WATER MILL (Gattari) PILOT DEMONSTRATION MANUAL (Draft)

Technical Service Branch/RESCAP

Gattari in Marumori Town in Japan Gattari in Kasama in Zambia

BACKGROUND

In Zambia, most of household chores in the village are done by women for everyday life and one of the laborious one is agro-processing especially milling or pounding of cereals like cassava chips, rice and finger millet. Rural households depend to a large extent on just pestle and mortar for their daily life in isolated areas where there are no mills in Zambia. These rural communities frequently require food-processing services, in the form of maize grinding and rice mill etc. The availability and reliability of these services to a large extent determine the quality of rural lives. Adequate milling services do not only reduce the burden of carrying loads over a long distance, but also stimulate and diversify local agricultural production. Although these traditional pestle and mortar method have been part of villages for centuries, due to its low efficiency, it has not been able to meet the increasing processing needs. As such, diesel mills are operating in high agro processing demand areas.

Fig.1 A woman in village pounding cassava by pestle and mortar

Notably, there are places in some of districts with moderate gradient with abundant water resource in the Northern Province thus the natural

condition is favourable for water mill establishment in the area. It is also envisaged that there are more villages in the districts having furrows within the villages and they are used by people for agricultural purposes such as irrigation and fish farming and women use them for washing cloth and dishes as well. But the abundant hydro power has never been used for "processing".

A water mill technology called Gattari used to be a milling system at village level in Japan for centuries. The mill was used to thresh and polish rice and other grains for the local agricultural community. "Gattari" means sound of a pounding in a mortar and the system is worked by water like a "see-saw". The device has a potential to improve livelihood in the Province especially where hummer mills are not available. It can also contribute to the rice processing promotion since the device can be utilized for polishing.

It is in this context that a pilot is proposed to see if this device is an appropriate technology and if the device can be disseminated to the farming community in the province.

Fig. 2 Water mill in operation

OBJECTIVES

1. Labour saving for women in villages for milling or pounding
2. Cost reduction for milling

PRECONDITIONS AND PREPARATIONS

1. Adequate gradient to have the system and the device
2. Water furrows diverted from streams or rivers
3. Heavy and hard wood available
4. Safety in the village (no theft)
5. Presence of farmers with innovative spirit to adopt new concept
6. Feasibility check
   ① Gradient

② Availability of water furrow

③ Wood materials

2. Meeting with people of the village

① To brief what “gattari” is and its opportunities and risks

② To hear their opinions if they are interested in or ready in participating

③ To explain the procedures and their role to play in this pilot

HOW TO MAKE IT

1. Design

The device is based on the principle of a “seesaw”. (see the picture below). Frequency of pounding on the mortar is more important than the weight of the pestle. The higher the point of shaft, the higher the crushing power it has.

The shape of mortar determines how the grains or stuff are circulated within the mortar so good mortar needs to be selected for that purpose. The mortar is damaged if the pestle drops too strong so the mortar needs to be strong enough.

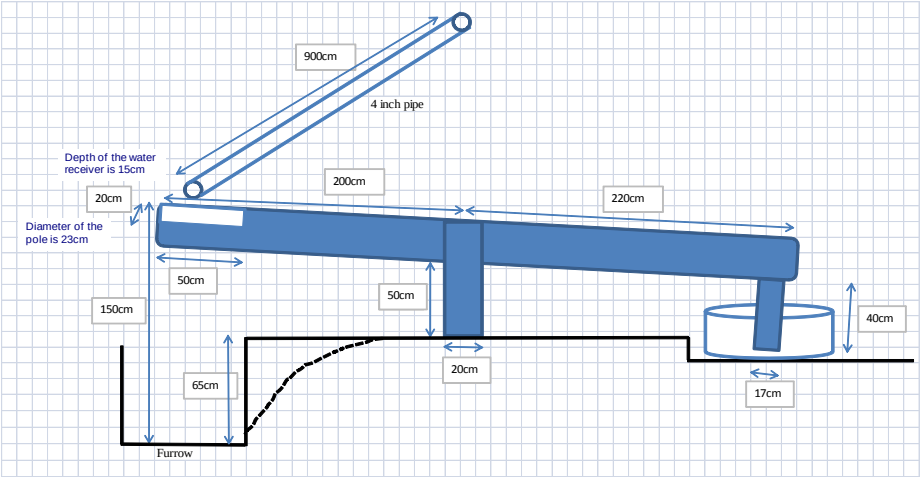


Fig. 3 Design of "Gattari"

Fig. 4 Water mill called “Gattari”

2. Actual making

① Site selection needs to be done. Availability of water intake with a height of more than the expected height of the water receiving box on the pole is required. Drainage is also required to drain water from the water receiver.

Fig. 5. Appropriate gradient required

② Two Y shaped poles to be erected with height of 100cm or 120cm from the ground depending on the power required.

Fig. 6. Y shaped poles to support the shaft

③ A wooden pole with diameter of about 20cm and length of 420cm to be prepared.

Fig. 7. Hard wood pole with 420cm

④ Select appropriate point to fix a shaft while checking the balance of the pole, then a shaft is inserted through the wooden pole.

Fig. 8 Metal pipe as shaft

⑤ Make a water receiver at the edge of the wooden pole by grooving the pole to receive water from water intake. The box or the hole needs to have a shape to release water easily.

Fig. 9 Water receiver

⑥ Fix the pestle on the other side of edge of the pole.

Fig. 10 Pestle on the pole

⑦ Put a mortar under the place where the pestle comes down.

Fig. 11 Size of mortar should fits with pestle

Fig. 11　Shaft held by the Y poles

Fig. 12　The device on the Y shaped supporters

① Balancing needs to be done by adjusting the weight of the stones tied on the pestle and water receiver sides.

Fig. 134 Balancing by using stones

Fig. 145 Technical advice given by TSB staff

OTHER ALTERNATIVE USE

According to the basic design described on this manual, the site for this device is restricted to places where there are furrows with gradient but the device can be used without water furrow as shown on the Fig. 14.

The device can be fixed as shown on the picture operating it like seesaw using Y shaped supporters. The person on the far side of the water receiver in the picture can push the pole downwards and release it so that the pestle can be lifted high and pound the stuff in the mortar.

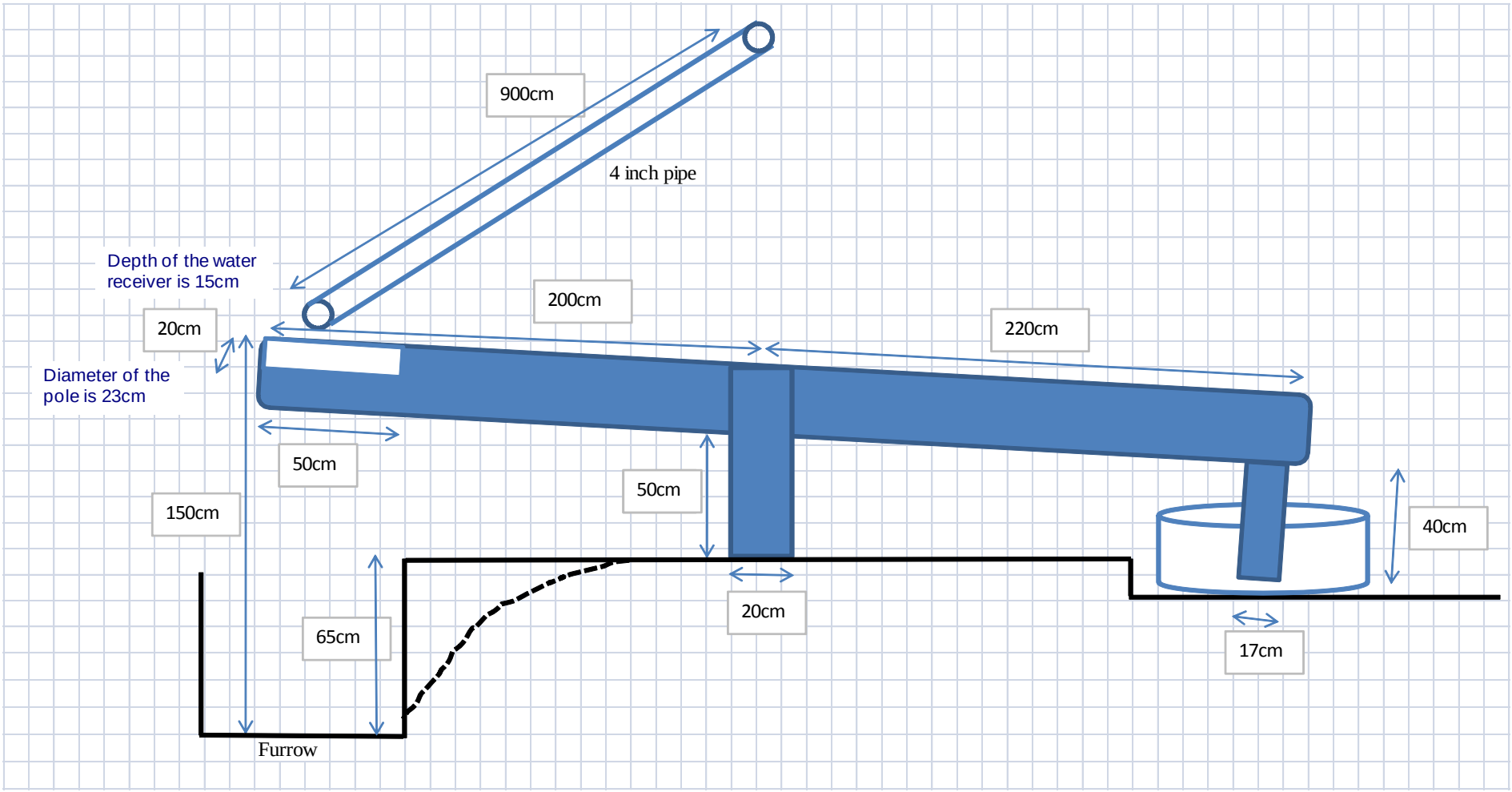
Fig. 156 Pounding cassava without water furrow

CONCLUSION

The device has a potential to improve household chores for women in the village in the Province. But there are steps to be taken before it will be disseminated to farmers in wider areas. It needs further modification in accordance with the local context in Zambia.

The technology also needs to be assessed not only for technical feasibility but adoptability by farmers in terms of economical aspect in different conditions.

*The content and information in this manual are subject to change or modification according to the environment and preference of the local people.


900cm
4 inch pipe
Depth of the water receiver is 15cm
200cm
220cm
20cm
Diameter of the pole is 23cm
50cm
50cm
150cm
40cm
20cm
65cm
17cm
Furrow