

Thesis Title	Impact Assessment of The Utilization of Wastewater from Tapioca Industry for Eucalyptus Plantation
Thesis Credits	12
Candidate	Miss Kittima Kraipeerapun
Supervisors	Dr.Sudarut Tripetchkul Associate Professor Dr.Morakot Tanticharoen
Degree of Study	Master of Science
Department	Natural Resource Management
Academic Year	1998

ABSTRACT

This study investigated the feasibility and impact of using wastewater released from tapioca factories for irrigating eucalyptus plantation. The factory (Ammadas Champee Ltd.) was located at Amphore Sikeu, Nakhonratchasima province, and the experiment was carried out during February 1997 to November 1998 using a randomized complete block design. These experiments were divided into three parts . First, the quality of the wastewater released from the factory was examined from the treatment ponds before being evaluated for its potential use in agriculture. The second part involved the examination of the effect of wastewater from aerobic ponds on eucalyptus plantations , particularly on changes in chemical properties of soil and growth of eucalyptus. The third part was to estimate the economic benefit of re-using wastewater for eucalyptus plantations.

The results suggested that wastewater treatment using natural open ponds can reduce the amount of BOD, COD, nitrogen , ammonium-nitrogen, orthophosphate, total solids, suspended solids, and total dissolved solids at 97.4 , 97.1 , 91.3 , 74.3 , 83.5 , 66.0 , 82.8 and 61.5 % during the operating process, and at 82.6 , 77.4 , 91.0 , 86.0 , 81.0 , 26.2 , 43.5 and 27.3 % during the non-operating process, respectively. The U.S. Salinity Laboratory and FAO guidelines were used for evaluation of the water quality. All ponds were then categorized : the fermentative ponds were classified as C4-S1 class whereas the facultative ponds and the aerobic ponds were considered C3-S1 and C4-S1 classes during the operating process. The fermentative and facultative ponds were classified as C4-S1 and C3-S1 during the non-operating process, the

aerobic ponds were classified as C3-S1. The wastewater released from tapioca factory have electrical conductivity values and sodium absorption ratios at a level that is acceptable for irrigation. It also contains high level of nutrients that are useful for plants such as potassium, orthophosphate, calcium and magnesium. However, the wastewater from anaerobic ponds had pH values as low as 4.0 to 4.2 and were high in suspended solids, BOD and COD. This is usually not suitable for irrigation. The wastewater from facultative and aerobic ponds had higher quality and probably suitable for agricultural irrigation. Nevertheless, the alkalinity of the facultative pond water is lower than the standard range that is suitable for irrigation. Thus, pH appeared to be a major constraint on using this water for irrigation. A comparison between the last open pond with the previous pond did not show significant differences in chemical properties, and all had high levels of nitrogen, available phosphorus, potassium, calcium and magnesium. The pH values ranged between 7.7 and 9.7. The use of wastewater from the aerobic ponds at the eucalyptus plantation increased the amount of sodium and calcium in the soil significantly. The method of irrigation also affected soil chemistry. The results also showed that flood irrigation can increase the amount of sodium, calcium, potassium, magnesium, total nitrogen, organic matter, available phosphorus as well as increased the cation exchangeable capacity, pH value and the electrical conductivity. Eucalyptus trees irrigated with 720,000 litres per rai (1,600 m²) of wastewater annually were not significantly different in girth measured at breast height from those eucalyptus irrigated with 20,800 litres per rai. Moreover, using this wastewater for three years and six months at the eucalyptus plantation, did not increase soil salinity in the area. In conclusion, it is possible to use tapioca industry wastewater for eucalyptus plantations. From the economic analysis, by re-using this water, a tapioca factory can reduce both the total investment and the annual operating cost as much as 11.8 %. This saving was accounted for the income from trading the eucalyptus trees cut after a 4 year cycle.

Keywords : impact assessment / utilization of wastewater / tapioca industry / eucalyptus plantation / irrigation / wastewater quality / chemical properties of soil / anaerobic pond / facultative pond / aerobic pond / economic benefit