PADDY FIELD IRRIGATION CONTROL SYSTEM BY USING PROGRAMMABLE LOGIC CONTROL (PLC)

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Supervisor's Name : Ahmad Nizam bin Mohd Jahari @ Mohd Johari

Date : 14 June 2013

Special dedication to my family, supervisor (Mr. Ahmad Nizam Bin Mohd Jahari @ Mohd Johari), friends and FKEKK technicians for their supports and help.

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ABSTRACT

. This project report represents an automatic irrigation and drainage control system without human intervention. In addition, this project also maintains the water level of paddy field in specific phases to overcome the problem of water balance in paddy field. In this project, two pumps were used to regulate the flow of water to paddy field or drainage canal. The project system also include water level switch sensor and light indicator. Water levels switch sensors are used to opening or closing the pumps within a specified range of liquid. Besides, light indicator was used as monitoring control system to shows a phases in growth paddy. The prototype was developing based on based schematic and schedule of irrigation and drainage paddy field *of Kementerian Pertanian dan Industri Asas Tani Malaysia (moa)*.

ABSTRACT

Report projek ini memperkenalkan system pengairan dan kawalan perparitan automatik tanpa memerlukan campur tangan manusia. Di samping itu, projek ini juga mengekalkan paras air sawah padi mengikut fasa pertumbuahan yang tertentu untuk mengatasi masalah tidak keimbangan air di sawah padi. Projek ini menggunakan dua pam untuk mengalirkan air ke dalam sawah padi atau perparitan. Sistem projek ini juga menggunakan pengesan paras air dan lampu isyarat. Pengesan paras air digunakan untuk membuka and menutup pam pada takat air yang tertentu. Selain itu, lampu isyarat digunakan sebagai system kawalan paparan untuk menunjukkan fasa pertumbuhan padi. Prototaip dibina mengikut skematik dan jadual pengairan dan pemparitan sawah padi *Kementerian Pertanian dan Industri Asas Tani Malaysia (moa)*.

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PIC	-	Programmable Integrated Circuit
PSM	-	Projek Sarjana Muda
LED	-	Light-Emitting Diode
LCD	-	Liquid Cristal Display
PLC	-	Programmable Logic Circuit
MCU	-	Microcontroller Unit
LED	-	Light Emitting Diode
MARDI	-	Malaysian Agricultural Research and Development Institute
JPS	-	Jabatan Pengairan dan Saliran
USB	-	Universal Serial Bus

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CHAPTER I

INTRODUCTION

Nowadays, the maximization of technology is offers the greatest of benefit and improvement of lifestyle and industrial. In this case, the maximization of technology also gives an opportunity to improve irrigation and drainage efficiencies of agriculture especially for paddy field. The rice yield is increased [1], allow crop production throughout the year because of water consumption [2], and modernization of an irrigation system [3] depend on efficiencies of irrigation system and technology.

1.1 Introduction of the Project

Paddy Field Irrigation Control System by using Programmable Logic Controller (PLC) is automatic irrigation system based on PLC as controller. The irrigation system consists two of pump, which is one pump was used to supply water into irrigation canal and the others pump are used to pump out water into drainage canal.

The purpose of this project is to maintain water level of paddy field from rainfall and evaporation. In order to maintain water level at certain level, water level switch

sensor are used to opening or closing a pump within a specified range of liquid of specified phase.

Furthermore, light indicator are used as monitoring to determine the sub-operation of system. The different colour are used for each sub-operation of system. There have two sub-operation of system, which are to check the system is energize with power supply and to determine which operation of system in various growth stages of paddy.

1.2 Problem Statement

Presently, the farmers of paddy field are still using manual controller to opening or closing the irrigation canal and drainage canal. Seconds, water balance in paddy field because of rainfall and evaporation was affected potentially injurious strain in paddy field. Hence, the farmer is required to constantly check progress of irrigation system in paddy field. Furthermore, the farmers also needed to measure water level of paddy field and monitor the water level of paddy field.

1.3 Objectives

The purpose of the study is to maximization the technology of irrigation and drainage control system to reducing the dependency of human and ensure stable supply of water requirement. The principle objective of this study is to design and develop an automation system for improving the operation of existing. The objectives of this project are:

(a) To design prototype of irrigation and drainage control system based on PLC.

(b). To improve irrigation and drainage efficiencies for maintaining certain water level of paddy fields on prototype.

1.4 Scope of works

In scope of works, there are divided by three main scope of work which is literature review, software design and hardware design. The scopes of work of project are:

(a) Literature review

(i) Research the concept of irrigation paddy field in Malaysia
(ii) Research technology of irrigation paddy field.

(b) Software design

(i) Design grafcet diagram for standardization of the specification of system
(ii) Convert grafcet diagram to ladder diagram to check the sequence and cycle of system by using CX-Programmer software.
(iii) Create Cx-Designer to check the ladder diagram whether the program is satisfaction or not by using screen creation or visual screen

(c) Hardware design

(i) Testing and maintenance ladder diagram with PLC.
(ii) Integrate Omron PLC with component.
(iii) Testing and troubleshot prototype between ladder diagram, PLC and component.

1.5 Methodology

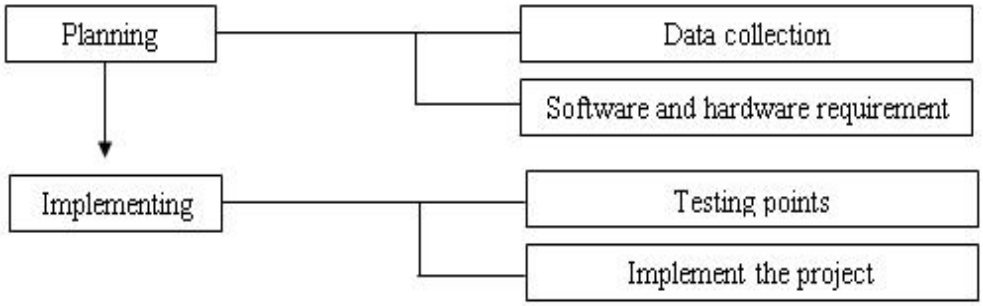

Figure 1.1: Overview of methodology

Figure 1.1 shows an overview of methodology will use for development of this project system and also prototype. Thus, two major steps were used to evaluate this project system, which is planning and implementing. In planning, two parts will be consideration which is data collection and software and hardware requirement. In implementing, two parts will be consideration which is testing points and implement project. The further explanations of methodology will explain in chapter three.

1.6 Report Structure

This thesis consists of five chapters that will explain in detail about the process of this project system. The first chapter will discusses an introduction, objectives, problem statement and scope of workd for this project system.

The second chapter will discuss literature review and consist of two type of resource. The first type of resource is thesis and journal about system irrigation and drainage paddy fields. The data of those resources was collected to analysis, compare and improve the existing irrigation and drainage control system paddy fields. Second's type of resource is interview with an agriculture officer and farmer.

The third chapter will cover the details explanation of methodology that is being used to make this project complete and working well. Therefore, many methodology or research has been used to take the advantages and improve as upcoming studies.

The fourth chapter will discuss the results of prototype project system consists of two parts which is simulation and hardware. There have four stages of result, which is simulation, hardware testing, interface between software and hardware and troubleshooting. Furthermore, this chapter also will discuss the discussion from the beginning of process project system until successful develop prototype project system.

The last chapter will conclude all achievement and information obtains that should be done. Besides, recommended also given for further study of this project system.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

Literature review gives an overview of the *Paddy Field Irrigation Control System by using Programmable Logic Controller (PLC)* of inquiry. These have two types for resource, which are primary sources and secondary sources. The primary sources are thesis and journal that relevant with this project system. In these primary sources was consist a schedule, existing project control system for irrigation system for paddy field and water control concept and secondary sources is interview an agriculture officer and farmer.

2.2 Schedule of irrigation system for paddy field

Based on *Buku Panduan Pengurusan Air untuk Tanaman Padi,* [1] there have three phases of growth stages of rice plant, which is vegetative phase, productive phase and filling grain phase. Besides, different growth stages of the rice paddy require different amounts of water.

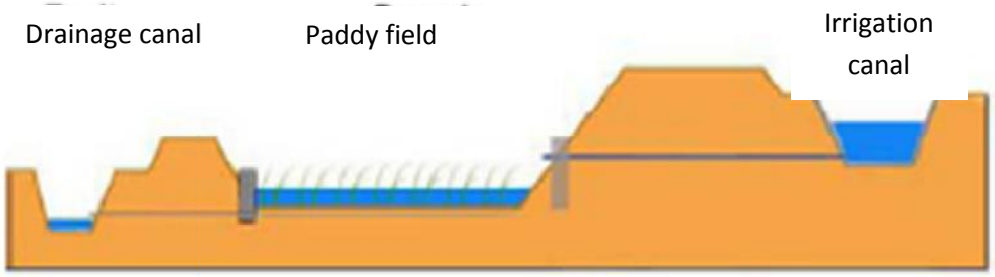

Figure 2.1: Growth rice plant in vegetative phase

Figure 2.1 shows a growth paddy in vegetative phase for five to fourteen days. In this phase, rice plant require five cm water level in paddy fields. The volumes of water level of rice plant depend on phase of growth.

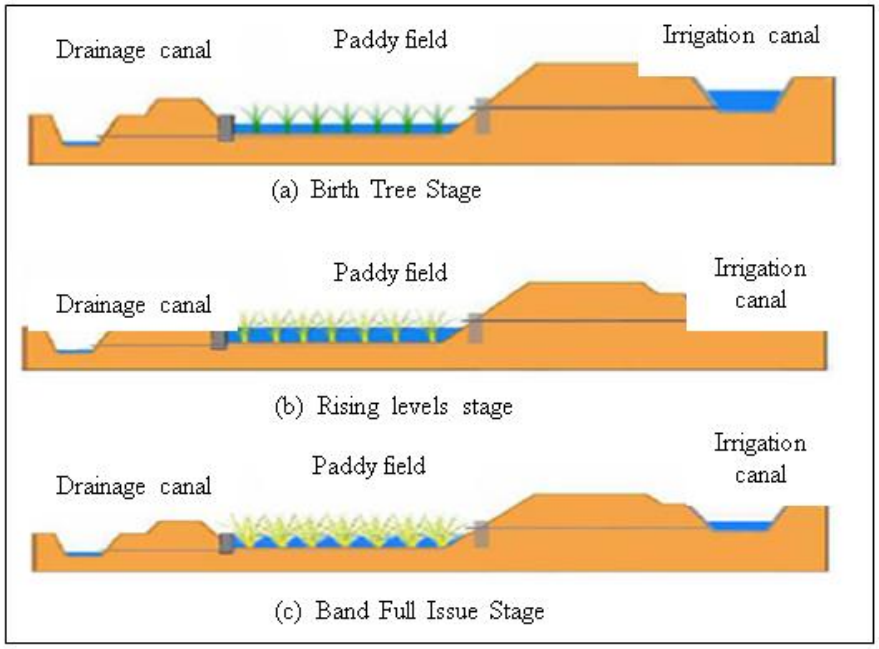

Figure 2.2: Productive phase for rice plants.

Figure 2.2 shows a growth paddy in Productive phase for forty one to eighty days. In this phase, rice plant require five cm water level in paddy fields. The volumes of water level of rice plant depend on phase of growth.