Rain Water Harvesting System

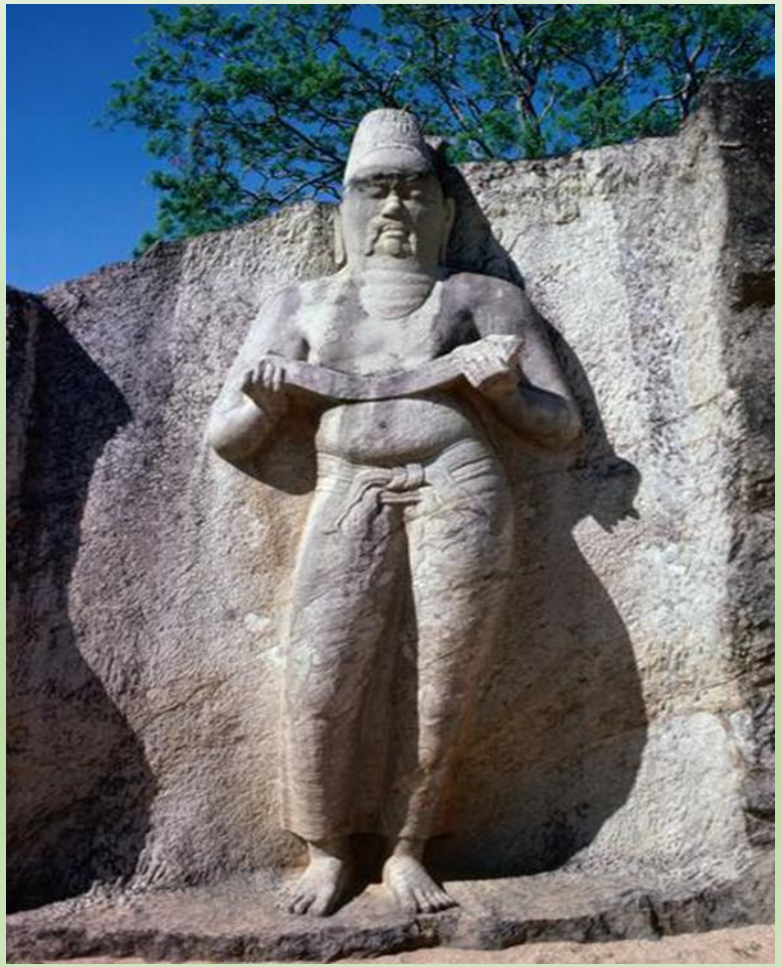
At

Forbes & Walker Fine Foods

Wanathavilluwa

History of Rain Water Harvesting

It is said the first rainwater harvesting system was introduced to Sri lanka by King Mahasena with the construction of the giant Minneriya tank covering around 1,900 Ha.



However, the common perception is that the title of “The founder” of professional rainwater harvesting and irrigation management goes to King Parakramabahu The Great

“Not even a little water that comes from the rain must flow into the ocean without being made useful to man"

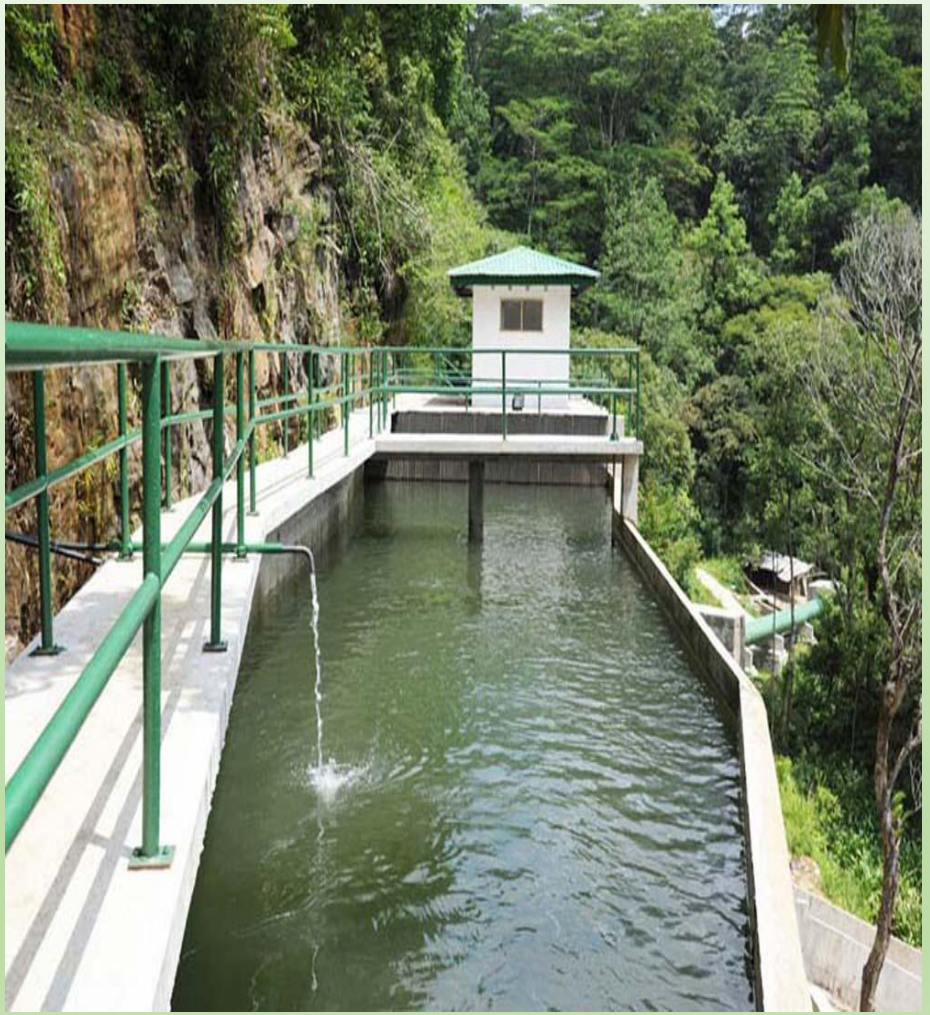
King Parakramabahu the Great
(Culavamsa, LXVIII, 8)

History evolves

- The rainwater which was initially harvested for irrigation and crop management and later was used in power generation.

- The power generation industry evolved from the large hydro power projects to mini and micro hydro power projects.

- The irrigation and agriculture industry however remained tied to the mega projects of the ancient Kings and the modern Mahaweli development projects.



Enter Forbes & Walker

- Forbes & Walker was established in 1881, by James Forbes, a tea taster and Chapman Walker, an Accountant, initially as Tea Broker to handle the sale of Ceylon Tea. We now handle the sale of all other plantation produce such as rubber, oil palm and spices.

- We also operate a modern warehousing and logistic facility focusing on the services to the plantations.

- The diversification to agriculture began in the early 1980's but was moved to India in the early 1990's.

- The operations were brought back to Sri Lanka from 2011 onwards with the dawning of peace with the establishment of an Asparagus plantation in Wanathavillu and Gherkin export industry in Girandurukotte

Seeing the Big Picture

- Daily fresh water requirement of 350,000 liters

Option 1 - Deep Well

- Established 2 deep wells of 100 meters each
- However:

> The EC level of the water exceeds 12,000 ppm

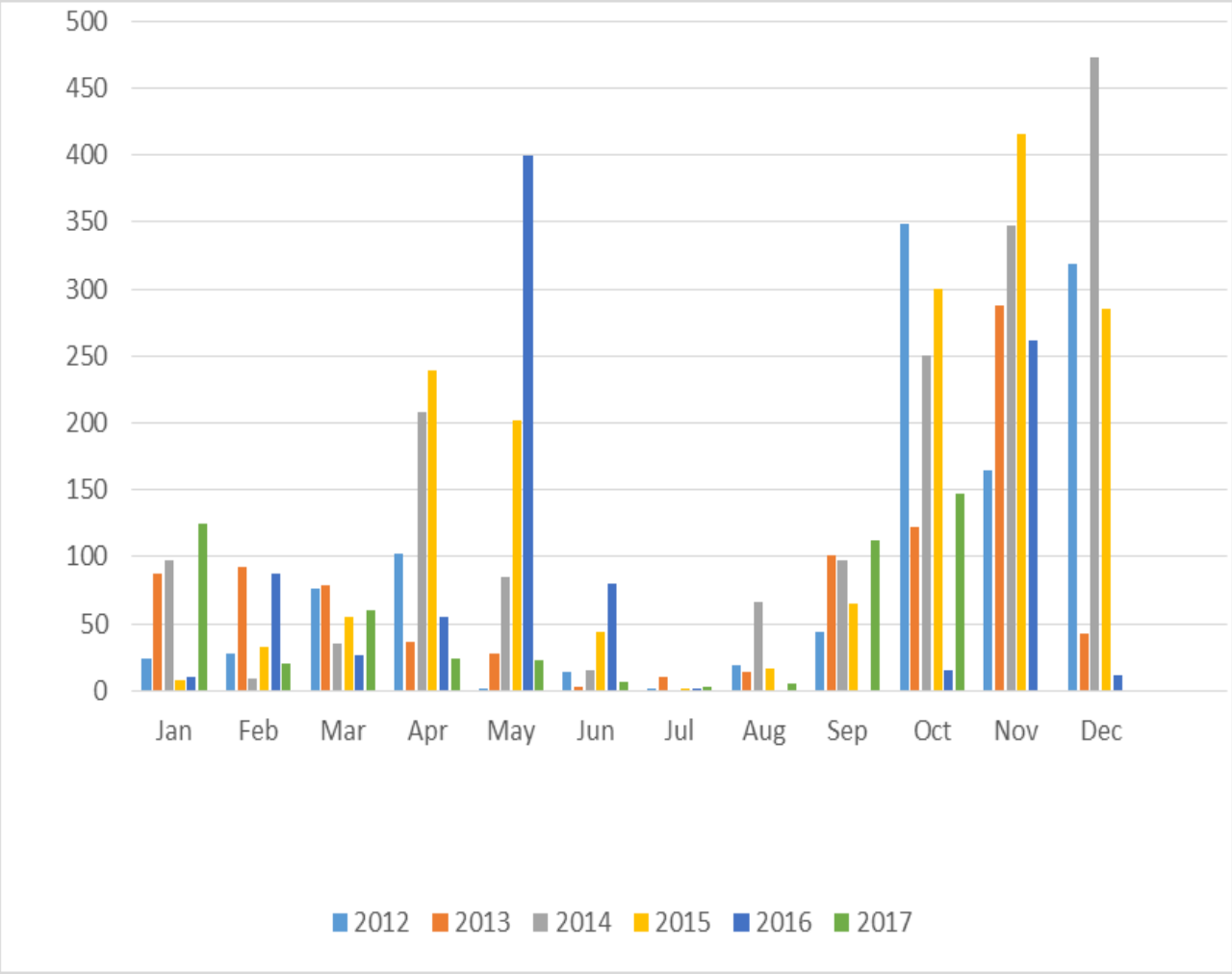
> Contains many other heavy metals and minerals making the water impure and clogs the drip lines and the very sensitive drippers

Seeing the Big Picture

- Option 2 - Pray for Rain

Therefore implementing a Rain Water Harvesting system as most appropriate initiative to improve our water quality and availability.

Data Analysis



Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2012	24.5	28.1	76.0	102.2	1.1	13.6	0.3	18.8	44.2	349.0	164.0	319.1	1,140.90
2013	87.4	93.0	78.5	36.6	27.7	3.0	9.9	14.5	101.6	122.1	287.5	43.3	905.10
2014	97.0	9.2	35.3	208.4	84.9	15.4	0.0	66.2	97.7	250.1	347.0	472.8	1,684.00
2015	8.0	32.6	55.1	238.7	202.3	43.6	0.5	16.8	65.4	300.0	415.3	284.9	1,663.20
2016	10.1	86.9	26.9	55.0	398.9	80.0	0.2	0.0	0.0	15.1	261.7	12.2	947.00
2017	124.5	20.3	60.5	24.2	22.8	7.1	2.4	5.0	112.5	147.2	NA	NA	526.50

Annual rain fall data – Puttlam District , Source – Department of Metrology, Sri Lanka

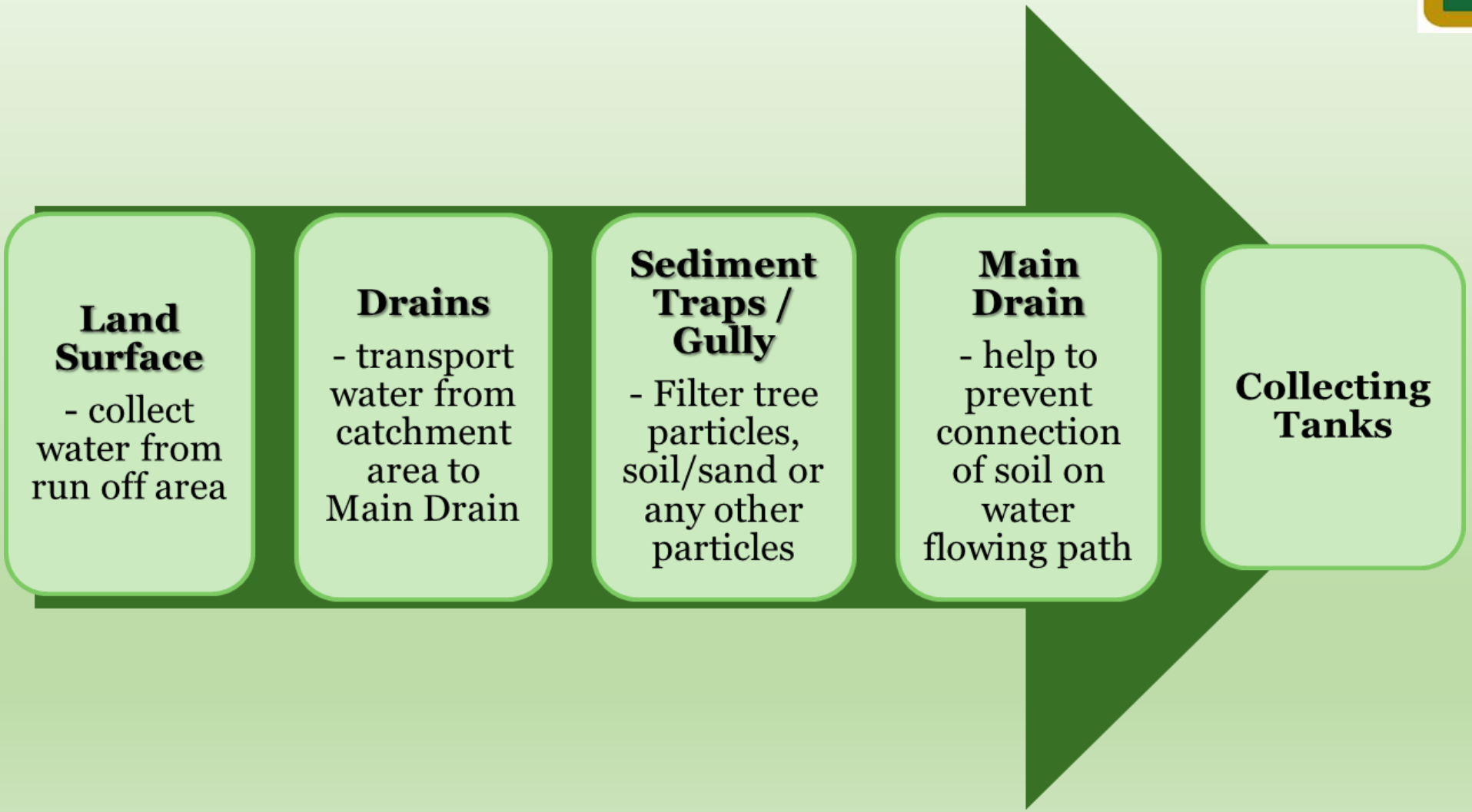
Calculations

- Average rainfall per annum for last 5 years - 1,267.44mm
- Land extent, 25 Acres - 101,175sq.mt
- Run off coefficient - 0.6
- Capturing capability in liters (1,267.44x101,725x0.6) - 77,000,000L
- **Design capacities of 3 ponds (RWH – 4Mn, Stock tank – 3Mn)- 7,000,000L**
- Total expected rainfall collected from 2 ponds - 4,000,000L
- Average available water capacity with 20% evaporation - 3,200,000L
- Suppose these tanks will fill 10 times per annum - 32,000,000L
- As a ratio of total capturing capability (32Mn/77Mn*100%) - 42%
- **Average available quantity per day - 87,671L (30%)**

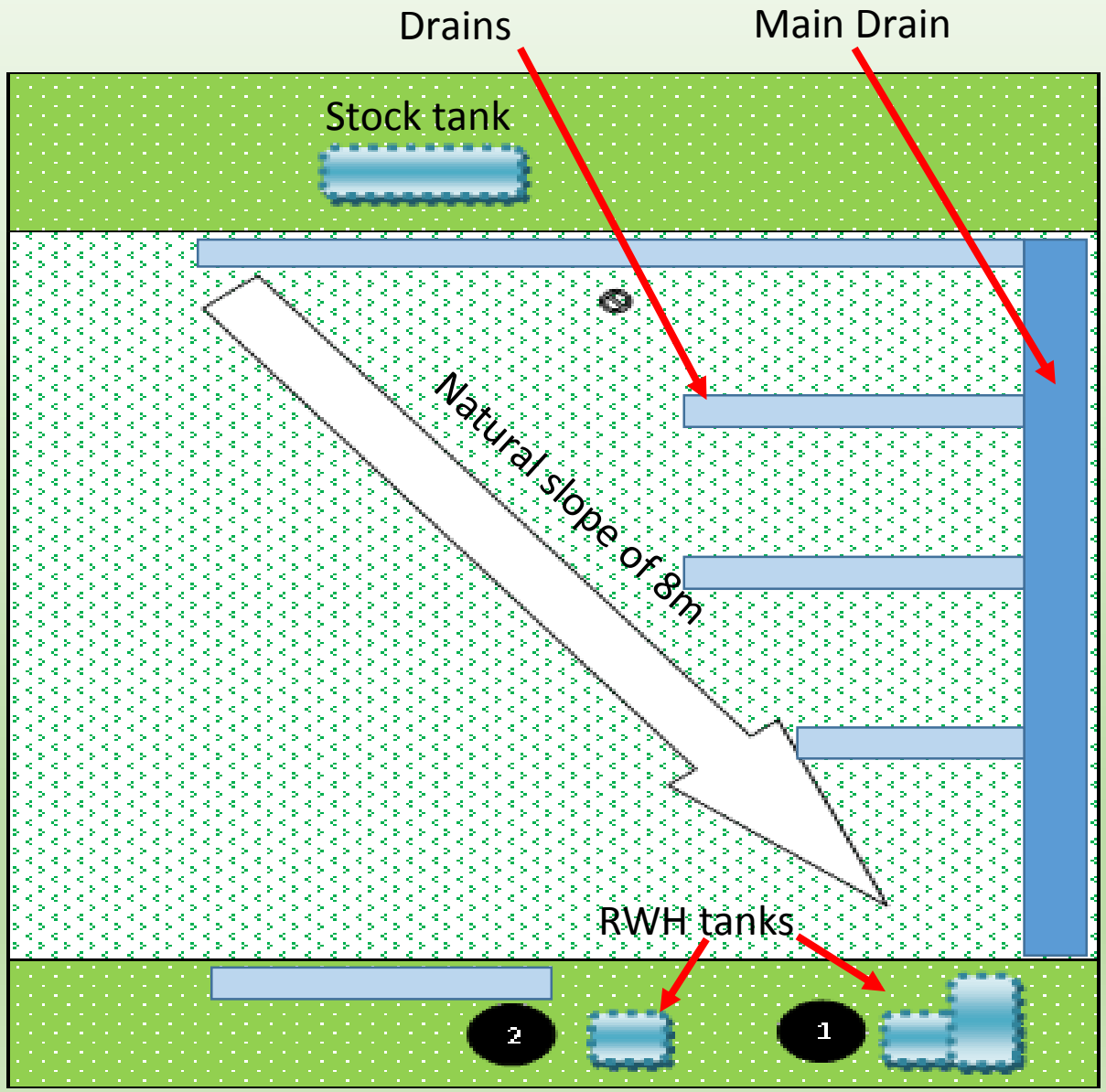
Methodology

- Feasibility study to determine potential of capturing rain water
- Identification of locations, capacities and ground water run off pattern
- Designed to optimize the collection with proven technology
- Obtaining regulatory approvals from government institutions
- Use of Geo membrane to reduce cost and fast implementation time
- Design and construction of sediment traps and soil filtering gullies
- An over flow system with anicut based diversion technique

Conveyance System



Land Surface



Drains

Lengths

5 No.s Vertical Drains – 2,200m

Sediment Traps / Gully

7 No.s Sediment Traps

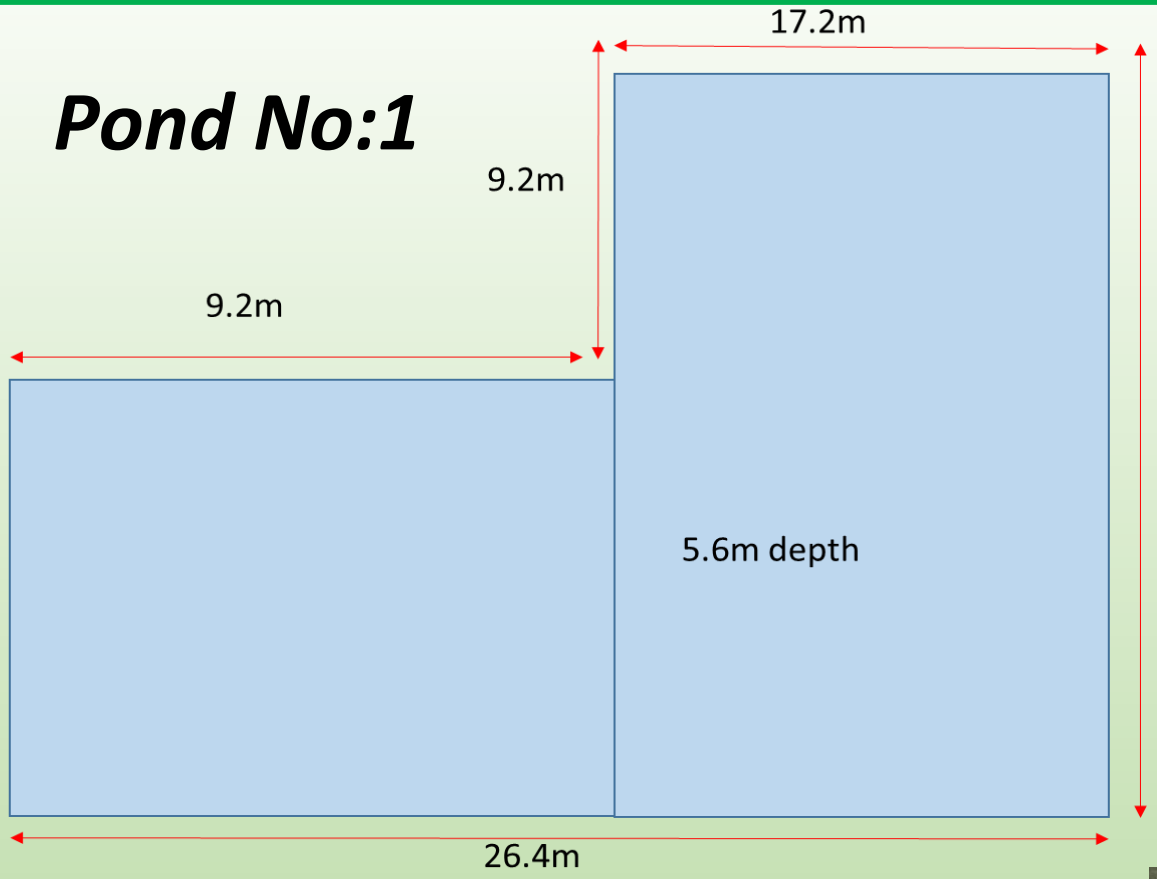
10 No.s Gullies

Main Drain

Length

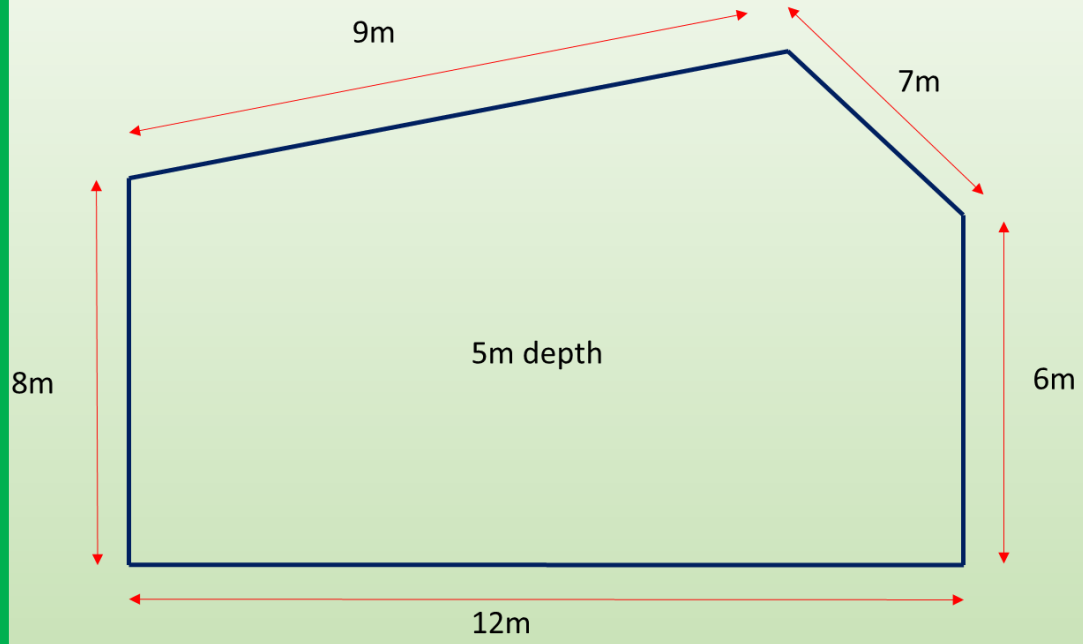
Main Drain – 450m

Pond No:1



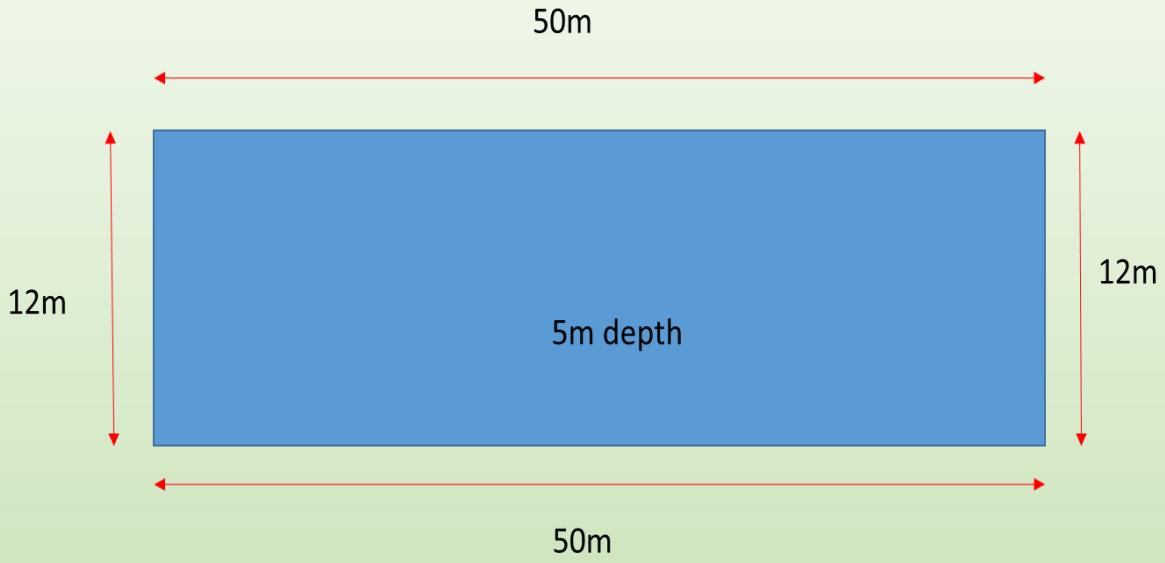
Capacity – 3.5Mn Liters

Pond No:2



Capacity – 500,000 Liters

Pond No:3



Capacity – 3Mn Liters

Value Creation – Capital Cost Saving

a) HDPE Water Tanks
(Constructed in 2011)

- 12No.s 10,000L Plastic Tanks - Rs. 1,320,000/-
- Concrete base - Rs. 850,863/-
- Total cost - Rs. 2,170,863/-
- Storage capacity - 120,000L
- Capital cost / liter - **Rs. 18.09 /liter**

b) Concrete Water Tanks
(Constructed in 2016)

- Cost of construction of
- 3x3x3m tank - Rs.288,400/-
- Capacity - 27,000 liters
- Capital cost / liter - **Rs. 10.68 /liter**

c) Rain Water Harvesting Tanks
With 0.75mm Geo membrane
(Constructed in 2018)

- Cost of construction of 3 tanks - Rs. 9,242,437.70
- Capacity - 7,000,000liters
- Capital cost / liter - **Rs. 1.32 /liter**

Initial Results

- Construction of tanks, drains, arteries, soil barriers, sediment traps, gullies and anicut was completed on 15th August 2018
- The actual rain fall on 4 days given below
  - ➢ 29th September 2018 - 35mm
  - ➢ 30th September 2018 - 16mm
  - ➢ 1st October 2018 - 41mm
  - ➢ 2nd October 2018 - 26mm
- Tanks were overflowing before the day end on 2nd October
- Collecting 7 million liters of water free of charge, sufficient for 20 days of irrigation

Value Creation – Operational Cost Saving

- The main operational cost benefit up to now is electricity
- Previously pumped water from 2 Deep wells
- Cost of electricity in month of September 2018 - Rs. 183,593.65
- Cost of electricity in month of October 2018 - Rs. 113,118.90
- Approximate saving - Rs. 70,474.75 / month of which we could attribute 50% to the water pumps
    - Note that we have not completed a full year to establish an exact ROI

Other Benefits

- Improved water quality, no salinity and hardness
- Relying more on rain water as conservation technique
- Shorter implementation time with Geo membrane and contractor's expertise
- Less labour costs
- Comparatively low implementation cost
- Potentially increased yield and quality of produce

We already started Aquaculture fish farming as a pilot project although it is too early to discuss the results as harvesting has not been done yet

Challenges Faced

- Unpredictable nature of Rain & the power of water

Total project implementation period is 9 months
Government approvals – 6months , Design and construction – 3months

- Regulatory burden and bureaucracy

Following approvals taken from government institutions

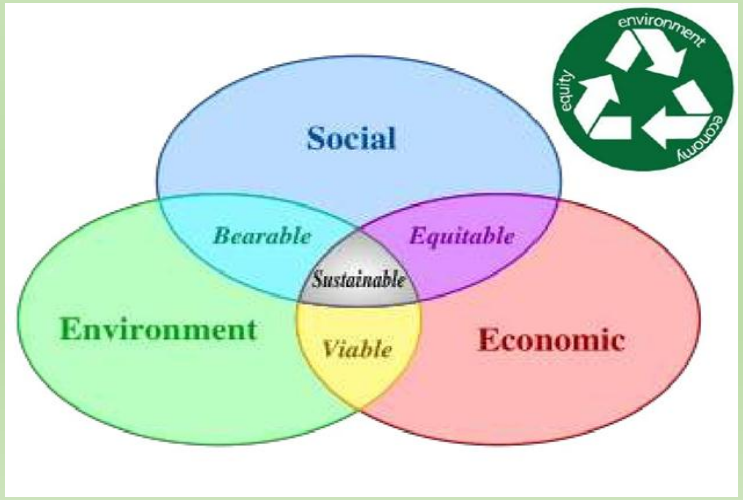
1. Demarcation and plotting of identified locations of 3 ponds by a certified surveyor and obtaining GPS coordinates
2. Approval from Geological and Surveys Beurae for mining and transportation of soil
3. Approval from Central environment Authority
4. Approval from UDA
5. Approval from Archaeology department
6. Approval from district Secretary Puttlam through District development Committee
7. Approval from Divisional Secretary – Vanathawilla
8. Approval from Pradeshiya Sbha – Vanathawilluwa for access roads

Concluding Remarks

- The Main objective to ensure the quality water supply to enhance the productivity & quality by integrating with the normal irrigation system appears to be on track
- The reduced capital cost almost makes the system pay for itself
- Part or whole of the rain water is utilized in an effective manner as envisaged the Great King Parakramabahu rather than literally sending it “down the drain”
- Proud to be contributing towards a ‘Sustainable Green Environment Initiative’
- We are pleased to showcase this project to all those interested in conservation or even just irrigation

Paradigm shift

The famous adage of the great King can now be rephrased as ***"let not even a little water that falls from the sky flow out to your neighbors garden without being made useful to yourself" - Shardha Sosa***



Thank you for your attention and Best wishes in your efforts in conservation

Any Questions please?