

# Overview on economics and technology development of rubber seed utilisation in Southeast Asia

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**Abstract** This paper overviewed the potential of rubber seed biomass for its various applications and processing technologies. The rubber seed availability and supply are studied and focused on Southeast Asia region. Technologies with rubber seed and rubber seed oil processing are reviewed. Challenges over rubber seed utilisation, e.g. rubber seed biomass availability, labour issue, etc., are raised and discussed. Future developments of rubber seed utilisation, in term of its management trends and supply solutions, are proposed. Rubber seed is gaining attractions for its vast practical applications, as a result of the expansion of rubber industry.

**Keywords** Rubber · Biomass · Southeast Asia · Technology · Value-added products · Biofuel

## Potentials of rubber seed as value-added products

Over years, there is a food versus fuel issue, in which it is claimed that growing crops for food instead of fuel on agricultural land is more energy efficient (Gelfand et al. 2010). Ideal strategy is proposed to grow crops for food while the leftover wastes, e.g. leaves, stalks, etc. (biomass), are used for fuel production. However, the increasing demand of biomass fuels raises the biomass fuel price and induces threat to biomass supply security (Mathias and Balasankari 2010) for both biofuel and value-added green products manufacture. Approach is planned towards diversification of biomass utilisation to accommodate the increasing needs of fuel. Ng et al. (2012) has reviewed the green contribution towards the environment in utilising palm biomass. However, the utilisation of palm waste is saturated with its increasing exploitation. Feedstock of biomass is important to provide an alteration other than food for energy supply. There are industries which show potential towards further biomass utilisation, e.g. paddy, rubber, wood, etc. In this work, biomass utilisation based on rubber seed is reviewed.

Rubber crop is renowned for its common products: rubber wood, rubber milk or latex, rubber honey and recently, rubber seed oil extracted from rubber seed. Other than replanting purposes, previously, rubber seed has been regarded as a waste. However, rubber seed is proven to be a potential food source as it contains high protein and fat. Table 1 shows the characteristic contents of rubber seed. The presence of hydrogen cyanide (HCN) might have hindered its use as a food source. Nevertheless, it has been reported that Indians in the Amazon Valley of South America has been eating rubber seed without adverse effects (Njwe et al. 1988). In Malaysia, preserved rubber seed is popular as a side dish. Preserved rubber seed is considered as edible food since the value of HCN reduced effectively after being stored for

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