PLANNING AND DESIGNING AGRIVOLTAIC SYSTEM IN GRAPE PLANTATION AT JOGJA GRAPE FARM USING PVSOL SIMULATION

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ABSTRACT

The agrivoltaic system is an innovative solution that combines solar energy production with agricultural activities on the same land, supporting both energy efficiency and land conservation. This study aims to design an optimal agrivoltaic system for a greenhouse at Jogja Grape Plantation and to analyze its technical and economic performance. Two design scenarios were simulated using PVSOL software: Scenario A supplies electrical load only for the greenhouse, while Scenario B supplies both the greenhouse and the owner's house. Field surveys revealed that the total energy requirement for the greenhouse is 982.8 kWh/year and 7,225.92 kWh/year for the house. Simulation results show that Scenario B, with a capacity of 4.86 kWp, can generate 7,516 kWh/year with 3,351 kWh/year of self-consumption. The system results in annual electricity savings of Rp4,829,517, with an estimated break-even point (BEP) of 12.11 years. Meanwhile, Scenario A, with a 1.62 kWp capacity, produces 1,623 kWh/year and has a BEP of 16.80 years. Based on technical and economic analysis, Scenario B is recommended for its ability to meet larger energy needs with better investment efficiency. This system has strong potential as a sustainable solution for renewable energy utilization in Indonesia's agricultural sector.

Keywords: agrivoltaic, PVSOL, solar power system, grape cultivation.