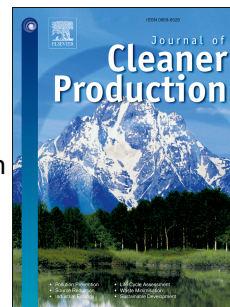


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M.B. Azwan, A.L. Norasikin, K. Sopian, S. Abd Rahim, K. Norman, K. Ramdhan, D. Solah



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Assessment of Electric Vehicle and Photovoltaic Integration for Oil Palm Mechanisation Practise

Azwan MB.^{1,2}, Norasikin AL.², K. Sopian², Abd Rahim S.¹, Norman K.¹, Ramdhan K.¹, Solah D.¹

¹ *Malaysian Palm Oil Board (MPOB), 6, Kawasan Institusi, Bandar Baru Bangi, Kajang, Selangor*

² *Solar Energy Research Institute, Universiti Kebangsaan Malaysia, Bandar Baru Bangi, Kajang, Selangor*

Corresponding Author: azwan.bakri@mpob.gov.my

Abstract

This study aims to analyse the integration of solar photovoltaic and electric vehicle in farm mechanisation operation for the sustainable development of the oil palm plantation industry in Malaysia. Multiple integration methods have been simulated, and the primary considerations comprise energy costs, capital expenditure, net present costs, and percentage of renewable energy contribution. The simulation results revealed that the on-board solar photovoltaic system is the best-suited method compared to other setups. The actual field test on the selected system was carried out to further validate the simulation study. The results produced a roughly similar percentage of solar energy contribution, which is in the range of 20-30%. In addition, a study was also conducted on the effects of extra weight being added to the vehicle. The results of this revealed that only less than 10 watts of additional power was required for the electric vehicle to move at constant velocity with the addition of 43 kg of solar panels and its frame. The operational costs of various practices, which include a knapsack sprayer, an internal combustion engine vehicle, and the selected system, were compared for the herbicide spraying. It was found that the selected system could provide the lowest operational costs per area and could avoid 8 kg of carbon dioxide equivalent per hectare per year from the total diesel fuel consumption. Finally, it was concluded that the integration of solar photovoltaic and electric vehicles could provide numerous advantages for the people, the planet, as well as the profit.

Keywords: Palm oil, mechanisation, electric vehicle, solar energy and photovoltaic.

1. Introduction

Among the elements that move us towards a more sustainable agriculture process is the utilization of renewable energy sources (RES). Besides environmental advantages, RES could also potentially yield long-term economic benefits, and will subsequently create a positive

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