



Singapore Healthcare Management 2023

Making Every Drop Count:

Using Drip Method of Irrigation (DMI) at Bicentennial Garden



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Background of the problem

In Singapore, approximately 5 litres (L) of water is required for 1 m² shrubs planting area in one day due to evapotranspiration rate and climatic condition. Bicentennial Garden has approximately 3,800 m² of planting area. This relates to 18,748L of water being used daily to water 4 gardening plots. On average, Singapore rains 160 days per year. With deduction of rainy days, the water consumption is approximately 3,844 m³ per year and is equivalent to SGH spending approximately \$10,532.56 per year on water consumption.



Fig.1 Traditional method of watering

Gardeners spent 4 hours daily using the traditional method of watering with hose. 60% of water through traditional watering are often not absorbed by the plants and will be lost through surface runoff, surface water evaporation and deep percolation. Thus, more water is required to achieve 100% water absorption by the plants.

Mission Statement

To reduce 46% of water consumption (L/m³) at Plot A and B of Bicentennial Garden within 6 months.

Analysis of the problem

The team analyzed the problem by applying 8 wastes of Lean for the current method of traditional watering.

<p>Defects Overwatering/ Underwatering by human errors</p>	<p>Waiting Wasted time waiting for watering to reach optimal absorption</p>	<p>Transportation Gardeners' movement to multiple plots to water plants</p>	<p>Motion Gardeners' physical motion to lift water house</p>
<p>Inventory Accumulation of pending gardening tasks to follow-up e.g. weeding, trimming, pruning of overgrown plants</p>	<p>Over-Production Unnecessary over-production of water caused by overwatering</p>	<p>Non-utilized Talent Under utilizing staff's talent to perform watering</p>	<p>Extra Processing Gardeners switching water hose to the different water points in the garden</p>

Fig.2 8 wastes of Lean

Due to the large gardening plot space in Bicentennial Garden, the process of manual watering method can be reduced to achieve lower water consumption and better staff utilization.

Initiatives

Due to the placement of existing water points at Plot A (Fragrant Zone) and B (Edible Zone), these 2 plots are identified suitable to carry out Drip Method of Irrigation (DMI). The 2 plots are estimated to have 1,162 m² of planting area.

14 numbers of inline dripline with battery-operated controller are installed with monitoring of variables such as, flow rate per controller and water pressure level.

Plot C (Colour & Texture Zone) and Plot D (Biodiversity Zone) will continue with the traditional method of watering with hose.

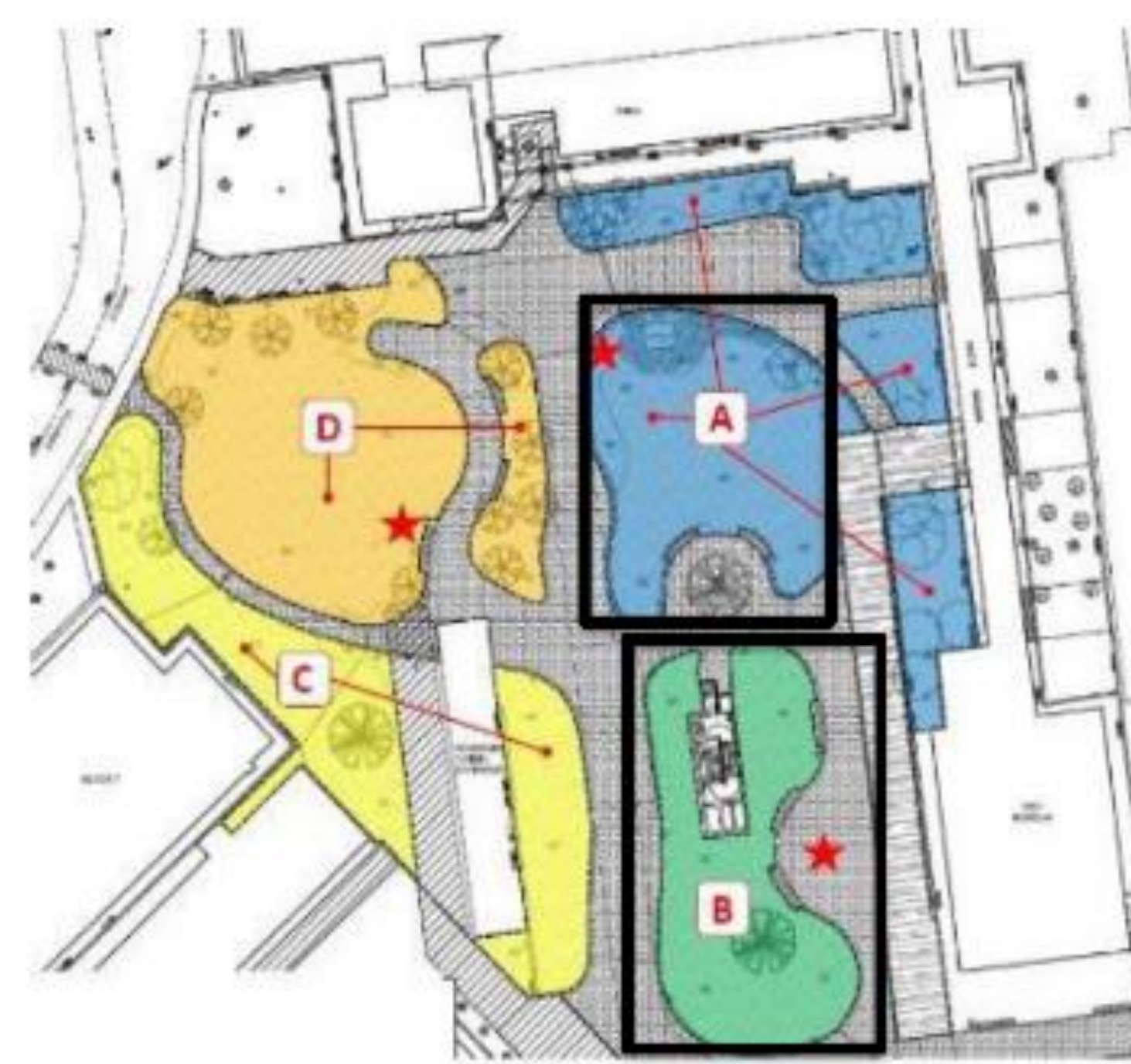


Fig.3 Map of Bicentennial Garden

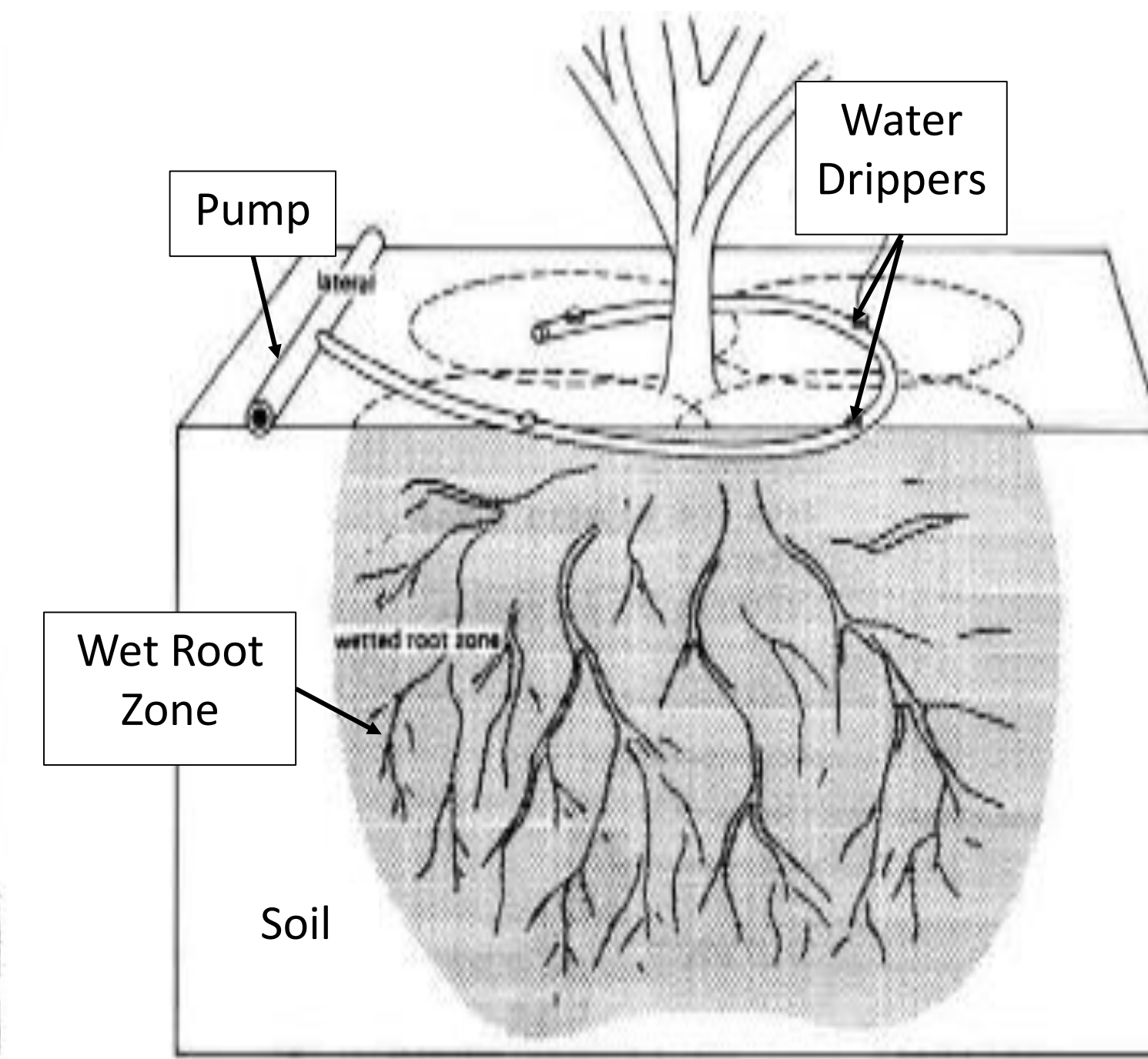


Fig.4 Photo of Drip Irrigation

Results

Water consumption data from Bicentennial Garden is analysed and projected.

Tangible benefits

1) Water and Cost Savings (in m³)

The total area of Plot A and B is 1,126 m².

The total water consumption calculated in a year:

Traditional method of watering	DMI
3,844 m ³ per year	2,054 m ³ per year
With DMI in place, we can look forward to save 1,790 m³ per year of water savings – 46.6% reduction	

Fig.5 Comparison of Water Consumption

This translates to potential cost savings of **\$4,904.60** per year.

2) Man Hours Savings

The replacement of manual watering with battery-operated controller and inline dripline, **the man hours saved will be 2.5 hours per day**. Man hours saved are utilized efficiently to perform other manual gardening tasks e.g. weeding, trimming and forking of overgrown plants.

Intangible benefits

Due to strategic placement of water points in the soil, there is an increase in irrigation efficiency and water absorption by plants. Plants are growing better due to the decrease human error of overwatering and/or under watering. Water saving is an environmentally conscious effort in reducing SGH's carbon footprint in our environment.

Sustainability Plans

With strategic water points in place, DMI can be implemented at other suitable plots at Bicentennial Garden and other landscape areas in SGH. The long term aim is to create a green environment in the hospital, yet not compromising on the necessary water consumption used for watering.

This will decrease SGH's carbon footprint and create a better environment for the country. With plans to install rain sensors to complement DMI in the future, we can also look forward to save even more water output per year.