

**TECHNO-ECONOMIC ANALYSIS OF AN OFF-GRID SOLAR POWER
PLANT FOR LIGHTING A DRAGON FRUIT ORCHARD IN BANYUWANGI**

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ABSTRACT

Dragon fruit farms in Banyuwangi utilize nighttime lighting to stimulate flowering and increase harvest frequency. The use of conventional electricity for lighting can increase operational costs, creating a need for more efficient energy alternatives. This study aims to analyze the economic feasibility and investment payback of an off-grid Solar Power Plant (PLTS) as an energy source for lighting dragon fruit farms. This research employs a quantitative method, with analyses covering investment costs, operation and maintenance costs, component replacement costs, Life Cycle Cost (LCC), Levelized Cost of Energy (LCoE), electricity cost savings, as well as Net Present Value (NPV), Benefit-Cost Ratio (BCR), Discounted Payback Period (DPP), and Internal Rate of Return (IRR). The results show that the total energy production over 25 years reaches 19,372.78 kWh, with an LCC of IDR 11,326,828.11 and an LCoE of IDR 756.38/kWh. Electricity cost savings reach IDR 14,709,143.11. The NPV is IDR 4,198,262.40, with a BCR of 1.30, a DPP of 25 years, and an IRR of 5.48% at a discount rate of 4.75%. The implementation of nighttime lighting increases the harvest frequency from two to three times per year and increases net income by IDR 9,180,000 over 25 years. Based on these results, the off-grid solar power system is considered economically feasible.

Keywords: Economic feasibility, investment analysis, Off-Grid solar panel, techno economyc