

ABSTRAK

RANCANG BANGUN SISTEM POMPA AIR OTOMATIS BERTENAGA SURYA BERBASIS ARDUINO UNTUK PERSAWAHAN DI DESA ULAK DEPATI

(2026 : xvi +114 Halaman+Daftar Tabel+Daftar Gambar + Daftar Lampiran)

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Penelitian ini bertujuan merancang dan membangun sistem pompa air otomatis bertenaga surya berbasis Arduino untuk mendukung pengairan persawahan di Desa Ulak Depati. Sistem terdiri atas panel surya 600 Wp, *Solar Charge Controller* (SCC) MPPT, baterai 24 V, Arduino Uno, sensor kelembapan tanah kapasitif, relay, *Solid State Relay* (SSR), dan pompa air DC. Metode penelitian meliputi studi literatur, perancangan, perakitan, serta pengujian setiap komponen dan sistem secara keseluruhan. Sistem kontrol bekerja berdasarkan pembacaan sensor kelembapan tanah dengan nilai ambang batas 450. Pompa akan menyala ketika nilai sensor melebihi 450 dan berhenti saat nilai mencapai 450 atau kurang. Hasil pengujian menunjukkan total kebutuhan energi sistem sebesar 706,68 Wh. Sistem mampu mengalirkan air sebanyak 2.513,60 liter dalam waktu 246 menit hingga mencapai ketinggian air 4,7 cm. Hasil tersebut menunjukkan bahwa sistem dapat beroperasi secara otomatis sesuai dengan kondisi kelembapan tanah.

Kata kunci: Arduino, irigasi otomatis, pompa air tenaga surya, sensor kelembapan tanah.

ABSTRACT

DESIGN AND DEVELOPMENT OF AN ARDUINO-BASED SOLAR-POWERED AUTOMATIC WATER PUMPING SYSTEM FOR RICE FIELDS IN ULAK DEPATI VILLAGE

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This study aims to design and develop an Arduino-based automatic solar-powered water pumping system for irrigating rice fields in Ulak Depati Village. The system consists of a 600 Wp photovoltaic array, MPPT Solar Charge Controller, 24 V battery bank, Arduino Uno, capacitive soil moisture sensor, relay, Solid State Relay (SSR), and a DC water pump. The research method includes literature study, system design, assembly, and performance testing of each component and the integrated system. The control system operates using a soil moisture threshold value of 450. The pump turns on when the sensor reading exceeds 450 and turns off when the value reaches 450 or below. Experimental results indicate a total system energy requirement of 706.68 Wh. The system successfully delivered 2,513.60 liters of water within 246 minutes, producing a water level of 4.7 cm. These results demonstrate that the proposed system operates automatically according to soil moisture conditions.

Keywords: *Arduino, automatic irrigation, solar-powered water pump, soil moisture sensor.*