



## DEVELOPMENT OF AN INNOVATIVE IRRIGATION SYSTEM FOR DRAGON FRUIT FARMING

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### KEYWORDS

innovation  
drip irrigation system  
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### ABSTRACT

The proper watering system will increase plant growth. Water become an essential part of dragon fruits growth; it should be fulfilled and controlled. A village with soil characteristic mostly hilly topography, dry, less of water, rocky, and limited plant (dry plant only) need special treatment for being a planting land. But it has some local wisdom exists, and the most popular are dragon fruits. A drip irrigation system is applied as an innovation of watering plants method. Water distributes through the capillary tube, flowing through the plant and controlled, called drip irrigation system. The aim of this research to explain the use of a drip irrigation system on the dragon fruit plant. Observation and experimental studies have conducted, the community considers drip irrigation as a new technology; presentations show that it is suitable to be applied in their area. This implementation was able to improve the efficiency and effectiveness of irrigation through dragon fruits in the village. Furthermore, the application of this technology can be used as a real work example to build a better Indonesia..

### INTRODUCTION

The availability of agricultural water is limited. While water demand increases through plant growth. Some laterite soil is infertile. The difficulty of obtaining water become the major problem that must be faced by the farmers during the dry season for laterite soil. Common water supply conducted by draining water from artesian wells or other water sources that are still available. Then, the water is stored in tanks for sprayed on crops throughout the land. Due to the limited volume of the water tank, the use of water for watering should be shared with the use of water for the daily needs of the residents.

Dryland farmers need an effective irrigation system for their agriculture. One effective method of irrigation on limited water is a drip irrigation system. The drip irrigation system is a method of giving water which is described as a continuation of water supply with a low discharge (Susilawati, Suwignyo, Munandar, & Hasmeda, 2012). This system can control the amount of water that enters the plant, with a stable discharge.

Dragon fruit is one of dry fruit with high society demand. Indonesia as a tropical island has many advantages for developing dragon fruit. The implementation of Drip Irrigation system through dragon fruit plants will help to increase the quality.

Fitriana, Diah, & Norma, (2015) utilized drip irrigation on limited land. The plants used are tomatoes, cabbage, shallots, chili, potatoes, and melons. This technology is able to reduce watering time, labor, and maintenance costs. However, this technology is considered relatively expensive. Drip Irrigation Systems can be combined with renewable technology. (Wijayanto & Widiastuti, 2016) Applies hybrid technology (wind turbines and solar cells) to turn on water pumps. The pump is used to fill the water reservoir, as a drip irrigation water supply for dragon fruit. Good technology in agriculture can further reduce maintenance costs, watering time and also the

amount of labor needed. The application of this technology depends on the condition of the land that is adequate. (Widiastuti & Wijayanto, 2018)

In the 21st century, technology has become the center of attention in all sectors of life, including agriculture. Indonesia needs to run to invite the lagging. To accumulate this problem, we trying to describe how the development of drip irrigation system in Indonesia.

## RESEARCH METHODS

This data collection technique is using observation, and experimental. The author made observations directly to the field, did experimentally, and revealed in writing. The analysis technique used is descriptive analysis. This process was performed on the initial data collection; researchers must understand what the meaning of the matters examined is; utilizing recording rules, patterns, configuration statement are well established and the direction of causation to facilitate a conclusion.

## DATA ANALYSIS

### Drip Irrigation System

Drip irrigation is a watering model that uses flow networks by utilizing altitude. The component of drip irrigation consists of main pipes, sub-main pipes and capillary pipes. At the end of the capillary tube, some emitters are used to distribute water in drips. Emitters are placed near the roots so that the land in the root area (Fitriana et al., 2015). Water pressure is obtained from the height difference between plants and water reservoirs. So that drip irrigation is classified as low-pressure irrigation. In drip irrigation, the level of soil moisture at the optimum level can be maintained. The drip irrigation system is often designed to be operated daily (at least 12 hours per day).

### Technology Overview



Figure 1. Simple drip Irrigation system

Drip Irrigation system is a simple technology. The key of this technology, there is emitter that changes the water current into a droplet, the water will fall continuously and controlled.

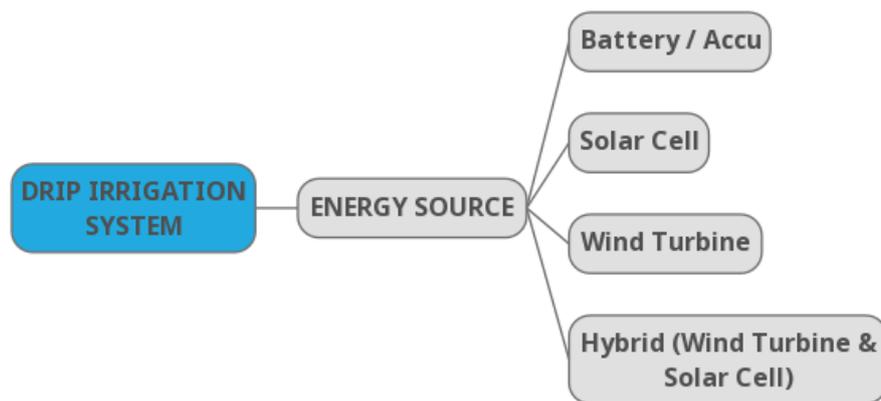


Figure 2. Drip Irrigation System by Source

Utilization of wind as an energy source is the working principle that converts the kinetic motion of the wind into mechanical motion pinwheel (Islam & Amin, 2012) which can be used to rotate the alternator shaft. The alternator will generate electricity that can be directly applied to drive the water pump. Other renewable energy sources are widely used in solar power. Although solar cell technology is still considered low enough to meet the electricity needs big power, but with the development of technology has been born of alternatives to change the paradigm. Consequently, the investment pump system and other electrical appliance with solar power can be more expensive. Irrigation technology to convert solar energy into electricity that solar radiation is used to drive the water pump (Xu, Liu, et al. 2013).

### Innovation

Drip Irrigation Systems Concepts is to drain the water on the plant utilizing periodic and regular drip. The water used comes from wells aspirated using an electric pump through the water tank (reservoir) to be streamed automatically to each plant. The energy used to turn to the electric pump by a combination of solar cells and wind turbine hybrid. The stored water in the reservoir out synthetically PVC pipe ½ inch and 3 mm capillary tube that branches off as needed number of plants will be sprayed. Irrigation system with drip method, with the help of a tool called dripper. Dripper can control the amount of water supply to the plant. Dripper neatly mounted on each of each root of the plant, and it is mean that water flowed directly commuted plant quickly, accurately and optimally. When compared with manual watering then this method is more targeted and opportunity of low water loss. Water loss can be due to irrigation is wasted due to the harvesting process too far away from the plant, as well as the amount of water evaporated due to the influence of ambient temperature. The use dripper to control the amount and timing of irrigation to maximize crop water consumption and saving measures for human use.

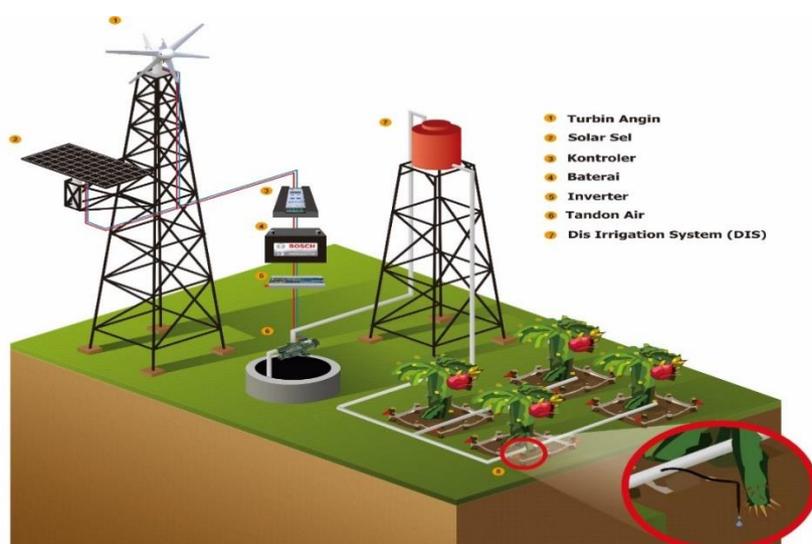


Figure 3. Drip Irrigation System Concepts on Dragon Fruit with Solar Cells and Wind Turbine Hybrid Technology

## Components

Table 1. List of Component DIS Technology

No.	Component
1.	Wind Turbine
2.	Solar Panel
3.	Controller
4.	Aki
5.	Inverter
6.	Water Pump
7.	Water Reservoirs
8.	DIS component

The supply of water is the ideal amount of water to saturate the soil around the root zone to field capacity situation. If the water is given excessive resulted in flooding in certain places that demonizing soil aeration. General guidelines about the timing of the water are about 60% of the water available in the soil. Installing drip irrigation can be explained through the picture as follows:



Figure 4. Drip Installation

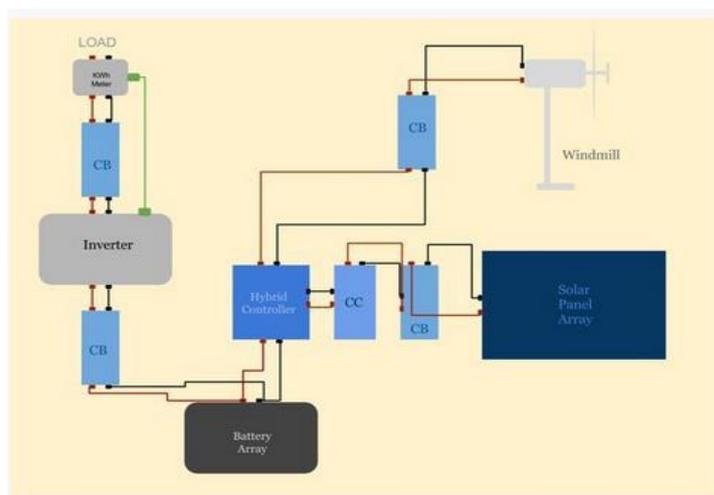


Figure 5. Electrical Installation System

Electrical installations have an essential role, when it comes to installation error occurs can damage components. At least there are two components to note that the DC and AC components. The installation used OFF grid system, where the installation of a separate energy source to the power source home or in other words, is a stand-alone installation. Then, the wiring of the pump -Turbine Wind - Solar Cells use the system underground that is buried in the ground so that the system neater and do not interfere with passing. All installed and integrated neatly fit the circuit diagram in Figure 8. All components are combined into one to facilitate a panel box technician in performing maintenance or repairs. Wind turbines and solar cells secrete both AC electrical currents that are less relevant to the water pump in general, so we use an inverter to convert the current to AC. The inverter is equipped

with a stabilizer that prevents excessive current and voltage stepping. All components properly seated neatly with emphasis on occupational health and safety according to the safe installation procedure and safe electric control.

## CONCLUSION

Based on the exposure that has been stated above can be some conclusions, Solar Cell Technology and Hybrid Wind Turbine is a merger between the kinetic energy source of wind and solar thermal radiation simultaneously in order to produce electrical energy optimally. Implementation of Solar Cell Technology and Wind Turbine Hybrid through two stages of electrical installations and installations DIS. These programs improve community knowledge and skills in the field of technology. Modernization of agricultural systems to facilitate cultivation of crops so that the quantity and quality of agricultural products increased. Establishment of independent domestic industry. They increased agrarian production communities with non-productive land use. It is improving the rural economy by society to be maximal.

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