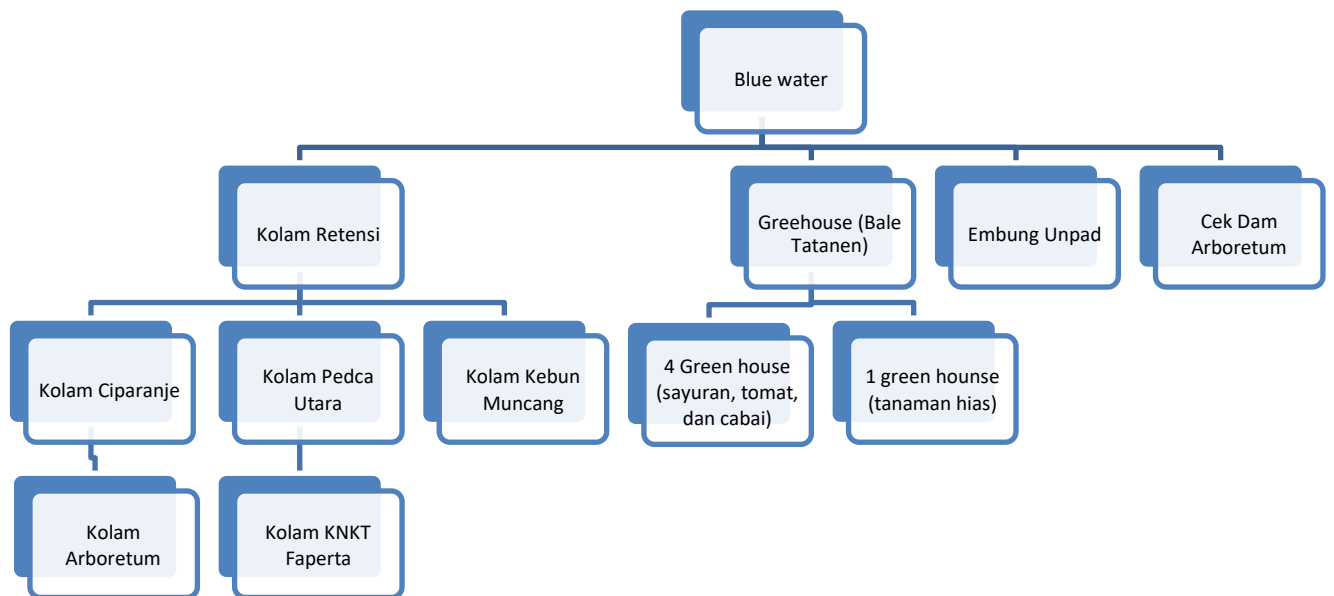
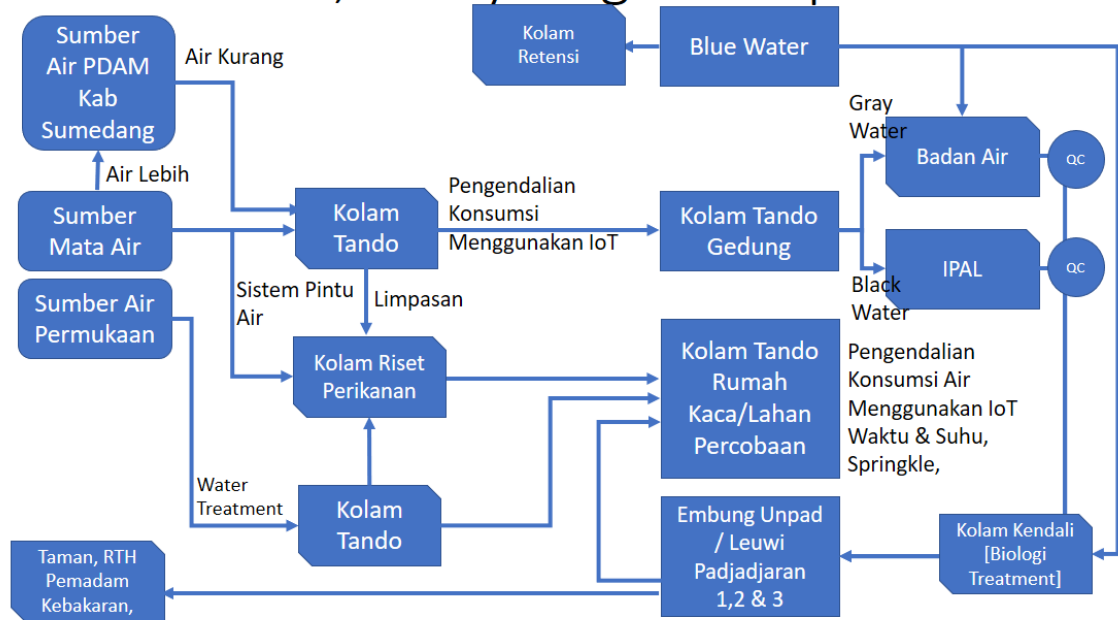




## Water Re-use, Recycling Program Implementation

### Skema Re-Use, Re-Cycling Air Unpad



"Blue Water" Scheme at Unpad Jatiningor Campus



“Nano bubble” technology to recycle water

### KETERSEDIAAN AIR EMBUNG UNTUK MEMENUHI KEBUTUHAN AIR DI KAWASAN KAMPUS JATINANGOR, UNIVERSITAS PADJADJARAN

ONFARM RESERVOIR WATER AVAILABILITY TO MEET THE WATER NEEDS IN JATINANGOR CAMPUS OF UNIVERSITAS PADJADJARAN

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**Abstrak**— Pengaruh dari pemanasan global salah satunya adalah perubahan pola cuaca. Perubahan tersebut menyebabkan debit sungai pada musim penghujan sangat tinggi sedangkan musim kemarau sangat rendah. Hal tersebut berdampak terhadap kebutuhan air baku dan konsumtif di sekitar kampus tidak terpenuhi sepanjang tahun. Penelitian ini bertujuan untuk memodelkan ketersediaan air dalam memenuhi kebutuhan air di sekitar kampus Jatinangor Universitas Padjadjaran. Metode yang digunakan adalah model debit F.J Mock dengan 80% nilai probabilitas debit andalan serta pola perhitungan 15 hari. Hasil menunjukkan debit yang masuk ke dalam tanggungan tinggi dengan debit terbesar pada fase kedua bulan Februari sebesar 54,68 liter/detik sehingga air yang dikeluarkan di outlet cukup tinggi. Naliran sangat rendah ketika masuk pada bulan Juni. Tetapi dengan jumlah cadangan air yang ada dalam tanggungan tetap bisa memenuhi kebutuhan air walaupun pada fase kedua bulan September selisih antara volume air di dalam tanggungan dengan air yang dipakai sangat tipis yaitu selisih 4.500 m<sup>3</sup>. Dengan demikian, adanya embung ini air yang ditampung pada saat musim hujan bisa memenuhi kebutuhan air di sekitar kampus pada saat musim kemarau dan juga efektif dalam mengurangi resiko banjir di bagian hilir.

**Kata kunci** — Neraca air, F.J Mock, debit andalan.

**Abstract**— One of the effects of global warming is weather pattern changes. These changes cause river discharge in the rainy season to be very high, while in the dry season is very low. It impact to raw and consumptive water needs around the campus which are not fulfilled throughout the year. This research aims to simulate the availability of water in meeting water needs around the Jatinangor campus of Universitas Padjadjaran. The method used is the F.J Mock discharge model with 80% reliable debit probability value and a 15-day calculation pattern. The results show that the discharge entering the reservoir is high with the largest discharge in the second phase of February at 54.68 liters/second so that the water discharged at the outlet is quite high. However it is very low when it comes in in June. But with the amount of water reserves in the reservoir, it can still meet the water needs even though in the second phase of September the difference between the volume of water in the storage and the water used is very thin, the difference is 4,500 m<sup>3</sup>. Thus, with this reservoir the water that is collected during the rainy season can meet the water needs around the campus during the dry season and is also effective in reducing the risk of flooding downstream.

**Keywords** — Water balance, F.J Mock, dependable flow.

#### I. PENDAHULUAN

Salah satu dampak yang terjadi dari pemanasan global adalah perubahan pola cuaca. Perubahan tersebut mempengaruhi daur hidrologi yang menyebabkan debit sungai merosot tajam di musim kemarau, sementara di musim penghujan debit air

meningkat tajam [1]. Ditambah rendahnya daya serap dan kapasitas simpan air di DAS menyebabkan pasokan air untuk kebutuhan pengairan dan air baku semakin tidak menentu [2] sedangkan kawasan kampus Universitas Padjadjaran di wilayah Jatinangor setidaknya membutuhkan 50.000 m<sup>3</sup> air



Jalatista Unpad

The usage of recycled water at the Unpad Jatinangor Campus includes four activities that have been carried out, which are

1. **Utilization of Unpad Basin for irrigation of rice fields and experimental gardens around the campus area.**



### **Pumps for irrigation in rice fields and experimental gardens**

Unpad basin serves for runoff water harvesting and storage. The collected water is utilized as a source of irrigation water for residents' rice fields, planting areas, and experimental gardens on Unpad Jatinangor Campus. Unpad basin has a pump that is used to channel water for irrigation of rice fields to the east of the Unpad campus.

The storage capacity of Unpad basin is measured by looking at the elevation, area and volume of inundation of the reservoir adjusted to the planning target. The results show that the normal water level elevation value is at 794 meters above sea level with an inundation area of  $\pm 0.69$  ha and an inundation volume of  $\pm 19,000$  m<sup>3</sup>. By comparing rainfall data at the Unpad Jatinangor Campus, the water balance in the reservoir can meet the needs



of 50,000 m<sup>3</sup> /year of water in the Jatinangor campus area with the results of the potential to harvest very large amount of water during the rainy season.

## 2. Nano bubble technology to recycle water



c

## 3. Utilization of Water from Arboretum UNPAD Check Dam for Irrigating Gardens and Experimental Gardens

Apart from being an infiltration area, the Unpad arboretum checkdam also functions as a source of irrigation water for parks and experimental gardens during the dry season. Check Dam Unpad has a storage capacity of 14,000 m<sup>3</sup>. In addition to irrigating parks and experimental gardens, the check dam is also used as a water filler for fire trucks. The use of check dam water for watering and irrigation activities is situational.



Irigasi Taman Unpad



Cekdam Arboretum



Kebun Percobaan Unpad

#### 4. Jalatista UNPAD

Jalatista Unpad is a program to provide drinking water that is processed independently to meet the needs of drinking water for the Unpad academic community and also to reduce the use of plastic beverage packaging waste. This program was implemented in August 2019 based on a circular letter from the Director of Facilities and Infrastructure of Unpad.



#### **Circular letter of the Director of Facilities and Infrastructure UNPAD Pertain to Jalatista**

Jalatista drinking water comes from raw water that is treated using Reverse Osmosis technology. It is currently available in 11 locations on Unpad Jatinangor Campus consisting of 10 jalatista placed on open area (outdoor)



and 1 placed indoor. Outdoor Jalatista can be found in the Rectorate Building, Bale Santika, Unpad Great Mosque, GOR Jati Padjadjaran, and a number of faculties within Unpad.



**Jalatista point location in UNPAD Jatiningor Campus (online access)**

#### 5. Utilization of Water from Rainwater Harvesting System from the Roofs of Buildings

In the rainwater harvesting system from the roof of the greenhouse, the collected rainwater is utilized as a source of irrigation water in the cultivation of vegetables, cherry tomatoes and melons as shown in Figure 4. The system built can accommodate 21 m<sup>3</sup> of rainwater which is used to supply irrigation water needs throughout the year. Unpad has 5 greenhouses that use this technology, 4 greenhouses focus on growing vegetables, chilies, and tomatoes while 1 greenhouse focuses on planting ornamental plants.

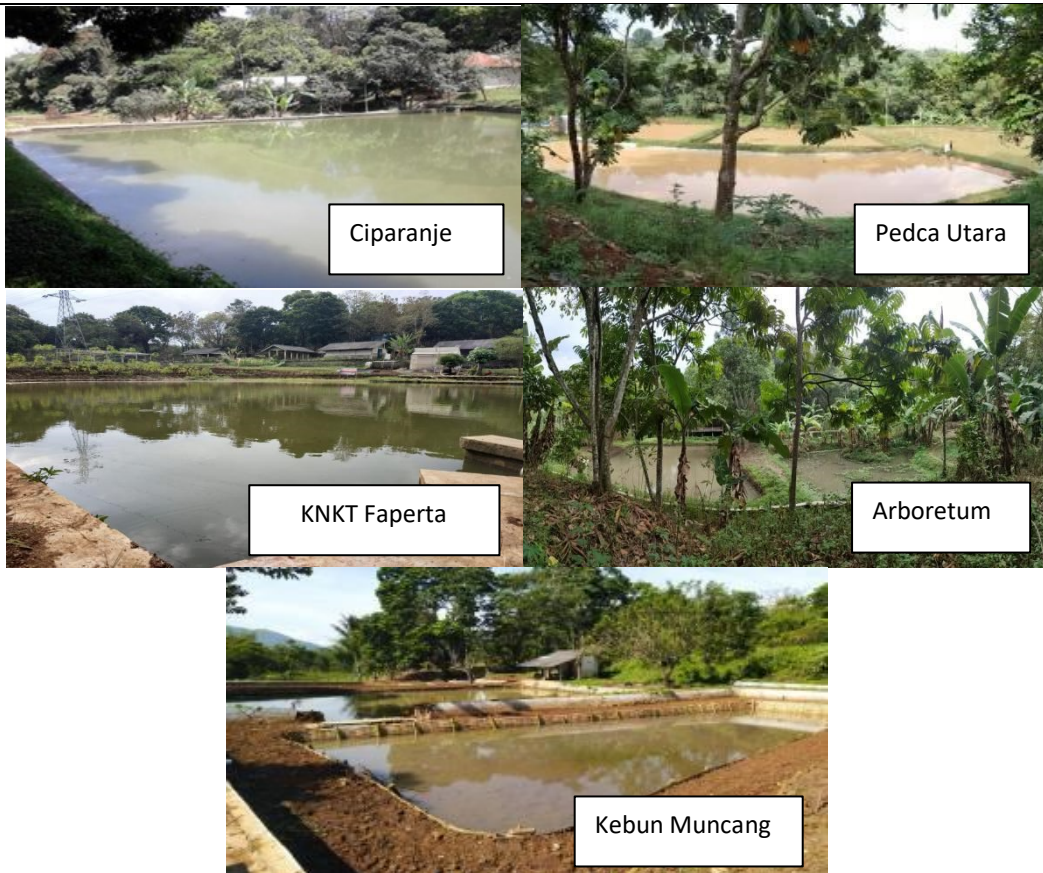


**Rainwater Harvesting System from the Roof of the Greenhouse for Irrigation**

#### 6. Utilization of Water from Surface Runoff Harvesting System for Irrigation and Fisheries



In addition to rainwater harvesting from rooftops, harvesting surface runoff water from the land surface can also be utilized as a source of irrigation water in the dry season or during deficit periods. Surface runoff water can be harvested from direct runoff that occurs during rainfall or in the form of a diversion system from natural flows that are accommodated in agricultural/fishery ponds that also function as retention ponds or infiltration ponds. The total area of the ponds in the Unpad Jatiningor campus area is approximately 1.1 ha which is spread in several places and at least able to accommodate more than 15,000 m<sup>3</sup> of water which is also used as irrigation water during the dry season.

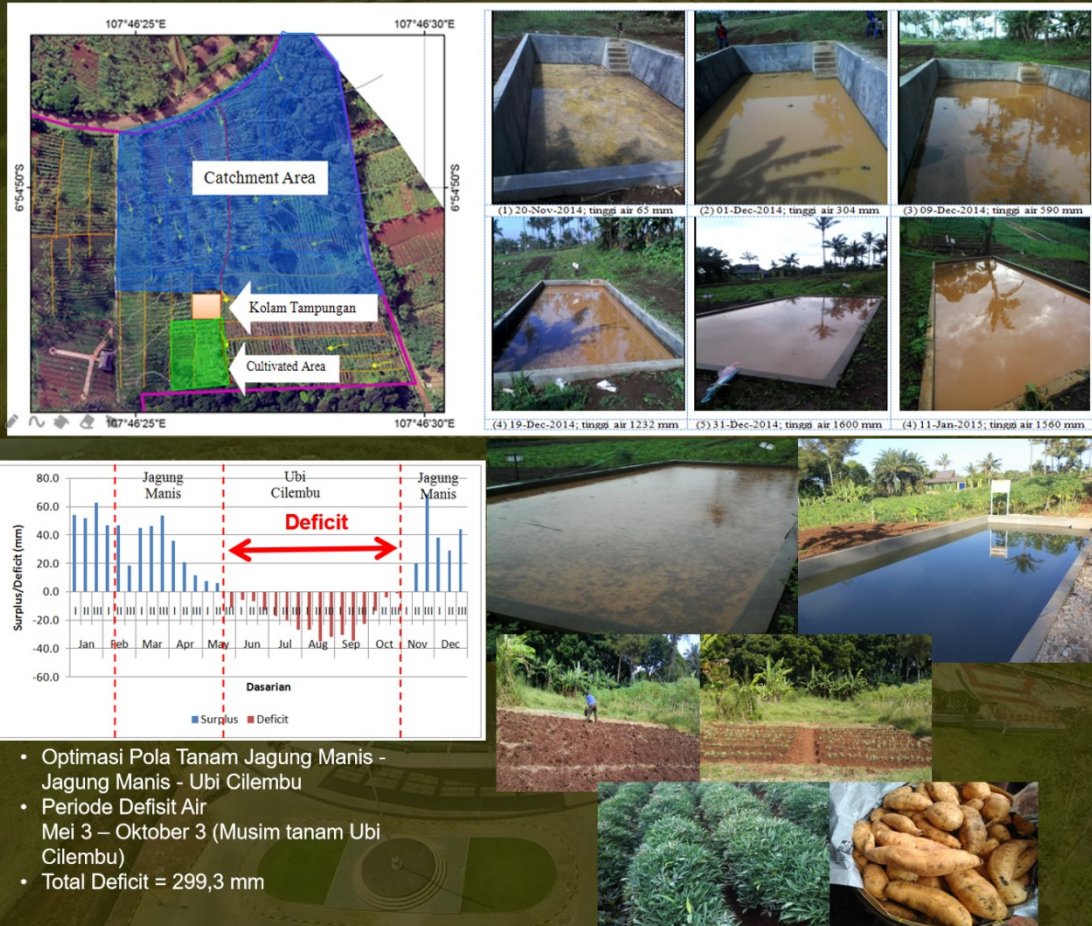


Surface runoff harvesting pond in the UNPAD area which performs as a retention pond and reservoir for irrigation water during the dry season



## SISTEM PEMANENAN AIR LIMPASAN: Macrocatchment System - UNPAD

PEMANENAN RUNOFF (SISTEM PEMANENAN LIMPASAN LANGSUNG)

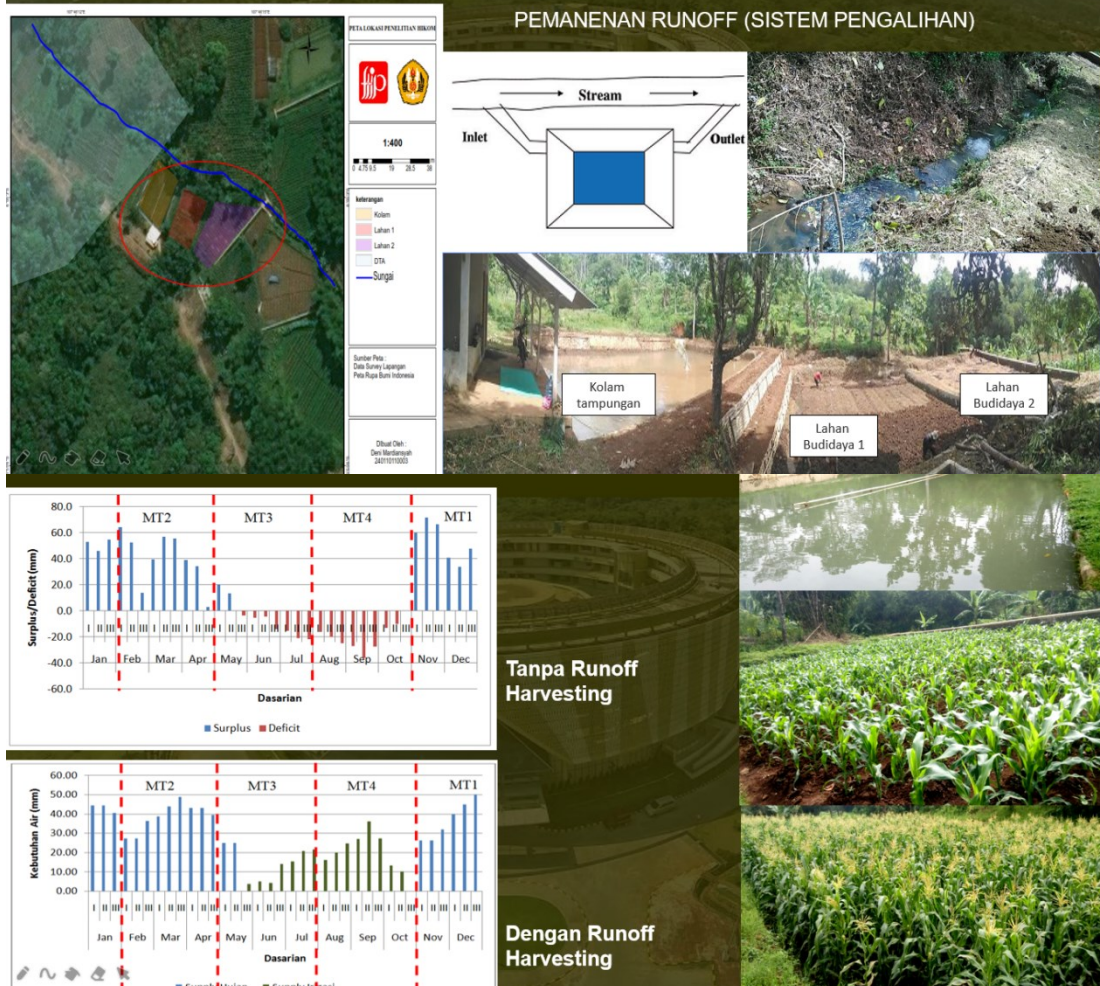


- Optimasi Pola Tanam Jagung Manis - Jagung Manis - Ubi Cilembu
- Periode Defisit Air Mei 3 – Oktober 3 (Musim tanam Ubi Cilembu)
- Total Deficit = 299,3 mm

Runoff water harvesting system directly from the land surface for irrigation water sources in the dry season



## SISTEM PEMANENAN AIR LIMPASAN: Macrocatchment System - UNPAD



Harvesting Surface Runoff Water by diverting it from natural watercourses and storing it in agricultural ponds for irrigation in the dry season