Neeru, a Rainwater Harvesting Project for Rural India

By

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Acknowledgement

1) www.rainwaterharvesting.org Center for science and environment. New Delhi.

2) www.caos.iisc.ernet.in Center for Atmospheric & Oceanic Science. Indian Institute of Science.

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The intent of this paper is to present a project "Neeru", which literally means "Water" in Kannada. The purpose of this paper is to come up with a solution in the form of a project to solve the water problems at Sivaganga farm.

If implemented successfully this project could become a prototype for local farmers who could also take up and implement this project in their farm, and can make the case for the creation of a viable economical, social and environmentally sustainable solution for rural development in India.

This Project Presentation Will Include

1) Introduction

2) Need for Rainwater Harvesting

3) Rain Water Harvesting Strategic

4) Project Implementation

5) Project Costing

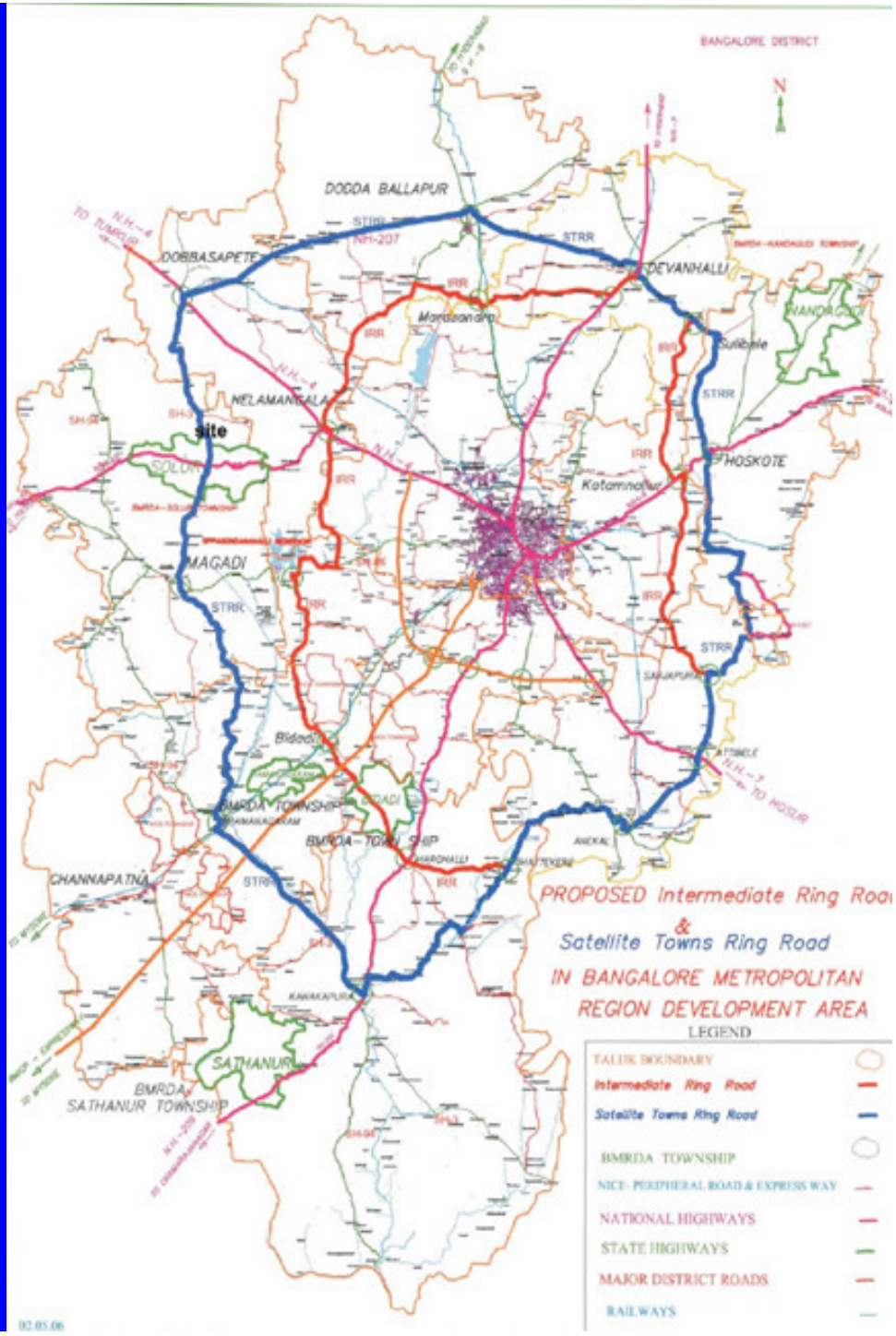
6) Conclusions

Introduction

The project titled Neeru is a proposed Rain Harvesting Project for usage of rainwater in poultry and farming in Sivaganga farm, located in Kanakana Halli(45km from Bangalore), Sivagange Road, Solur Hobli Bangalore Rural District.

Included in this project are the study of current water requirements and the need for rainwater harvesting to meet water requirements.

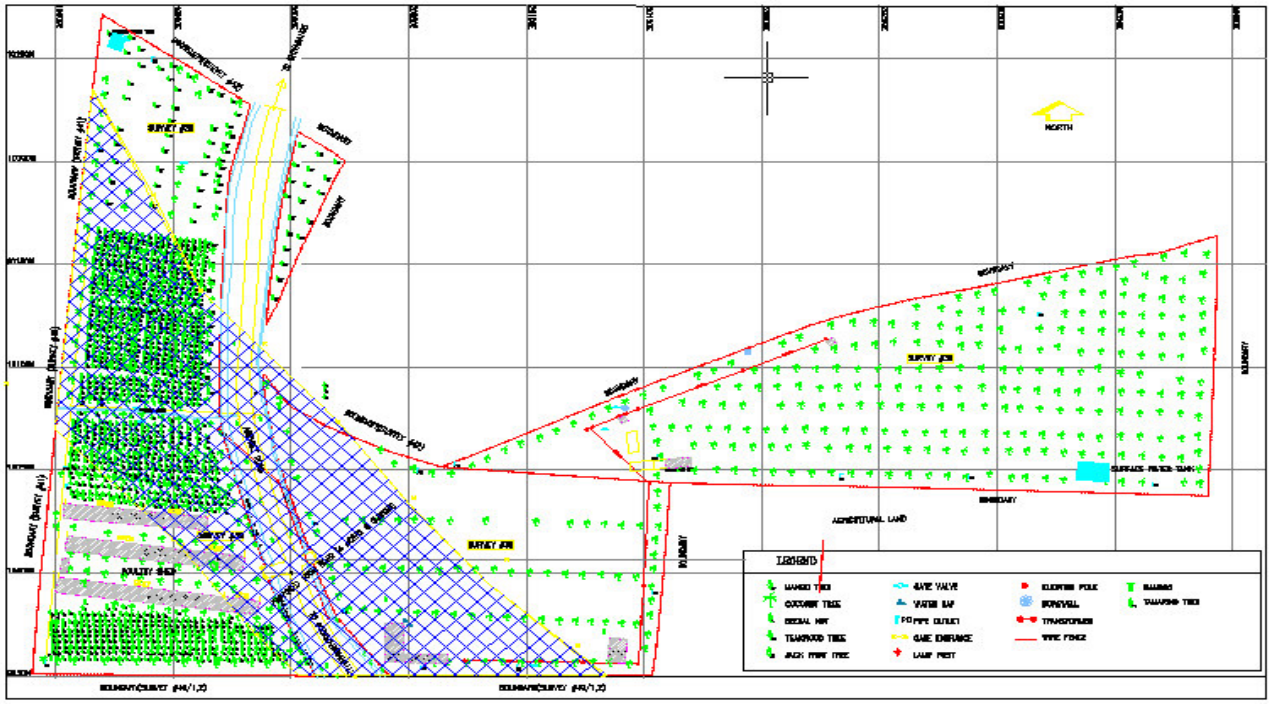
A prototype project is proposed on a 1.75-acre land area which houses a 1000 sq m area of poultry shed; the roof of the poultry shed is used as a catchment basin for rainwater harvesting.

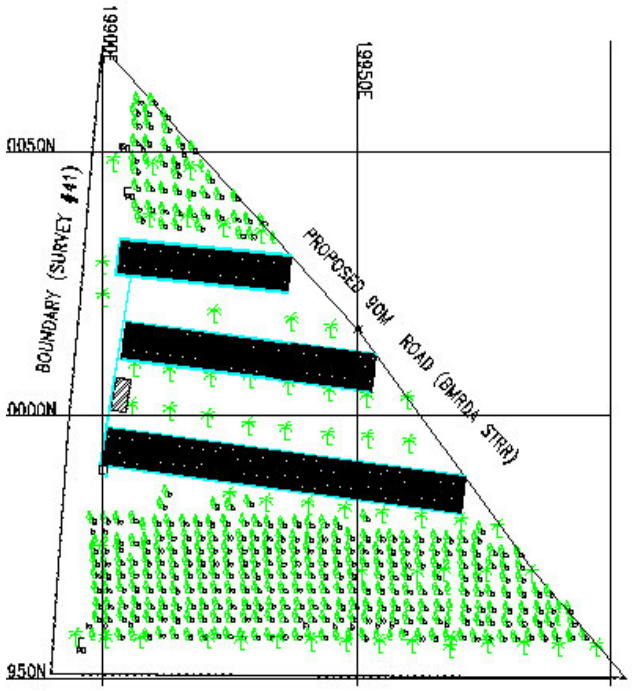


Site Description

The Farm site is a triangle (formed after the BMRDA Satellite Town Ring Road bisection) with an approximate area of 1.75 acre. This farm has 3 rectangular poultry sheds with dimension of 33mx6.75m, 50mx6.75m and 70mx6.75m for a total shed area of approximately 1000 sq m.

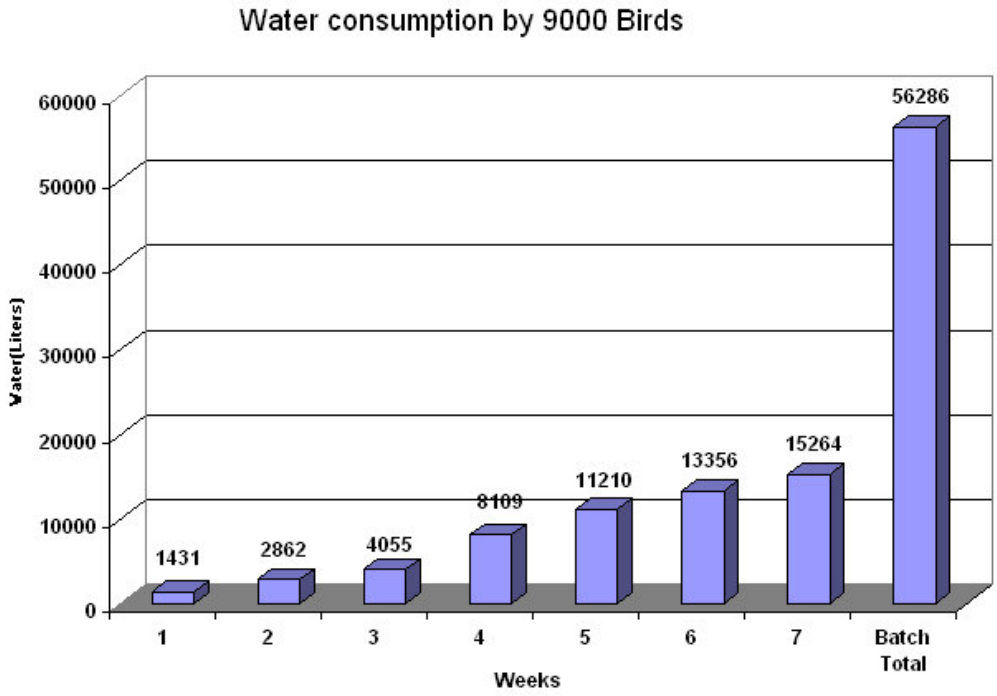
These sheds are located as shown in the figure below; these sheds could raise 9000 chicken birds. In addition, the farm has a workers quarters, 30,000 liter over head tank and its present vegetation includes 300 Arecanut trees, 60 coconut trees, 50 silver oak/teak trees and 5 other trees.





Need for Rainwater Harvesting :

The current water requirement for the poultry is approximately 3,40,000 liters annually based on 6 liter per bird and six,, 7-week batches in a year as shown in chart-1.



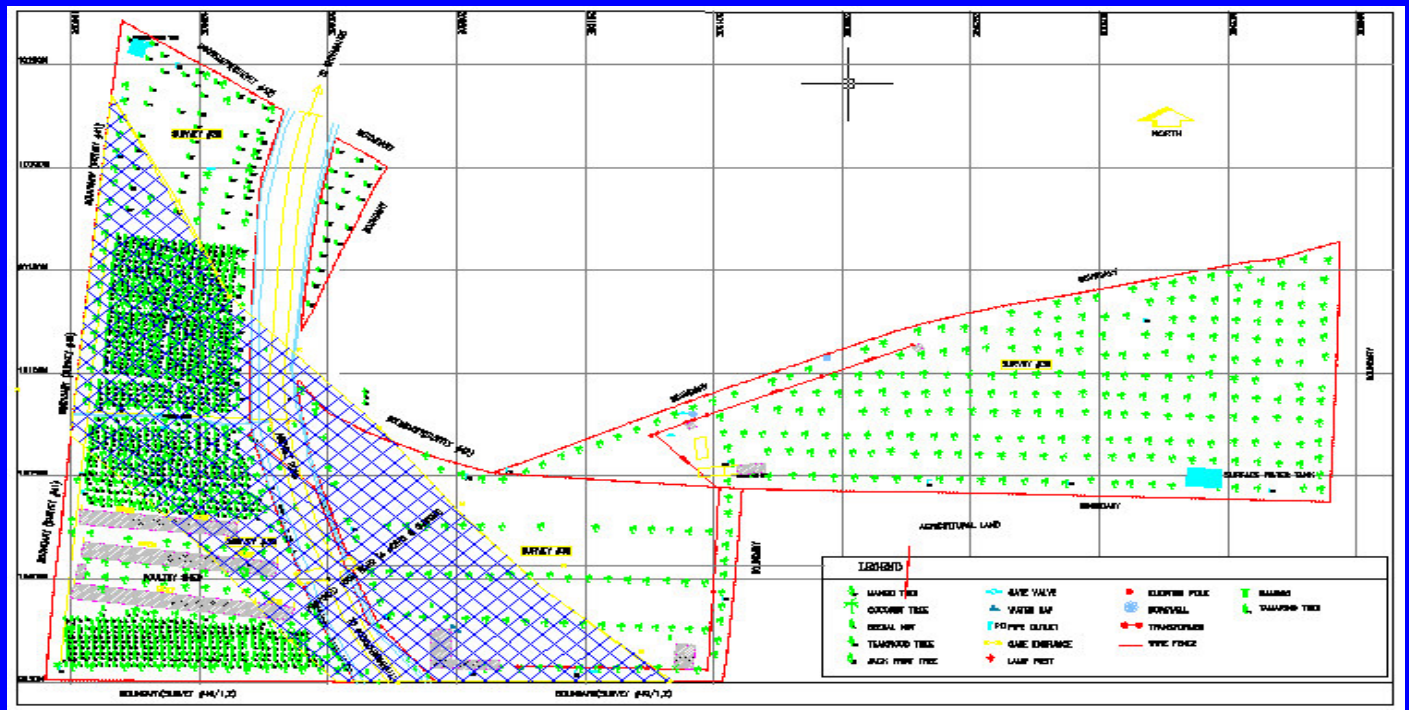
Week	9000 Birds(liters/week)
1	1431
2	2862
3	4055
4	8109
5	11210
6	13366
7	15264
1 batch	56286
6 batches	337716

Water requirement for the vegetation based on principles of horticulture is about 1000 liters per tree per year, taking into account 870 mm of annual rain spread over 60 days in a year. Hence water required, excluding rain would be 3,50,000 liters annually.

Need for Rainwater Harvesting :

Currently all water requirements excluding rain is provided by a bore well located 250 meters across the farm, but the new proposed BMRDA's Satellite Town Ring Road (STRR) would obstruct the water pipe line and would prevent water flow into the farm. This will have both economic and social impact on livelihood and will also effect the environment.

Hence there is an urgent need to save the vegetation on the farm and to continue poultry farm cultivation. One of the solutions proposed to solve the water problem was to bore a well at the farm but the success rate of such a bore well is very low. This had induced us to look to rains to solve the problem. Hence it has become imperative to go for Rainwater harvesting.



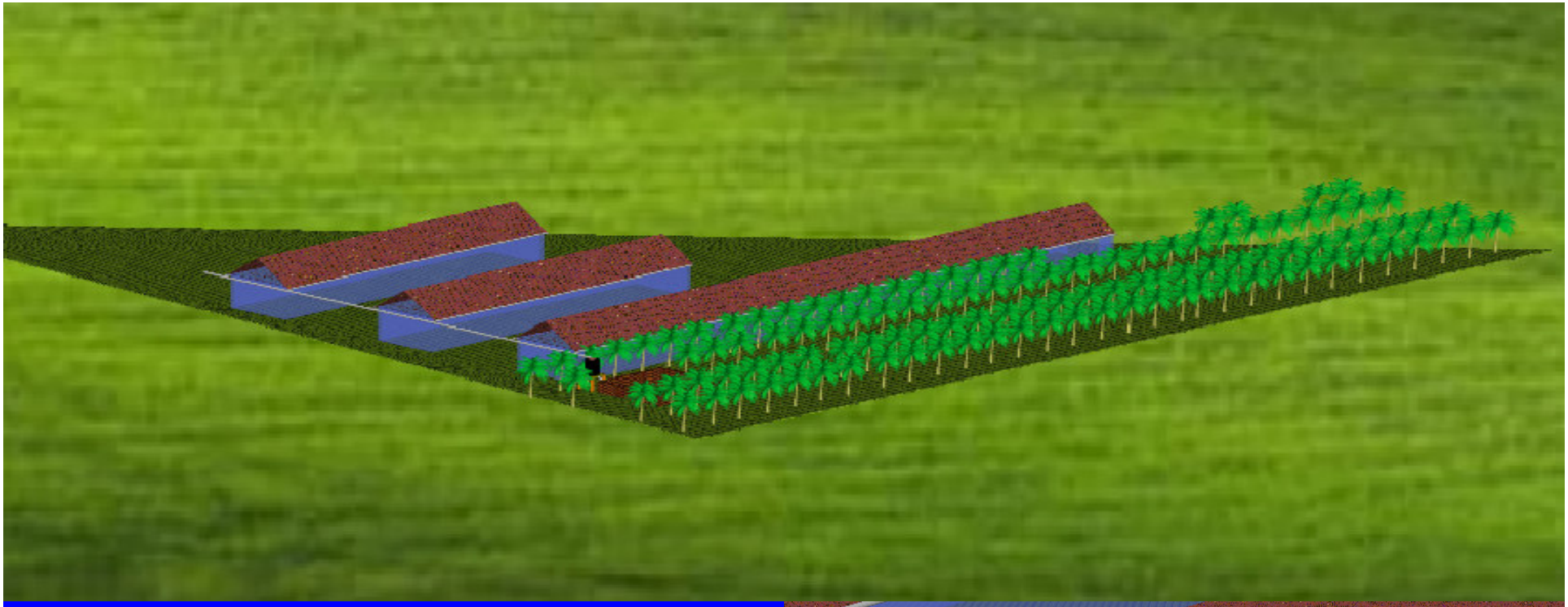
Rain Water Harvesting Strategic

Rainwater Harvesting is essentially collecting rainwater and using it during the dry period. Rain or precipitation falling on land (ground vegetation etc.) is either absorbed into the ground or travels as surface run off to a low lying area.

But if precipitation falls on a structure, predominantly it travels as surface run off.

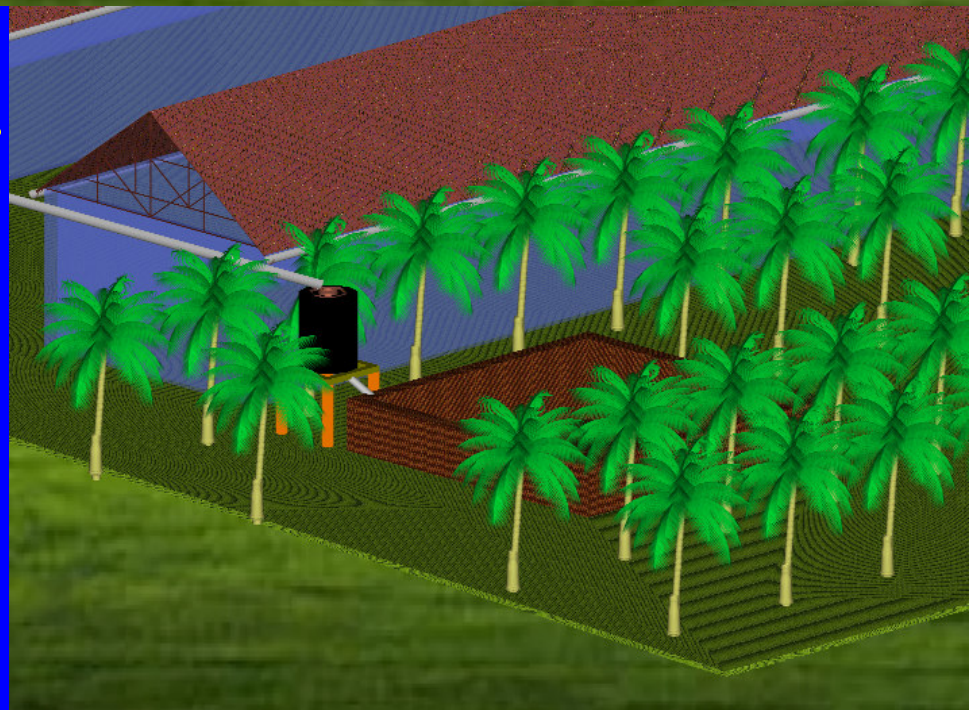
Hence the basic strategy for rainwater harvesting for farmland is to not allow any water that falls, to travel out of the farm as runoff.

For the structures on the farmland the strategy is to set up a rainwater harvesting system that comprises of catchments, transportation through pipes/ filtration, and storage in tanks for reuse.



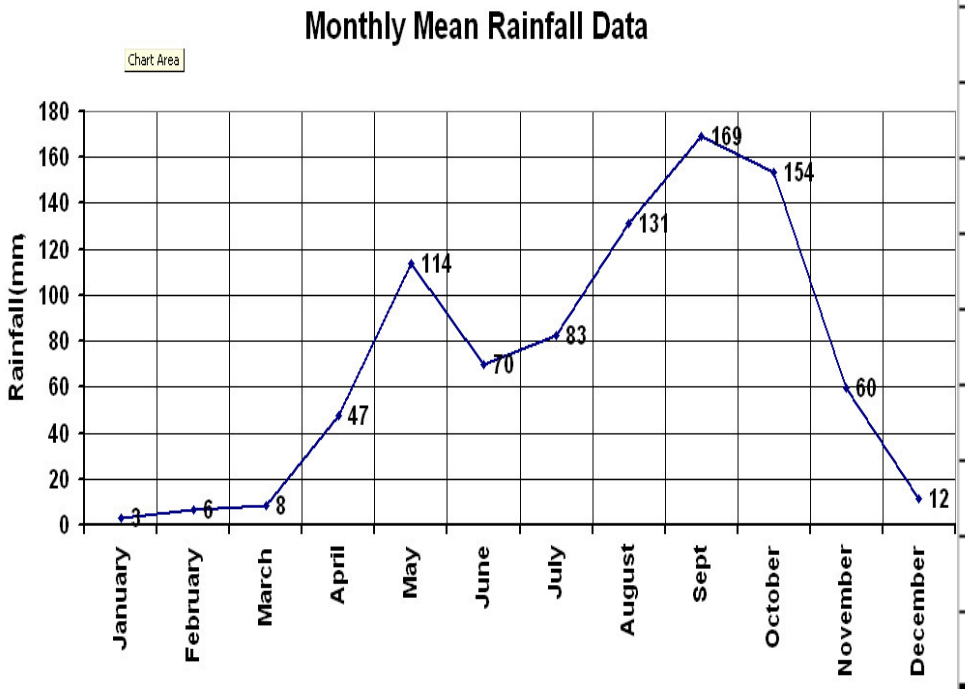
Thus three steps for the rainwater harvesting are

1) Collection of rainwater (including transportation through pipes)
2) Storage of rain water
3) Usage of rain water



Collection of Rainwater:

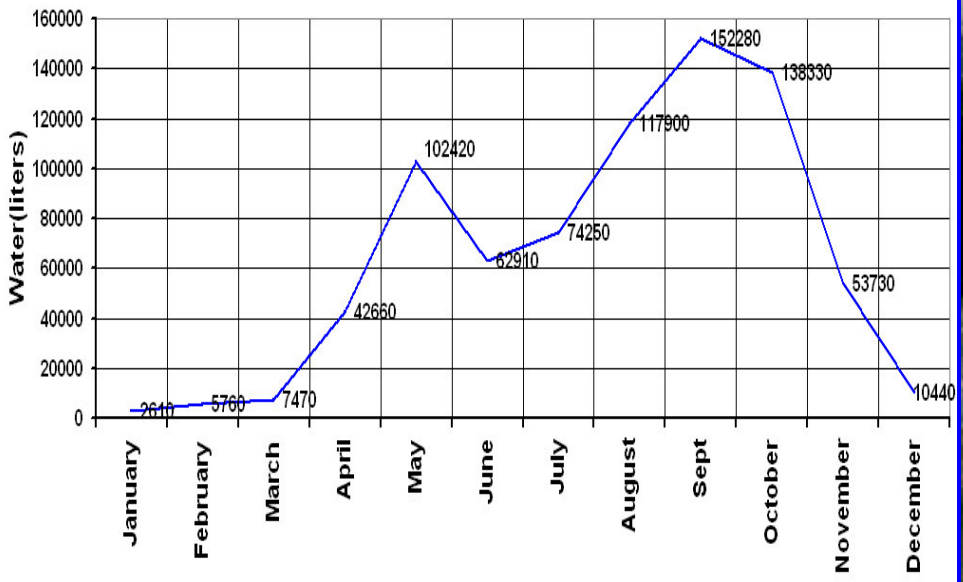
The roof in the structure directly receives the rainfall and is the catchments for the water harvesting system and provides water to the system. Rain falling on the roof travels as run off and the quantity of runoff is the volume of precipitation times the run off coefficient. The mean precipitation data from the past 100 years (refer to Table 1) is used as a basis for rainfall calculation



Rainfall (cm)		
Max	Min	Mean
191.35	48.59	86
Month	Rainfall(MM)	Rainfall(CM)
January	3	0.29
February	6	0.64
March	8	0.83
April	47	4.74
May	114	11.38
June	70	6.99
July	83	8.25
August	131	13.1
Sept	169	16.92
October	154	15.37
November	60	5.97
December	12	1.16

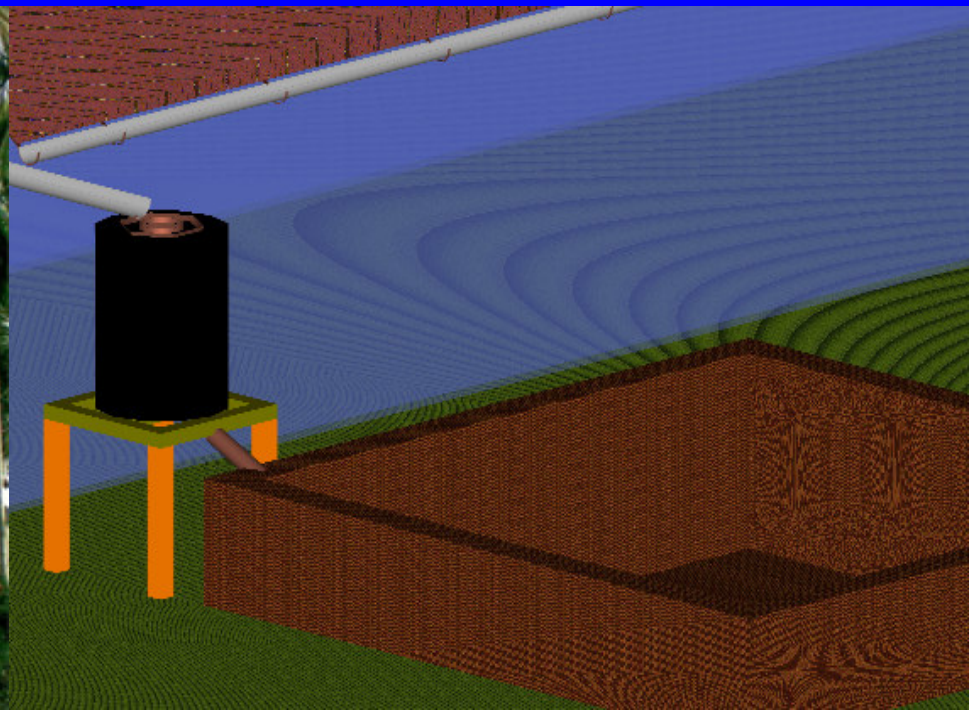
Collection of Rainwater:

Typically 90 % of the rain falling on the structure is harvested. Refer to chart-2 for monthly rainwater collection. Based on the rain discharge, roof drains are adequately designed and collector pipes from the roof drain to the storage tank are appropriately designed (Refer to drawings).



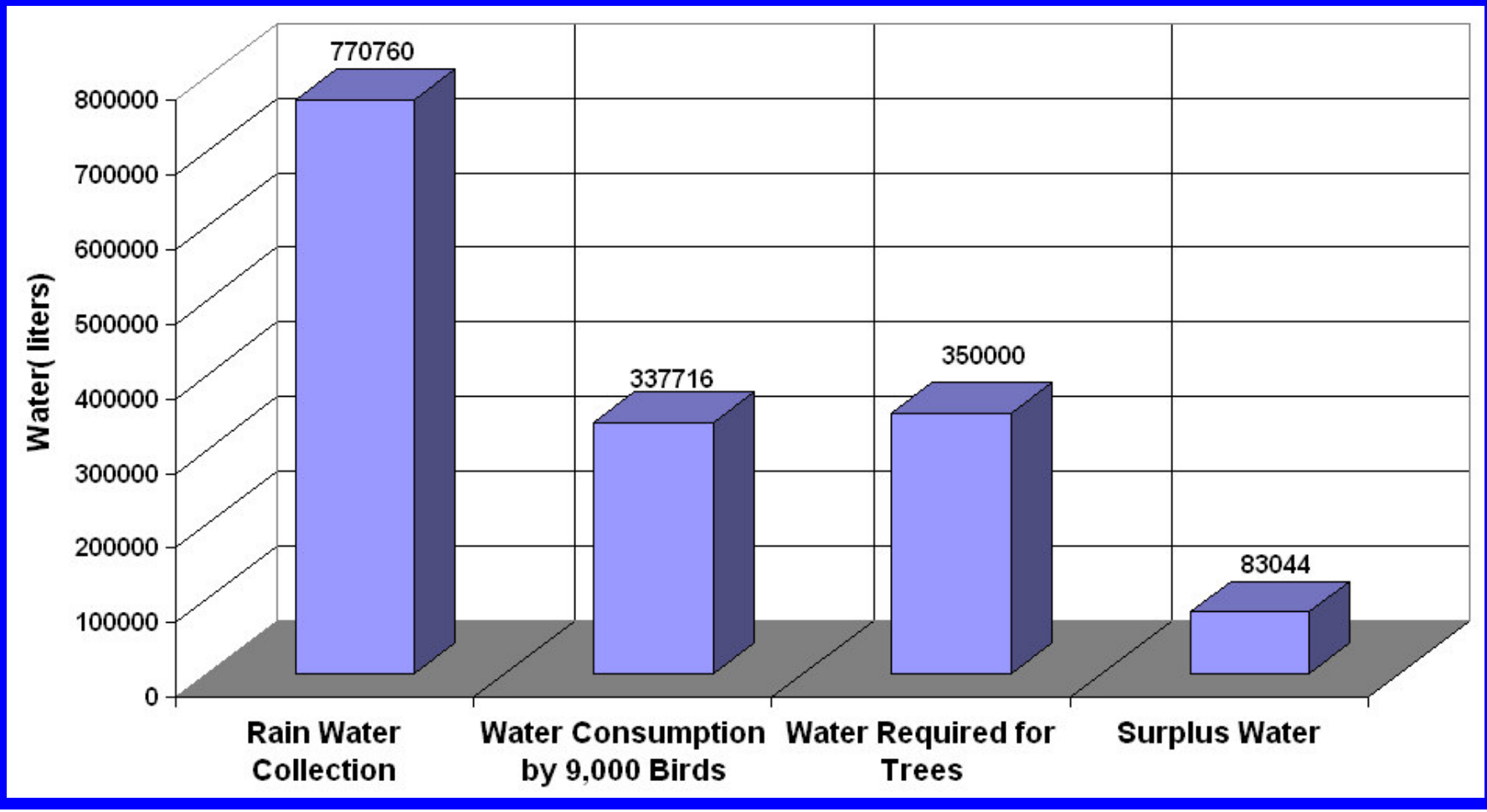
Storage of Rain Water:

Storage is basically a tank to hold collected water and the capacity of storage is based on a monthly maximum collection of 1,10,000 liters. This quantum of water could be used to sustain poultry for 4 months, which would ensure water to poultry in dry spell months. Of course increase in the capacity of the tank would increase water storage but would also increase the cost of the project



Usage of Rain Water:

Summary of water collection from roof and water demand requirement of poultry and surplus for vegetation is shown in chart-4; from the chart it can be inferred that in mean rainfall year rainwater harvesting would fulfill water demands on the farm.



Project Implementation

The project will bring back a way of life that is both respectful of tradition as it is of significance to eco-friendly living in rural India. Hence the design and construction shall be insightful to the local tradition of the place.

The architecture will be rural in spirit and will use native materials and construction methods to create buildings that are appropriate to the climate and history of the place, and will be built by resident of the village.

Roofing design and detailing:

The roof is a 30-degree gabled roof consisting of regular spaced timber truss with cross purling and battens to support clay-tiled roof.

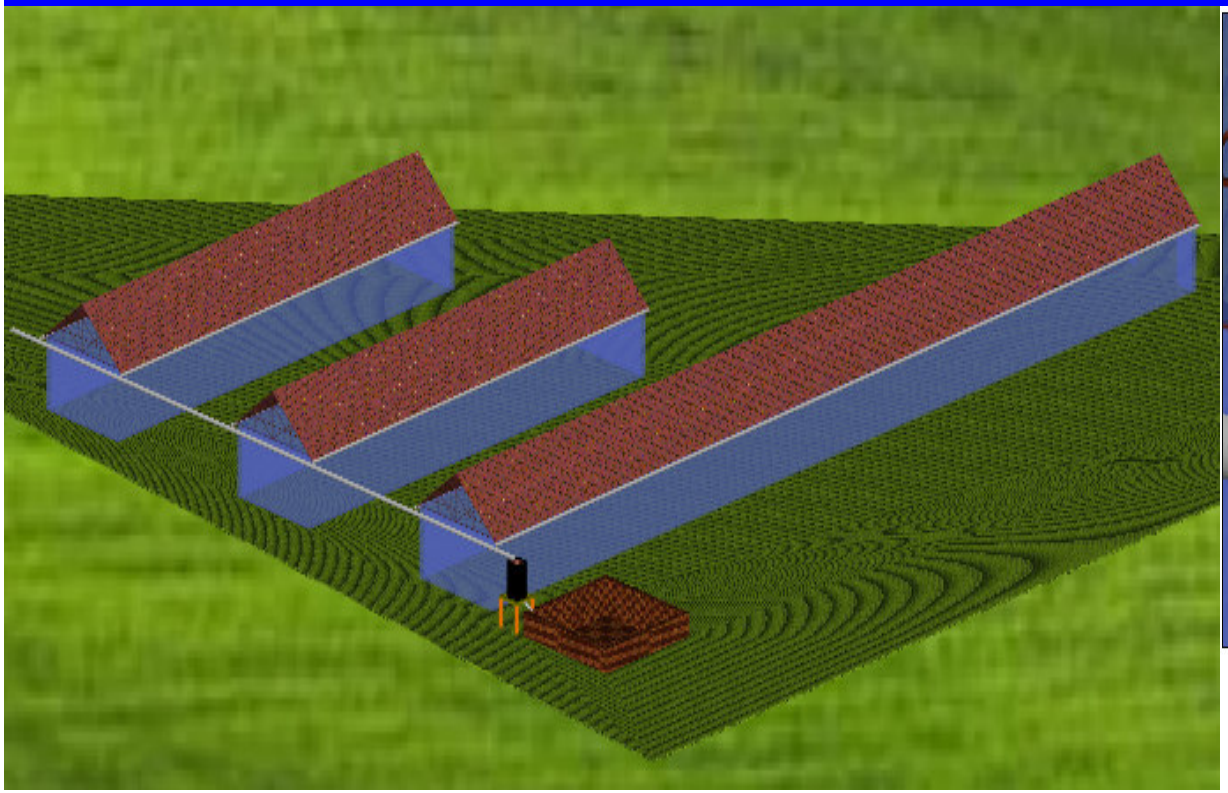
The eve end of the roof has a sheet metal gutter to drain rainwater. Gutters are all slope unidirectional toward one end of the roof. This design is incorporated in all the three sheds and the water is made to drain to one side of the roof (refer to drawing).

The size of the gutter is according to the flow during of 20mm/hour intensity rain. Gutters are fixed and supported by steel brackets at regular intervals so that they do not sag or come down when loaded with water.

Piping:

Pipes are conduit is basically a drain that conveys rainwater from the roof end to the storage system. These pipes are laid perpendicular to the roof gutter and connect all the ends of the shed. In this way all the rainwater from all the three roofs gets collected at one point and is conveyed to the tank through the filter. The conduit is a 6 inches diameter PVC pipe.

A coarse mesh is provided at the end of the gutter to prevent the passage of debris



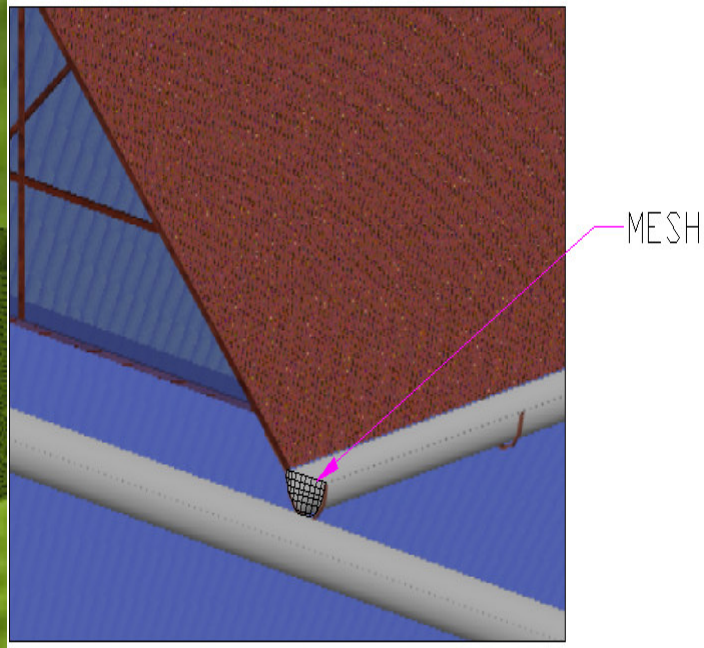
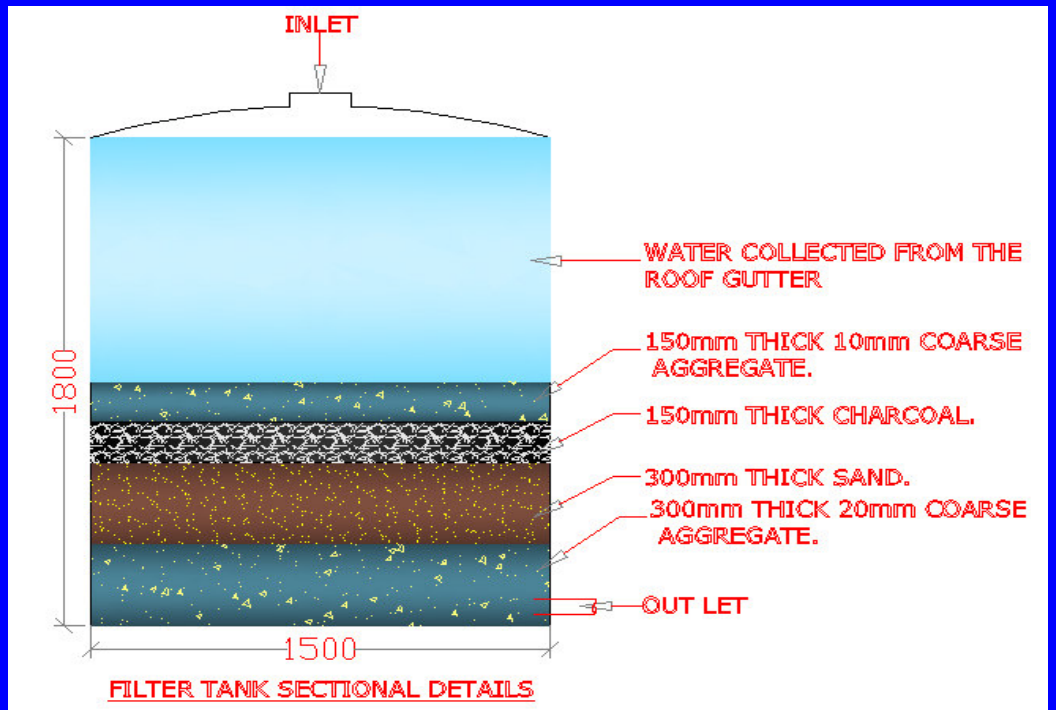


IMAGE SHOWING THE MESH TO FILTER THE HEAVY PARTICLES

Flush valve and Filter design:

The first spell of rain carries a relatively larger amount of pollutants from the air and catchments surface and this first spell of water should be drained out. Providing a flush valve at the end of the conduit before it joins the filter ensures that the runoff from the first spell of rain is drained out and does not enter the filter system.

After the first spell of water is drained out, the remaining water is made to pass through the filter, which removes suspended pollutants from collected rainwater. This filter unit here is a 1.5m dia x 1.8m high tank having an inlet and an out let. The chamber is filled with 30cm-25mm stone aggregate layer topped by a 30cm sand layer topped by a 10cm charcoal layer and finally a 10cm-10mm stone aggregate layer. The out let from the filter is led to the storage tank.

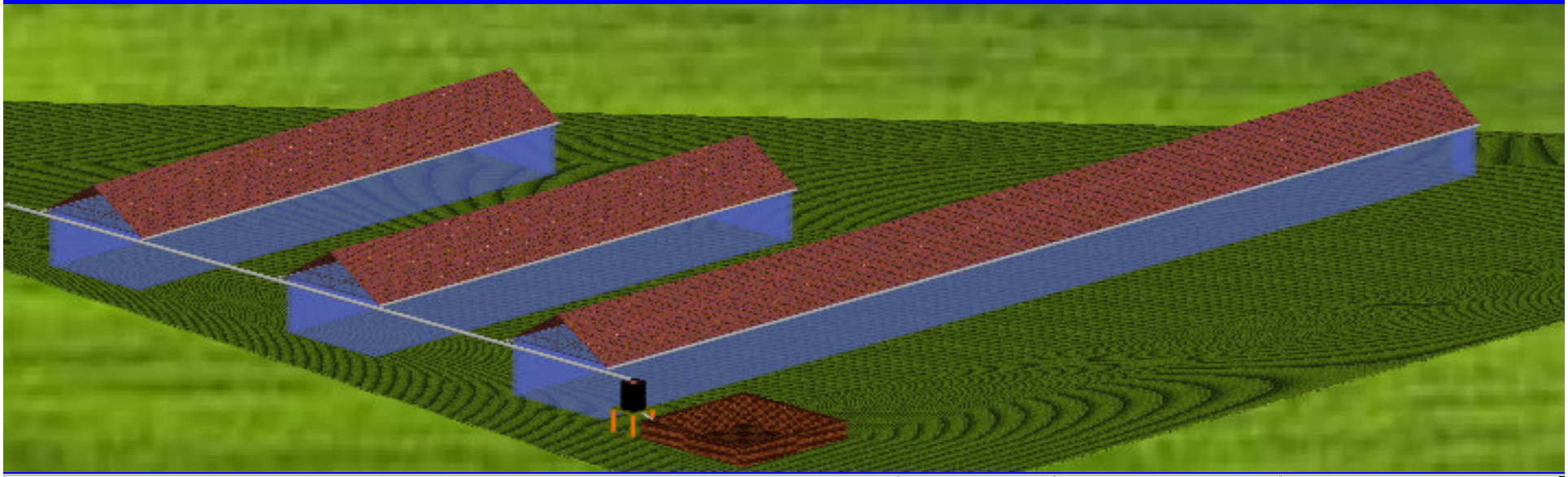


Storage tank design:

The storage tank is a masonry tank with dimension of 7.5x7.5x2 meter above ground located next to the first poultry shed. The dimension of the tank is based on 1,12,500 liter storage and the location is based on the available space. The tank is constructed above ground to facilitate gravity flow of water from the tank to irrigation vegetation on the farm.

Project costing

Construction including Structure and Roofing, Roof Gutter, Piping, Valve, Filter, Storage tank and other miscellaneous tasks is approximately 5 lakhs and equipment to raise 9000 birds at 25 Rs. per bird is 2.25 lakh Rupees



Rain Water Harvesting Project Cost				
#	Item	Unit	Unit cost	Cost (Re.)
1	Roofing	1000	250	250000
2	Roof Gutter	300	100	30000
3	Piping	60	100	6000
4	Valve	1	200	200
5	Filter	1	25000	25000
6	Storage tank	1	150000	150000
7	Miscellaneous	1	50000	50000
				511200

The operational annual expenses including workers salary for 2 workers, utility, and EMI payment at 4% interest is 2 lakhs and monthly income based for a 6 batch per year including sale of manure generated and yield from vegetation sale is 3..12 lakhs.

Poultry Operation Monthly expenditure				
One time investment				
#	**Item**	Unit	**Unit cost**	**Cost (Re.)**
1	Equipment	9000	25	225000
Monthly investment				
#	**Item**	Unit	**Unit cost**	**Cost (Re.)**
1	Workers salary	2	2000	4000
2	Electricity	1	2000	2000
3	EMI for 7,36,200 lone @ 4% for 10 year	736200	7454	7454
4	Miscellaneous	1	2000	2000
			Total	**15454**
Operation Monthly Income				
Monthly income based on 6 batch per year				
#	**Item**	Unit	**Unit cost**	**Cost (Re.)**
1	9000	6	5	22500
2	Manure	1	1500	1500
3	Vegetation			2000
			Total	**26000**

Net profit per year would be 1.27 lakhs.

Break even analysis			
#	Item	Monthly	Yearly
1	**Total Revenue**	26000	312000
2	**Total Expenditure**	15454	185444
3	Net Income	10546	**126556**
4	Tax	0	0
5	**Net Profit**	**10546**	**126556**

#	Item	Monthly	Yearly
1	**Net profit**	10546	126552
2	**Workers salary**	4000	48000
3	**Electricity**	1500	18000
		16046	**192552**

Income Tax Payee!

Final Remarks

Lack of water for farming brings with it unemployment in Rural India trigging migration to urban areas has been both an environmental and a social problem in Rural India.

Here an attempt is made to solve both these problems by first solving water problem using rainwater harvesting and then using collected water and available land resource to establishing a Poultry Industry that will generate employment in rural India.

Hence this project may be a solution to rural unemployment problem and this project with good economic proceeds could be a vision to bring back a way of farmers life that is both respectful of tradition i.e continuing farming and eco-friendly living for our times.

It is a vision to think native, to live in harmony with nature, and through the process blend the urban rural divide.

THANK YOU