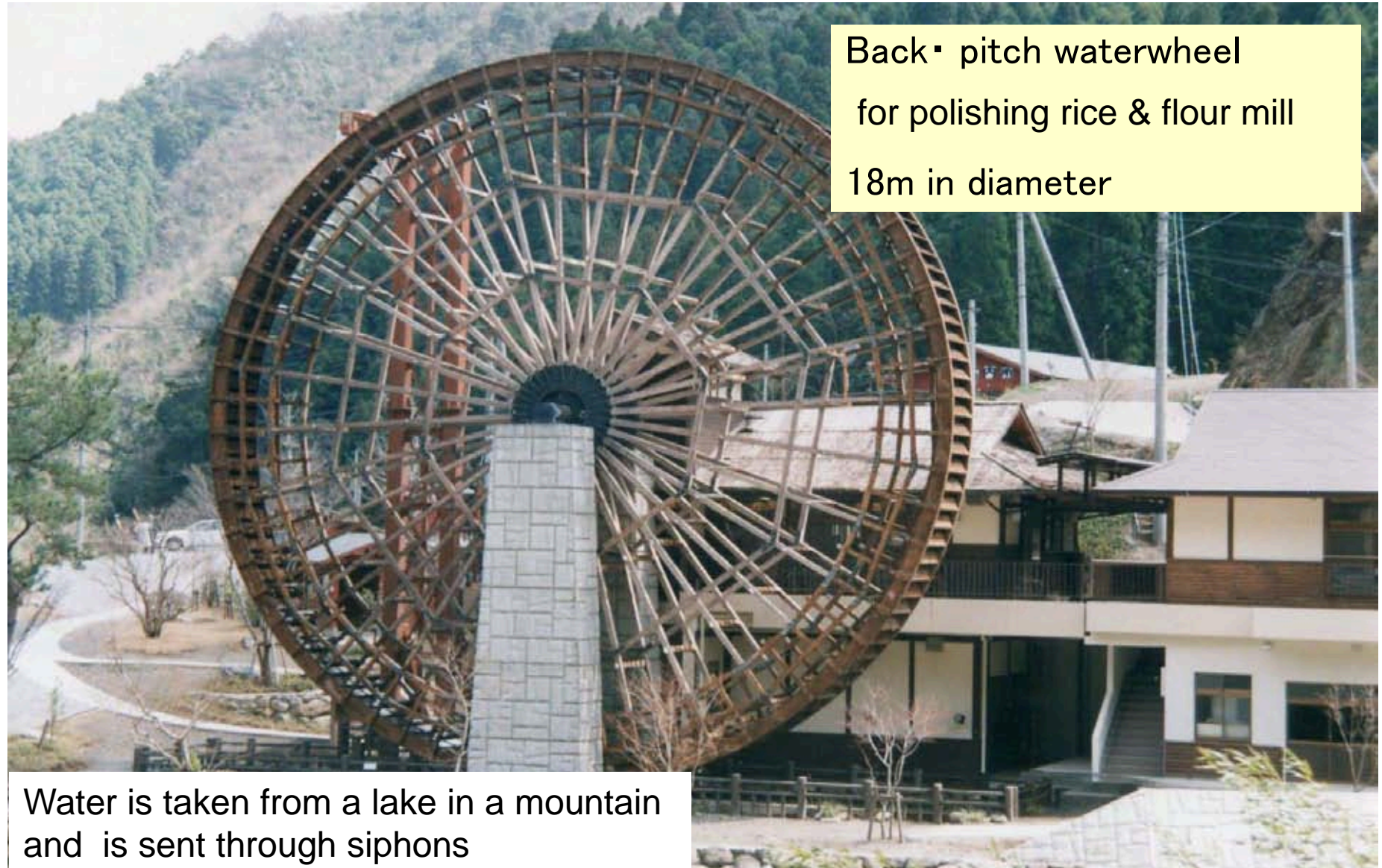


Back-pitch wheel for polishing rices &
flour mill. 18m in dia. Built in 1993

Waterwheels for Rice Polishing (18 diammm)

(Built in 1993 and in operation now)

Back-pitch waterwheel
for polishing rice & flour mill
18m in diameter

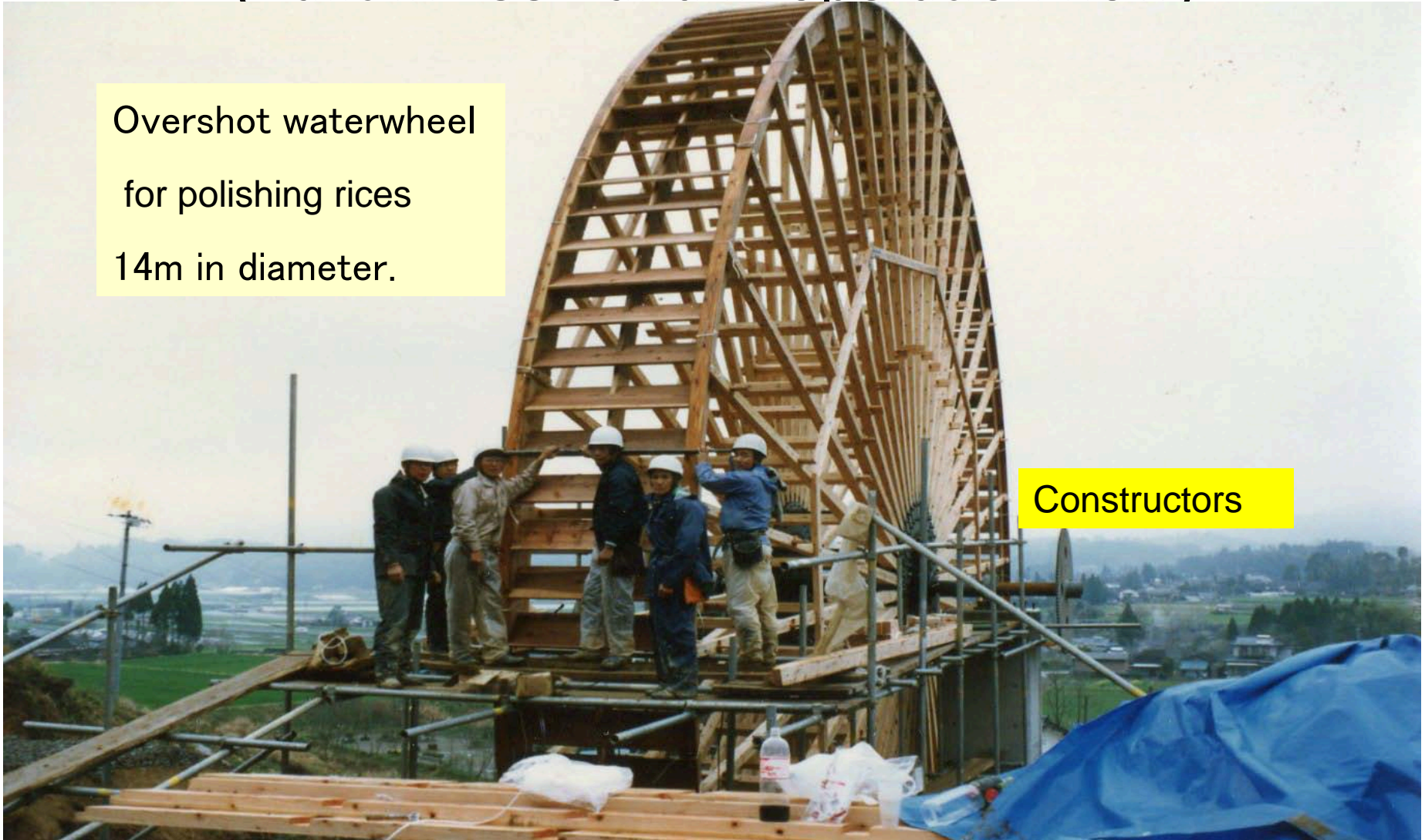


Water is taken from a lake in a mountain
and is sent through siphons

Building 14 m Diam. Overshot Waterwheels for Rice Polishing (Built in 1992 and in operation now)

Overshot waterwheel
for polishing rices
14m in diameter.

Constructors



Reconstruction of ninety-year waterwheel for an incense factory and waterwheel is rebuilt in indoor space

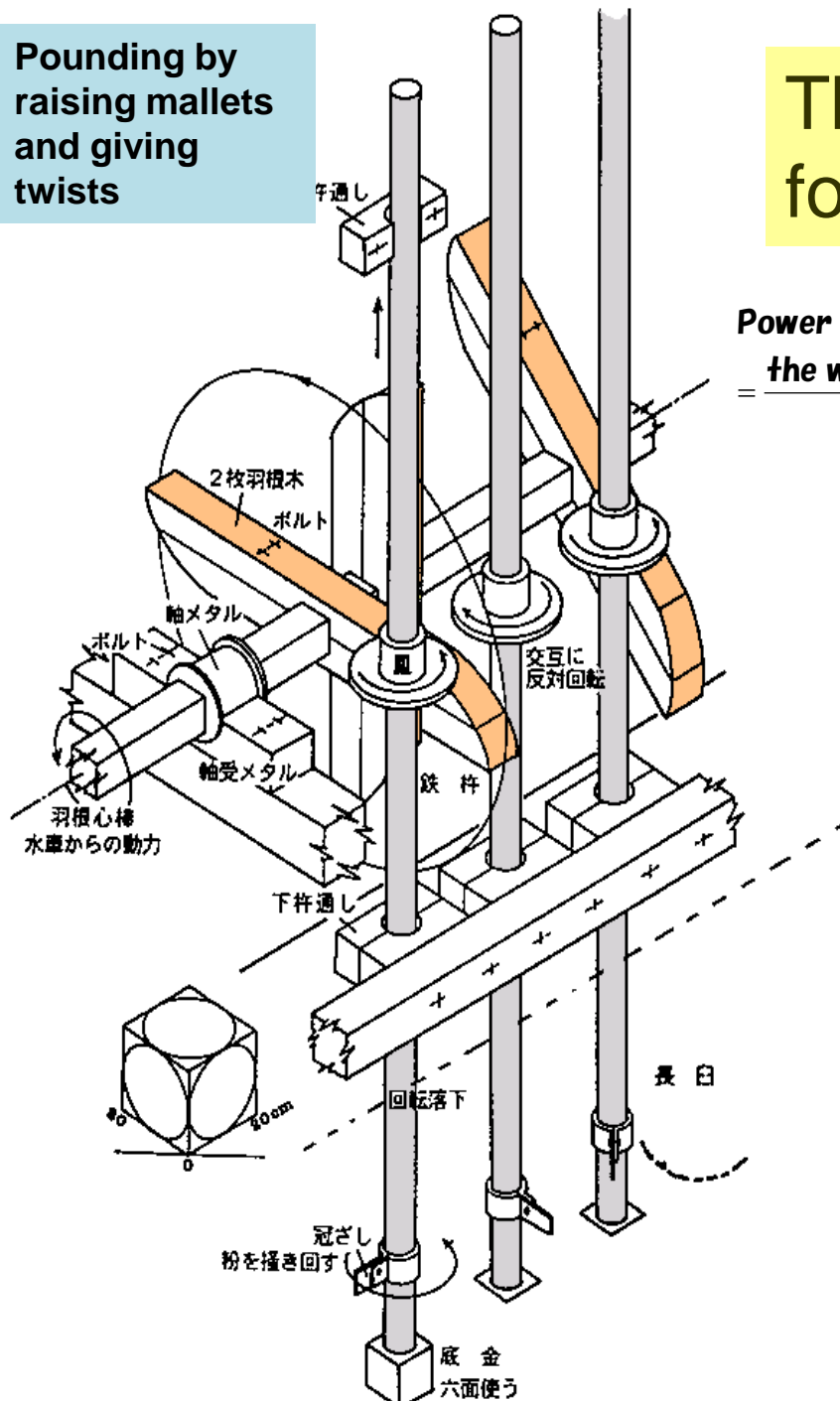
5.5 m in diameter
The width of 1 m
Rebuild in about 22 years



Milling devices is over there

Pounding by raising mallets and giving twists

The power of pounding stone for making incense sticks



Power

$$= \frac{\text{the wt. of mallet} \times \text{stroke} \times \text{the num. of pounding/s} \times \text{the num. of mallets}}{75}$$

The number of mallets	15 mallets
The weight of a mallet	50kgf
Strokes(average)	0.54m
The number of pounding	0.654 times/s
Power of mallets	3.53PS

Output

=3.53PS+conveyor power(1PS?)

+other factors such as the loss of transmitting devices

Polishing rice waterwheel with 7 m in diameter

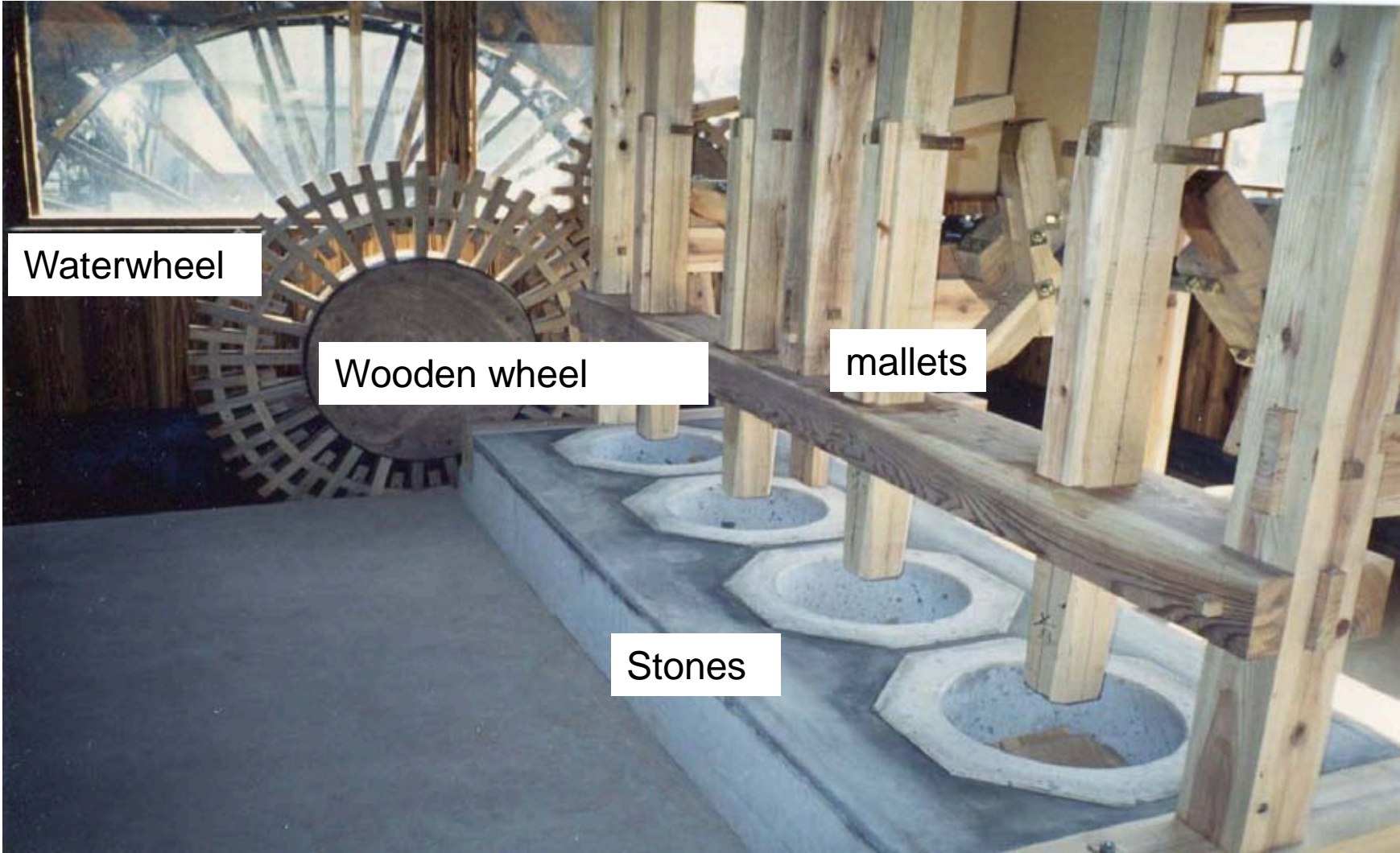
- Grinding buckwheat with stone mills
- Taking river water from a dam in upstream and rotating

Rotation:8 RPM



Polishing rice waterwheel(Overshot)

Waterwheels for polishing rice with mallets



Waterwheel

Wooden wheel

mallets

Stones

Waterwheel

川原慶賀 絵

Mallet

Stone

ペリー提督日本遠征記(第1巻) 1856年刊 東京都 国立国会図書館所蔵

Record of Perry's expedition in Japan 1856

Polishing rice waterwheel in Thailand



Built with locally available materials

Reduces children's heavy burdens of polishing rice

Capable of one-kilo polishing rice, the equivalent of one day consumption , in 30 minutes

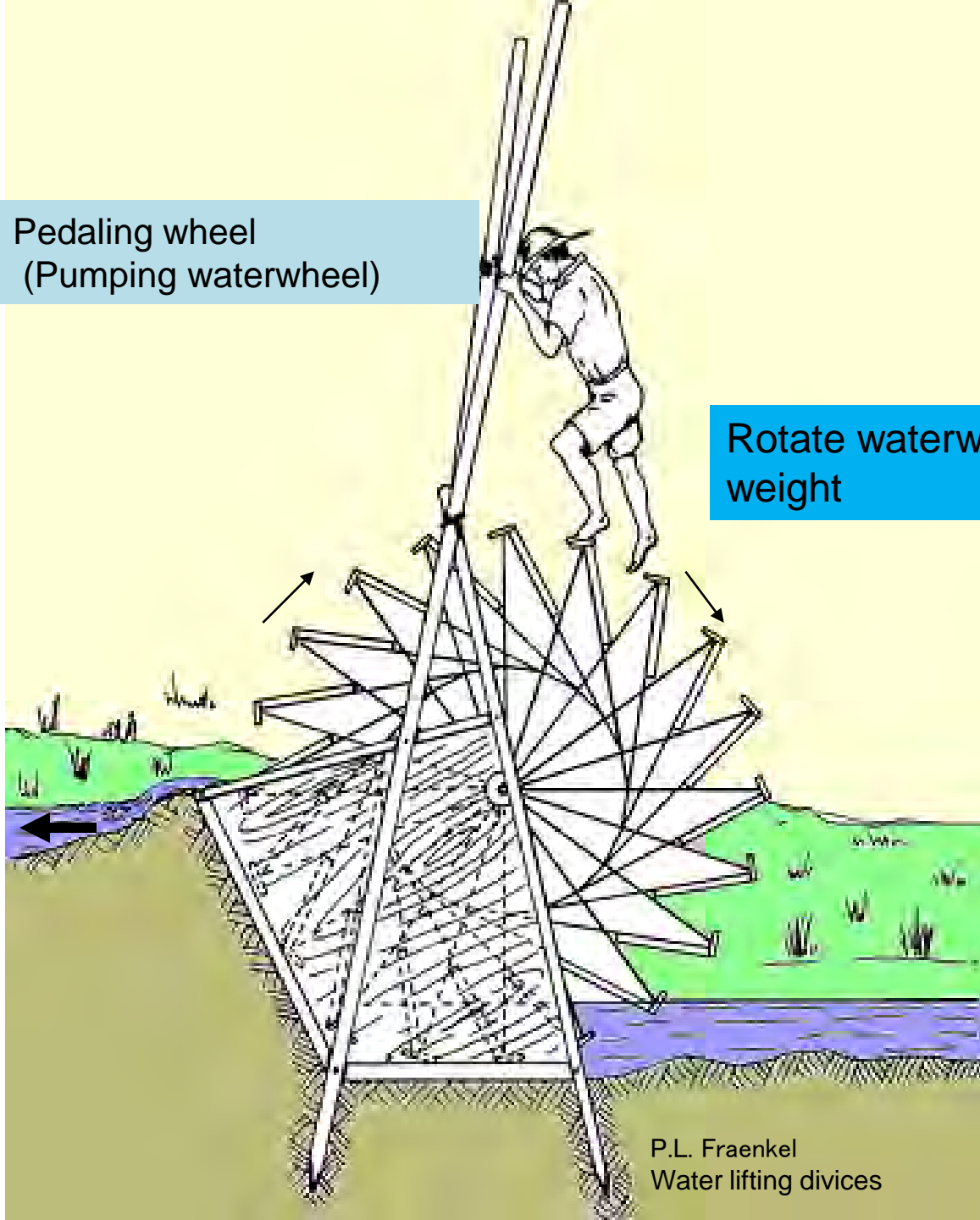


Mallet and Stone

Waterwheel with locally available materials

Pedaling wheel
(Pumping waterwheel)

Rotate waterwheel by
weight



P.L. Fraenkel
Water lifting devices



**Pedaling the
waterwheel by a
person's weight**

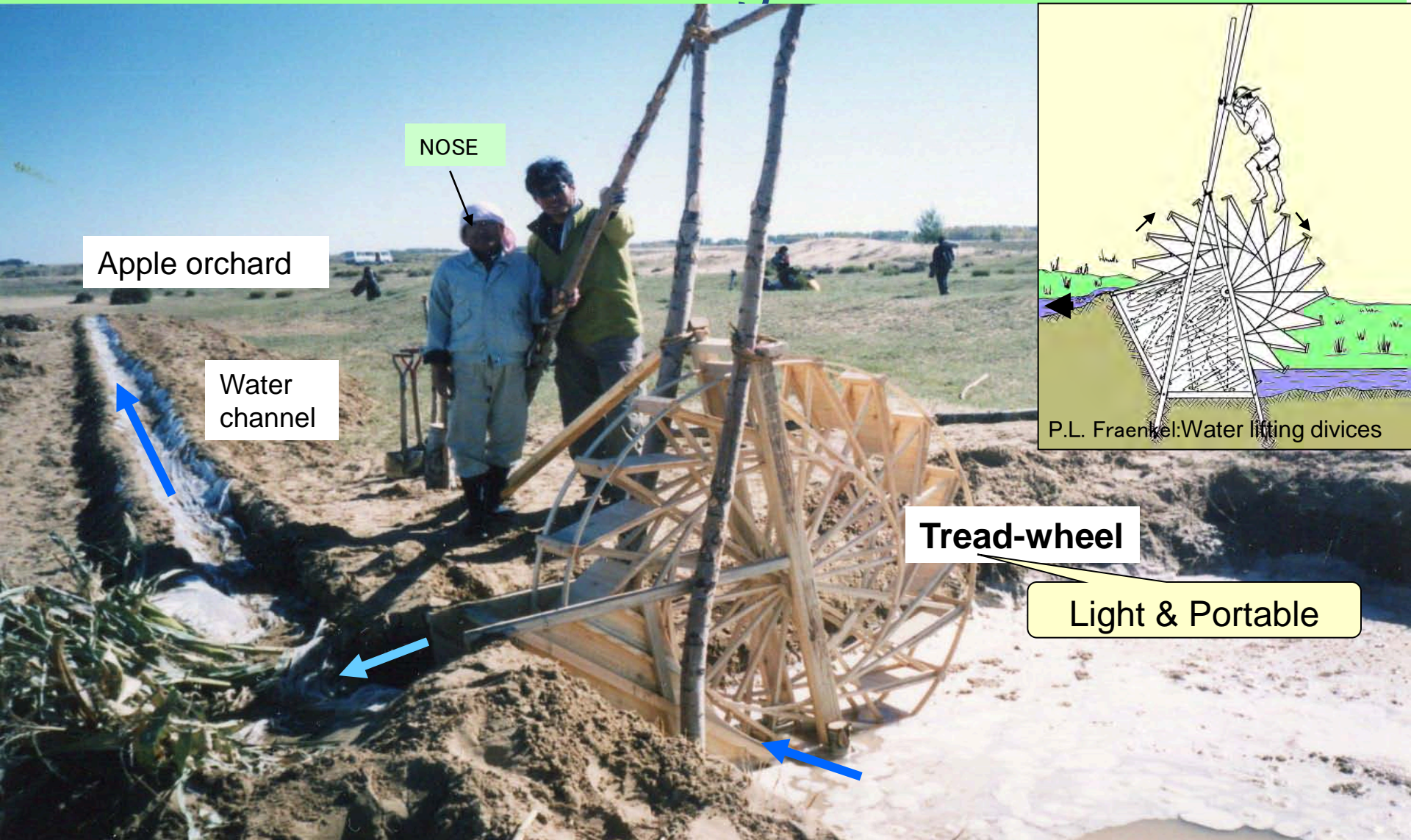
**Capable of
pumping 200 liters
of water per
minute**

Water Pumping wheel in apple farmlands in Mongolia Movable by oneself



Watering seedbed

Japanese Tread(Scoop)-wheel for irrigation in Mongolia



Diameter 1.8m, Weight 30kg , Discharge ●m³/h(●rpm)

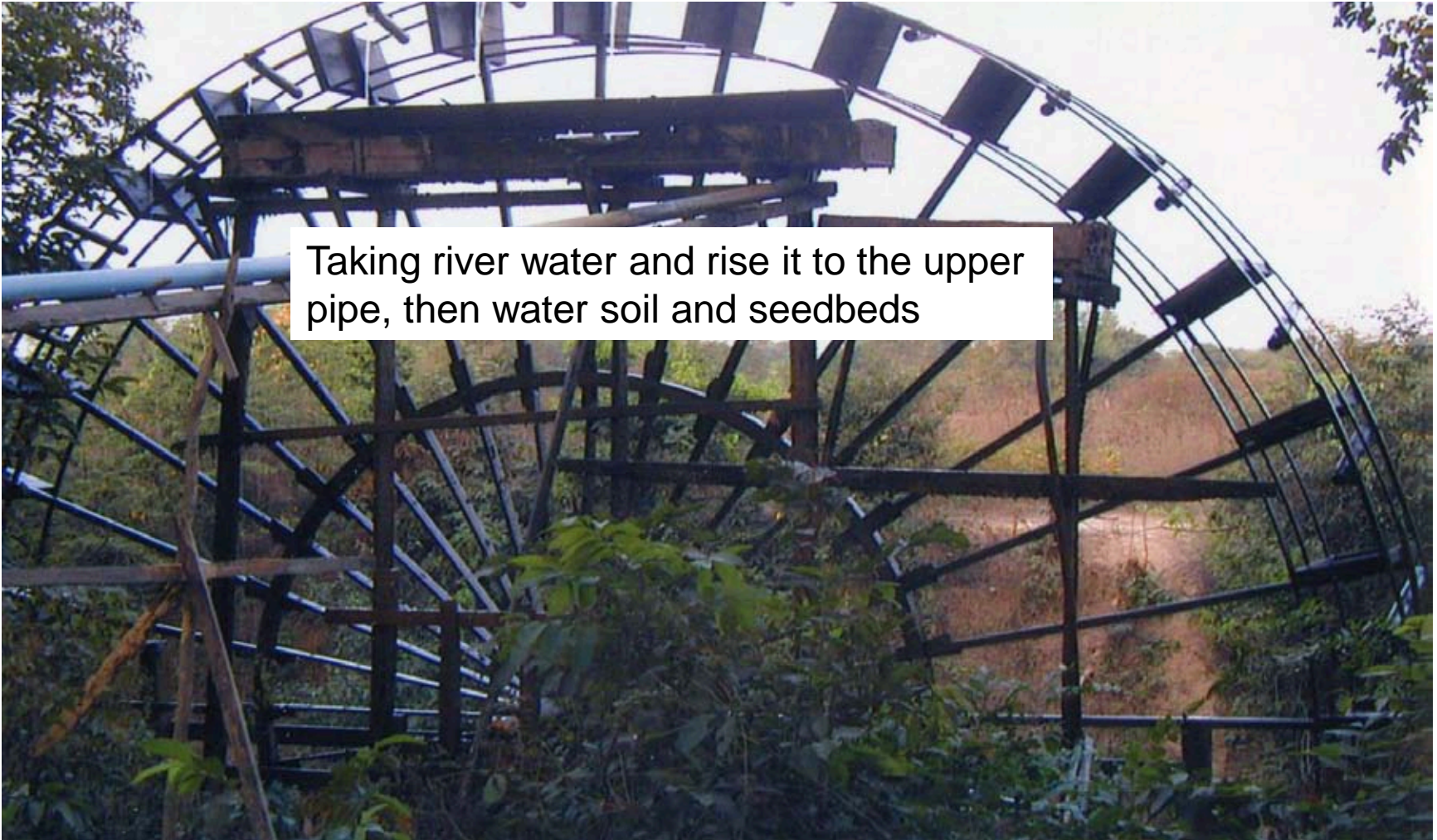
Asakura Three Consecutive Waterwheel (Mr. Nose is in center, and Mr. Anegawa is in the right)



Water supply to rice fields

Mr. Anegawa

Pumping waterwheel with 12m in diameter in Cambodia and Technical Interchange with local staff(Sponsored by AIM)



Taking river water and rise it to the upper pipe, then water soil and seedbeds

Waterwheel repair with simple tools

- Elaborated production with a hatchet
- Keeps good balance on an unstable foothold
- Build a waterwheel uniting with tools



Nishinippon Institute of Technology Environmental ESD Programme / Waterwheel for washing taro potatoes (the original form of waterwheel power in Laos)



Aiming to learn the importance of waterwheel, our predecessors' wisdoms and the usage of clean energy through the processes of building waterwheel.

Aiming to cultivate an environmentally friendly mind in the processes of gaining experience in building a waterwheel and using it.



Build washing -and-peeling taros waterwheel which was popular in farming areas in Japan. This kind of waterwheel is a symbol of clean rivers

Small-scale and light waterwheels : Japanese style that can peel taros.



Waterwheels for washing taros

Peeled taros by waterwheels built by students of Nishinippon Institute of Technology



Taros



Waterwheel electricity in a non-electric village in Laos

Rotated 70 per minute under condition of 1cm depth and non- friction

Condition

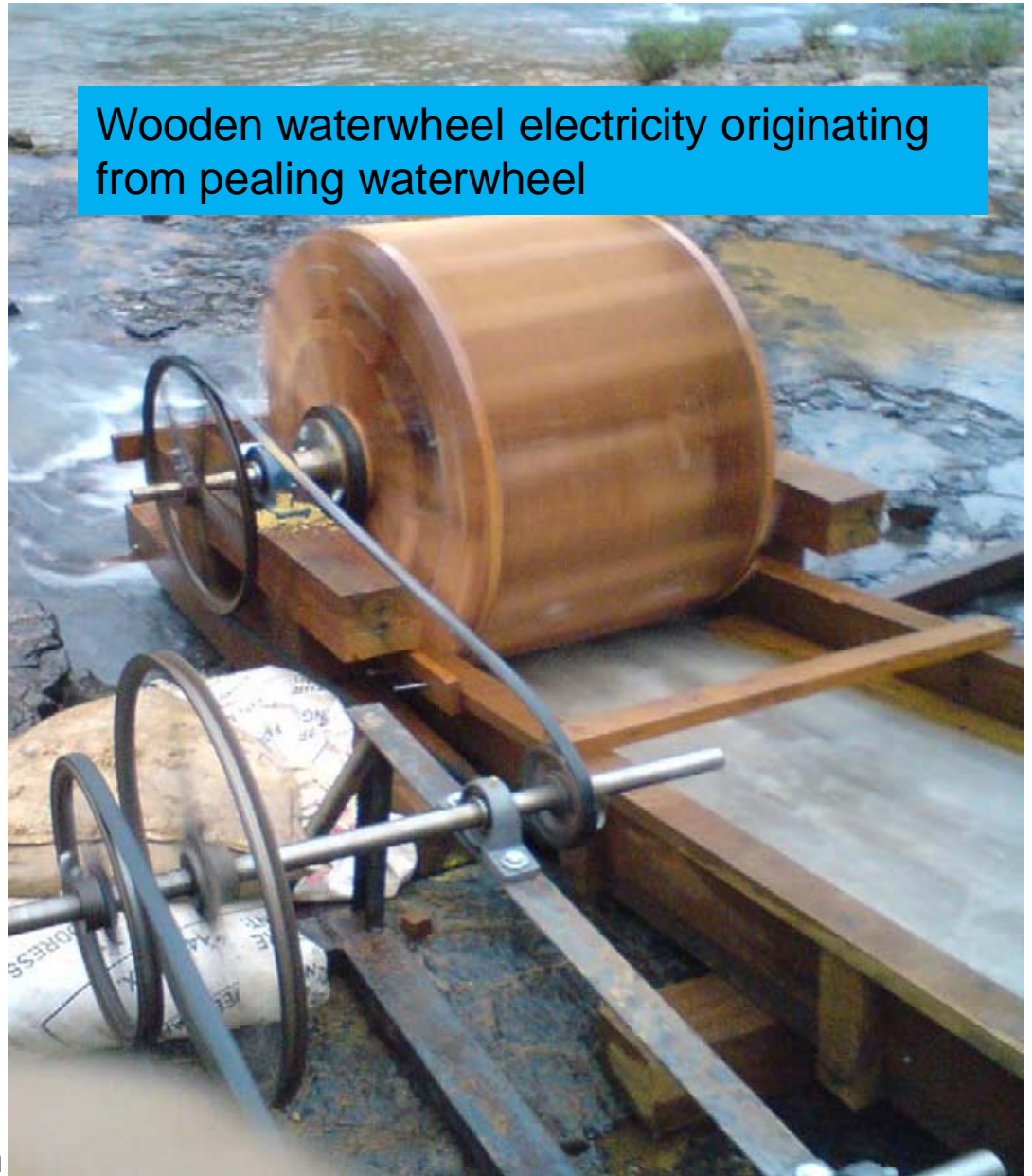
- Water velocity: 3.5m/s
- Canal with an inclination of 1m
- Connect with a battery with 12V and 200A

Result

- Produced more than 13.5V under condition of 30RPMw
- Charged successfully into battery

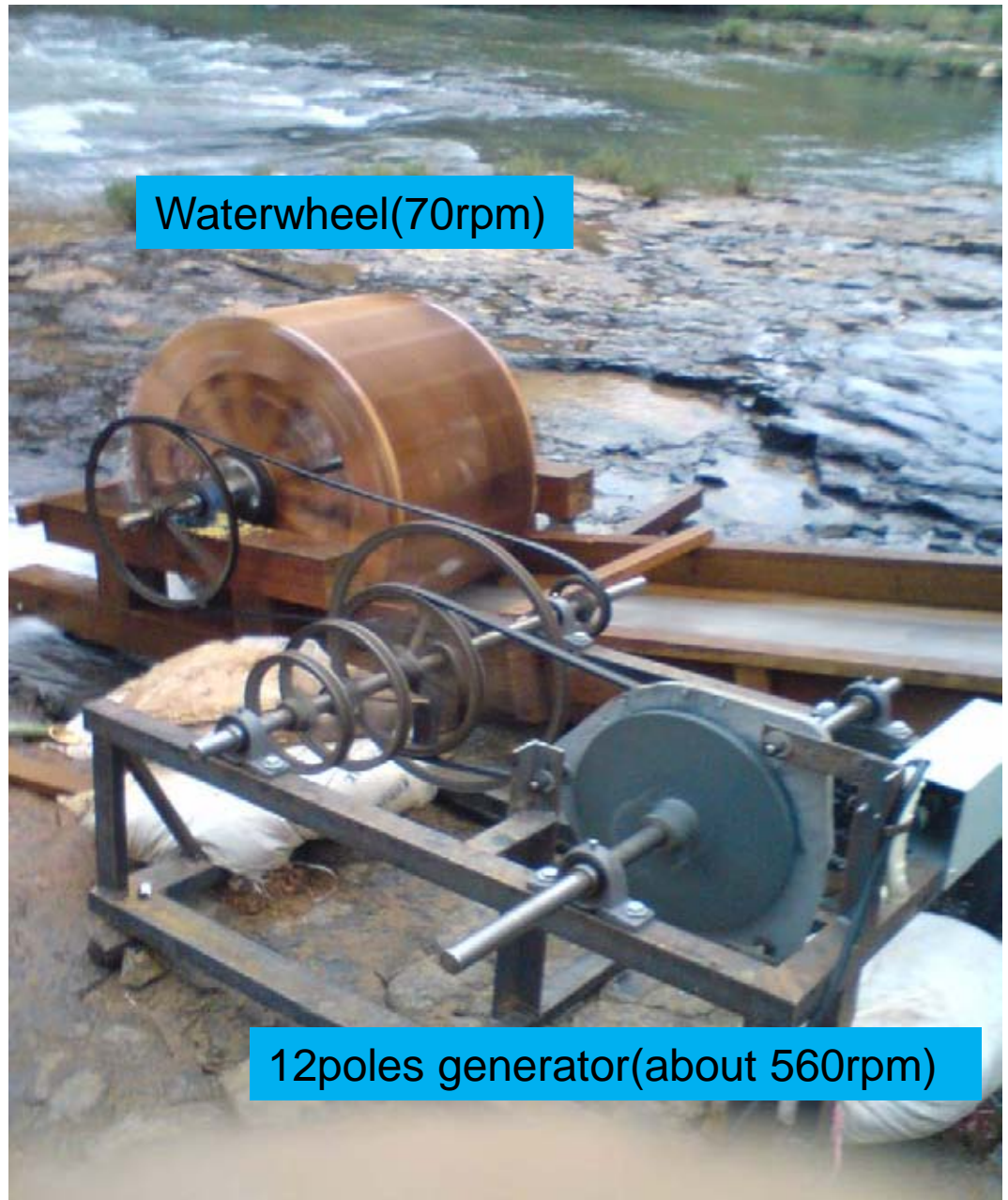
Can be expected to produce large amount of electricity with the 5 – 10cm Depth of water

Wooden waterwheel electricity originating from peeling waterwheel



Hand-made waterwheel and generator

- Belt is used to accelerate rotation. Minimization of accelerator and generator is possible
- Waterwheel is built with locally available materials and simple tools
- Can be used as alternative motor



Waterwheel(70rpm)

12poles generator(about 560rpm)

ご清聴ありがとうございました。

Thank you
for your kind attention

