

Narumon Boonkrachang 2012: Dried Betel Nut Husking Machine with Horizontal Wheel. Doctor of Engineering (Agricultural Engineering), Major Field: Agricultural Engineering, Department of Agricultural Engineering. Thesis Advisor: Assistant Professor Sivaluk Pathaveerat, Ph.D. 161 pages.

This research was to a) determine the physical and mechanical properties of solar drying of fully mature betel nut, b) construct the dried betel nut husking machine with horizontal wheel and also c) study on engineering economics. The results of the physical and mechanical properties of betel nut shown, on the 6<sup>th</sup> of drying period, the betel nut fruit and kernel have been sphere in shape. Although, their dimensions were changed by the drying period. The other properties of the fruit and kernel (value in parentheses) were the average weight of 12.39 (8.73) g, average moisture content of 11.57 (11.28)% (w.b.), bulk density of 0.23 (1.45) g/cm<sup>3</sup>, apparent density of 0.39 (2.61) g/cm<sup>3</sup>, the coefficient of static friction on rubber and steel surfaces of 0.57 (0.72) and 0.45 (0.49), respectively, the highest rupture force of 1.54 (2.53) kN, the highest deformation at rupture point of 23.05 (2.21) mm, the highest energy at rupture point of 4.57 (2.09) N-m, and the force and deformation ratio at rupture point of 0.25 (1.56) N/m.

The husking machine was determined the husking efficiency, the husking quality and the machine capacity. The results of testing husking machine with 2 horizontal wheels (Model I) shown the moisture content of fruit were 13.21% (w.b.) to 7% (w.b.) that were high husking capacity. The Model I yielded husking efficiency of 90% from whole fruit, the whole kernel of 60% from the husked whole fruit, the machine capacity for produce whole kernel of 102 kg/h, and the energy consumption of 29.38 kg/kW-h. The dried betel nut husking machine with horizontal wheel (Model II) was constructed for reduce the disadvantages of the Model I. It was convenient and safe. Model II was husking efficiency of 69.16% from whole fruit, the whole kernel of 96.42% from the husked dried whole fruit, the machine capacity for produce whole kernel of 61.05 kg/h, and the energy consumption of 42.24 kg/kW-h. It has been produce 2,704 kg of whole kernel of a year to be at break event point.

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Thesis Advisor's signature