

ABSTRAK

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Program Studi : Teknik Elektro
Judul : Perencanaan Pembangkit Listrik Tenaga Surya Skala Mikro untuk Pompa Air Sawah Tadah Hujan di Indihiang

Sawah tadah hujan di Kecamatan Indihiang, Kota Tasikmalaya, menghadapi permasalahan utama berupa keterbatasan pasokan air irigasi, terutama pada musim kemarau, akibat ketergantungan penuh terhadap curah hujan. Kondisi ini berdampak pada penurunan produktivitas pertanian dan ketidakstabilan hasil panen. Penelitian ini bertujuan untuk merancang sistem Pembangkit Listrik Tenaga Surya (PLTS) skala mikro berbasis off-grid yang mampu mengoperasikan pompa air submersible secara mandiri untuk memenuhi kebutuhan irigasi lahan sawah seluas 1 hektar dengan sumber energi yang ramah lingkungan.

Metode penelitian yang digunakan meliputi studi literatur, pengumpulan data lokasi dan kebutuhan air, perhitungan kebutuhan energi listrik pompa, serta perancangan sistem PLTS yang mencakup modul surya, baterai, dan inverter. Simulasi kinerja sistem dilakukan menggunakan perangkat lunak PVsyst untuk memperoleh parameter energi tahunan, Performance Ratio (PR), serta evaluasi pengaruh iradiasi matahari terhadap sistem. Selain itu, analisis ekonomi dilakukan untuk menilai kelayakan investasi melalui perhitungan Net Present Value (NPV) dan Cost of Energy (COE).

Hasil penelitian ini diharapkan dapat memberikan rekomendasi teknis terkait kapasitas panel surya, konfigurasi baterai, serta kinerja sistem PLTS yang optimal, sehingga dapat menjadi solusi alternatif penyediaan energi listrik untuk irigasi sawah tadah hujan dan mendukung peningkatan produktivitas pertanian di Kecamatan Indihiang.

Kata Kunci: PLTS *Off-Grid*, Sawah Tadah Hujan, Pompa *Submersible*, PVsyst, Analisis Ekonomi.

ABSTRACT

Name : Mochamad Raihan Febriana
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Title : *PLANNING OF MICRO-SCALE SOLAR POWER PLANT FOR RAINFED RICE FIELD WATER PUMPS IN INDIHIANG*

Rain-fed rice fields in Indihiang District, Tasikmalaya City, face a major challenge: limited irrigation water supply, particularly during the dry season, due to their complete dependence on rainfall. This condition impacts agricultural productivity and unstable harvest yields. This research aims to design an off-grid, micro-scale solar power plant (PLTS) system capable of autonomously operating a submersible water pump to meet the irrigation needs of one hectare of rice fields using environmentally friendly energy sources.

The research methods used included literature review, data collection on location and water requirements, calculation of pump electrical energy requirements, and design of the PLTS system, which includes solar modules, batteries, and an inverter. System performance simulations were conducted using PVsyst software to obtain annual energy parameters, the Performance Ratio (PR), and to evaluate the effect of solar irradiation on the system. Furthermore, an economic analysis was conducted to assess investment feasibility through Net Present Value (NPV) and Cost of Energy (COE) calculations.

The results of this study are expected to provide technical recommendations regarding solar panel capacity, battery configuration, and optimal PLTS system performance, so that it can be an alternative solution for providing electrical energy for rain-fed rice field irrigation and support increased agricultural productivity in Indihiang District.

Keywords: Off-Grid Solar Power Plant, Rainfed Rice Fields, Submersible Pump, PVsyst, Economic Analysis.