

**Title** A young-coconut-fruit-opening machine  
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**Citation** Biosystems Engineering, Volume 98, Issue 2, October 2007, Pages 185-191  
**Keywords** young coconut; opening machine

### **Abstract**

The purpose of this research was to design, construct, and evaluate a prototype machine for opening young coconut fruit. The design concept was that a trimmed coconut could be opened by causing a small sharp knife to gradually move and shear off a circular section of the husk and shell at the top of the rotating fruit. The prototype consisted of a fruit holder, a height control mechanism, a knife and its feed controller, and a power transmission system. In operation, the small stainless-steel knife slowly penetrates through the husk and shell of the turning fruit in a direction approximately perpendicular to its surface. The rotation of the fruit causes the husk and shell to be cut by the sharp edge of the knife, which results in the formation of a circular opening at the top of the fruit. In this study, the key design parameters and their operation settings were determined as follows: the angle between the knife and the rotating plane (horizontal) was 50°; the angle between the knife cutting edge and the tangential line to the circular opening was 50°; the knife feeding speed was 50 mm/min; and the fruit rotation speed was 80 rpm.

Based on these design parameters, a commercial prototype was manufactured and tested. The prototype had the capacity to open an item of fruit at an average time of 30 s. A 58-mm-diameter opening was cut and a mean 0.2% of the juice was spilled, while the juice that remained contained 0.2 g of fine pieces of shell and husk. The mechanically opened coconuts were well received by consumers.