



## Automatic Fertilizer Irrigation System Using PLC

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### ABSTRACT:

Farming plays an important role in food production and economic development in India and the world as a whole. Getting high yield from farm produce depend on land fertility, soil moisture and other climatic factors. For all the crops fertilizer is required to increase yield productivity and gain profit. Generally, in India the main crops are wheat, rice, sugarcane, jowar and cotton and there is no automation implemented which is helpful for all crops. Means one system is used for only one crop, we are decided that to work on a project which is helpful all the crops whichever we want, we can directly apply how many fertilizers ratio we want and it is given to output. So, we are developed PLC based automatic fertilized-irrigation control and management system in which the fertilizer mixes in water by using the venture which creates a pressure difference between its inlet and outlet port and through the outlet port, fertilizer added into the water which is directly connected to the drip irrigation to the root of plants. This all functions are controlled by PLC. So, this project is useful for the improvement of soil porosity and nutrient by timely application of fertilizer and water level required for the crop's growth and development. This will metabolize the soil texture, give the nutrient to the crops, build plant tissue as well as increase the rate of crop productivity. Fertigation (fertilizer + irrigation) may be defined as the combination of irrigation and fertilizer application to the soil in order to improve crop production and plant growths. Drip irrigation system is an effective method of irrigation technique that can be primarily used to apply water and fertilizer into the plant. It enables water to drop little by little to the root of plants.

### Introduction:

This project aims at developing an automatic fertilized-irrigation control and management system for the improvement of soil porosity and nutrient by timely application of fertilizer and water level required for the crops growth and development. Our project is mainly divided into two parts that are Software and Hardware. Software is all consisted of PLC unit, and hardware part is consisted of mechanical structure that venture construction, Solenoid valves, pumps and motors. We have designed software using PLC and it is Time based machine which will help in irrigation and we can use it for any crops only we need to adjust the required quantity of fertilizer. Hardware part is completed using venturi and motors, which are operated by PLC controller and as per the requirement given from Sharad agriculture college, we have implemented our system.

The main objective of irrigation is to provide plants with sufficient water to prevent stress that may reduce the yield. The frequency and quantity of water depends upon local climatic conditions, crop and stage of growth, and soil moisture plant characteristics. Advanced fertigation systems combine drip-irrigation and fertilizer application to deliver water and nutrients directly to the roots of crops, with the aim of synchronizing the applications with crop demands and maintaining the desired concentration and distribution of ions and water in the soil. Hence a clear understanding of water dynamics in the soil is important for the design, operation, and management of irrigation and fertigation under drip irrigation. However, there is a need to evaluate the performance of these systems, because considerable localized leaching can occur near the drip lines, even under deficit irrigation conditions. The loss of nutrients, particularly nitrogen, from irrigation systems can be expensive and pose a serious threat to water bodies. In order to reduce these threats, we are developing the completely Atomized fertilizer irrigation system.

**Drip irrigation system:** Is an effective method of irrigation technique that can be primarily used to apply water and fertilizer into the plant. It enables water to drop little by little to the root of plants.

**PLC:** PLC is a programmable Logic Controller software part of our project, which is used to control all operation of fertigation, that is it control timing and operation.

Here we used ladder diagram programming is used for programming purpose. And Relay output PLC is used. Just we have set timings for to fill tanks and supply fertilizer & water to plants using drip irrigation. According to below flowchart the system works.

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### Working:

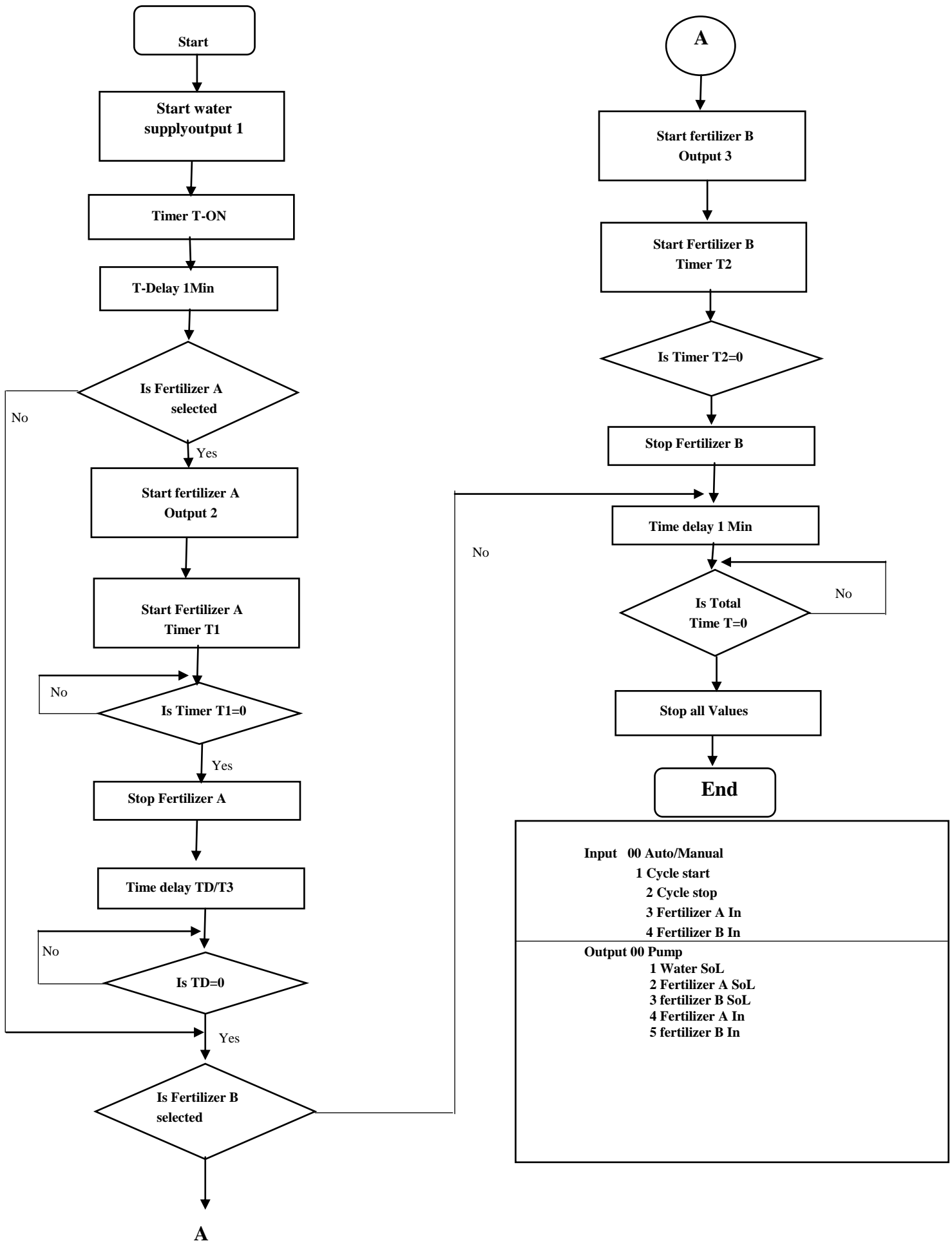
When we start the system, it indicates red light shows system is ON. After starting the system, we have to choose which fertilizers we want that is we provided two fertilizers, Fertilizer A & Fertilizer B. we can switch for fertilizer A, A&B, B directly using switch button. According to need we can choose which fertilizer we want. As per following path we can choose:

- a. Pump (Water supply [1 min])→Fertilizer A(T1)→ Flush valve [1 min]
- b. Pump (Water supply [1 min])→ Fertilizer A(T1)→Pump (Water supply [according to need])→ Fertilizer B(T2)→Flush valve [1 min]
- c. Pump (Water supply [1 min])→ Fertilizer B(T2)→ Flush valve [1 min]

All above working is done by using venturi which mixes the water with fertilizers.



Flow Chart



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**Objectives:**

1. Hydraulic studies and performance evaluation of various venturi apparatus.
2. Proposing feasible control panel for fertilization in drip irrigation system using PLC.
3. To reduce cost and easy installation.
4. Unskilled farmers can also operate this machine.

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**Conclusion:**

In this study, a fertigation system that can manage and improve the yield of crop has been developed. Fertigation is an efficient tool for providing plant nutrition for the field crops. Fertigation provides variety of benefits to users like high crop productivity and quality. There are various types for fertigation equipment's, which can be selected according to the crop type and irrigation systems. Watersoluble fertilizers or liquid fertilizers are most suitable for fertigation.

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