

# Corn Sheller

## B a c k g r o u n d

Maize (corn) is one of the most important staple crops in the world. In Kenya, for example, 45% of the population considers Ugali (maize meal) to be their survival food, making it the most consumed food of the country. Maize also accounts for 43% of the Latin American diet. In Asia, maize production is over 200 billion kilograms a year and it is expected that the total maize production in developing countries will eventually overtake production in industrialized countries.



**Shucking and shelling corn in rural Ghana.**

In many rural areas of developing countries, the maize kernels are removed from the cob by hand in a process called shelling. Shelling the annual maize harvest by hand typically takes weeks and may pull children out of school, since processing food for survival takes priority over education in subsistence farming households. The hardened, dry maize can also be painful to shell and lead to hand injuries.

Existing alternatives to shelling maize by hand are often unaffordable or difficult to obtain for subsistence farmers. An estimated 550 million small-holder farmers in the world lack access to mechanized agricultural technology. Industrial maize shellers are prohibitively expensive, with a cost range of US\$1,200-1,800; small-scale hand-cranked or pedal-powered maize shellers cost US\$20-50, which is still more than many families can afford. While industrial shellers are highly productive, their energy infrastructure requirements can render them unusable in rural villages. Furthermore, mechanized equipment and stationary pedal-powered devices are difficult to transport to the users. As a consequence, farmers may be required to travel long distances to process their crops or the technology may not be able to reach the communities who need it most.



**Shelling corn by hand.**



**A mechanized corn sheller.**

Another option is a simple tool that makes it possible to shell maize several times faster than by hand. The device has the additional advantages of being robust, portable, transparent to users and only a fraction of the cost of other alternatives commonly on the market. The maize sheller is currently mass-produced using injection-molded plastic or cast aluminum. In regions where the device is not currently being manufactured or distributed, the tool cannot be locally made using these infrastructure-intensive processes. In response, the D-Lab program at MIT, in collaboration with their community partners, has developed several versions of the maize sheller that can be made using locally available materials and methods.

One such device is a sheet metal sheller, that has been developed by a number of D-Lab staff members and community partners. Marco Villagarcia, an engineer from Cusco, Peru, made the initial sheller by forming ridges on a curved piece of sheet metal to replicate the inner surface of the mass-produced plastic shellers from Malawi. The design was simplified by Ralf Hotchkiss of Whirlwind Wheelchari International and Dennis Nagle of D-Lab who used a straight piece of sheet metal with tapered ridges to produce a similar surface. A simple jig was developed by D-Lab instructor Amy Smith and graduate student Kofi Taha for making these shellers quickly and easily. The process requires only a hammer, pliers and a tool to cut the sheet metal into the appropriate size to accommodate the local varieties of maize. This method has been used in many countries, both to produce maize shellers and as part of creative capacity building workshops. During these workshops, participants not only learn to make a useful device, but also learn that they can be creators of technologies and feel empowered to adapt the device to their own needs. In some communities, small manufacturing cooperatives have been formed to produce shellers and generate additional income. Other communities may not have abundant sheet metal for making maize shellers, so D-Lab and its partners have developed versions of the sheller made of different materials based on what is available in each region, including a re-bar sheller, a sand-cast aluminum sheller and a tin can sheller, all of which have the potential to save a family literally hundreds of hours of manual labor each year.



Shelling corn with a sheet metal sheller.



Sheet metal cornsheller and shelled corn.



Varieties of corn shellers using different materials and methods.

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Sheet metal corn sheller forming jig.

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