

Energy- and Emission-Based Performance of an Experimental Tobacco Bulk-Curing Barn

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ABSTRACT

Energy conservation and efficiency of small tobacco curing industry in Northern Thailand was investigated. Traditional, flue-curing barn as well as a modern, bulk-curing, experimental barn were used as case studies. Firewood and lignite were used as fuels. The energy consumption, temperatures and CO, CO₂ and O₂ emissions were monitored during curing process. Performance analysis in terms of energy utilization index, thermal efficiency and emissions for both types of barn was carried out. The results indicated that the existing traditional rural barn consumed more energy and produced more emissions than the modern barn. This was largely due to greater energy loss through walls and ceiling of the barn and poorer combustion in a furnace. A new curing barn with improved energy efficiency and better emissions was demonstrated.

Key words: Energy efficiency, Flue curing, Tobacco curing barn, Emissions

INTRODUCTION

Tobacco is one of the major cash crops and commonly grown in almost all provinces in Northern Thailand. Tobacco grown in Thailand can be divided into two categories: foreign tobacco such as Virginia, Burley and Turkish and native tobacco. Virginia tobacco is by far the most popular, accounting for over 60% of the total market volume. Around 30-60 million tons of dried tobacco are produced each year, earning approximately US\$ 37 million annually (Boonlong et al., 1992). During the past several years, the production is approximately 20 million tons a year. The products are either sold to the Thailand Tobacco Monopoly or exported. About 50% of the total tobacco output is produced by about 50,000 small individual households while the other half is produced by large commercial curers and their associates. Typically, individual household utilizes from 5 – 10 rai (one rai = 1,600 m²) of land for growing tobacco.

Traditionally, Virginia tobacco crop is flue-cured by individual farmer in the field. Traditional method is based on natural convection where fresh tobacco is hung loosely inside a curing barn and heat is provided from a hot flue pipe connected to a furnace. Its thermal efficiency was reported to be very low, being around 10 – 15% or even less (Boonlong et al., 1987, 1994, Siddiqui and Rajabu, 1996, Siddiqui, 2001). This highly energy-intensive process consumes enormous quantities of firewood with serious ecological implications.