

Internship Project

**Increasing biodiversity in Sadhana forest &
Design for sustainable lifestyle**

Sadhana Forest

Auroville

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PLACE

SADHANA FOREST, AUROVILLE,
TAMIL NADU, INDIA



Way of Life



The founders Yorit and Aviram opened up their home for the volunteers for the unique experience of sustainable living and to get the first hand experience of re forestation and water conservation.

They practice an eco-friendly way of life including veganism, alternative construction, solar energy, biodegradable toiletries, and compost toilets.

Accommodation for volunteers is in exchange for a 25 hour work week with additional community shifts.



Way of Life

Their Policies Include

Veganism

Gift economy

Alternative energy, construction

Un schooling

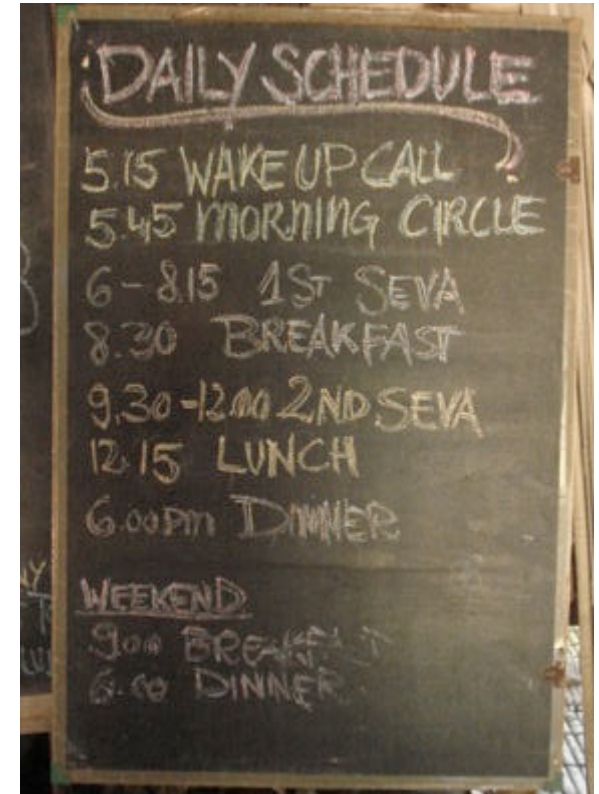
Being Conscious

No Competition, No discrimination

**Haiti Project on Food Forest and
sustainable solution**



Way of Life



Way of Life



Area of Work

Increasing the bio diversity by understanding the eco system and developing habitats for animals, birds and insects.

Especially Bees, which are the primary pollinators of our eco system.



Scope:

Initiatives taken now will be fruitful to achieve considerable increase in bio diversity in the long run of the reforestation project.

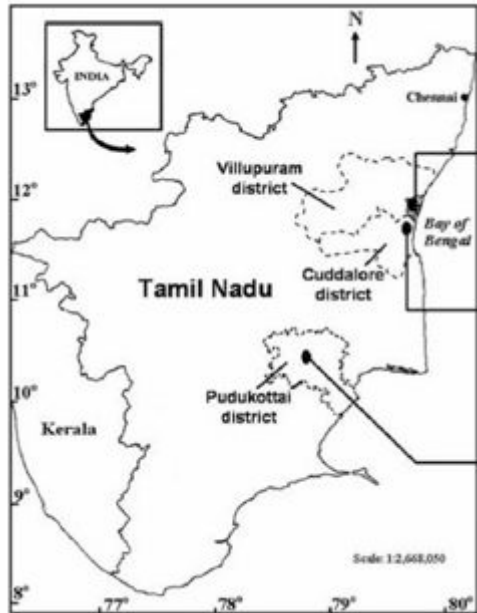
As a designer it is a complete different approach and experience to design something for the nature

The project opens up other perspective of design and it is an opportunity to work with the nature enthusiasts and people who really care her.

It will give me a chance to connect with nature and explore myself



Tropical Dry Evergreen Forest



Tropical dry forest occur in climates that are warm year-round, and may receive several hundred centimeters of rain per year. These seasonal droughts have great impact on all living things in the forest.

It is estimated that 95 per cent of the original forest cover has been cleared, and the species composition of the remaining forests have been altered by intensive human use including the removal of all the taller trees, A few sacred groves are left as evidence.



Habitat - Owl



Owl, a bird of prey found in most parts of the world except Antarctica. The number of owls is becoming smaller because the woodlands in which they live are being destroyed. Owls need somewhat dense, mature trees with good trunks to roost during the day, preferably in a shaded, secluded area



3d model of the Owl Nest
following the standard dimensions

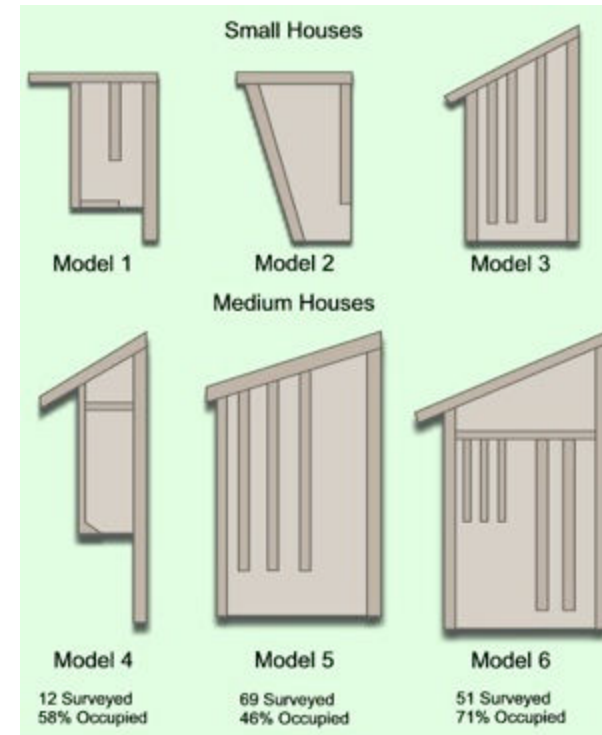


Actual model made in teak wood and
kept in the forest

Habitat - Bat

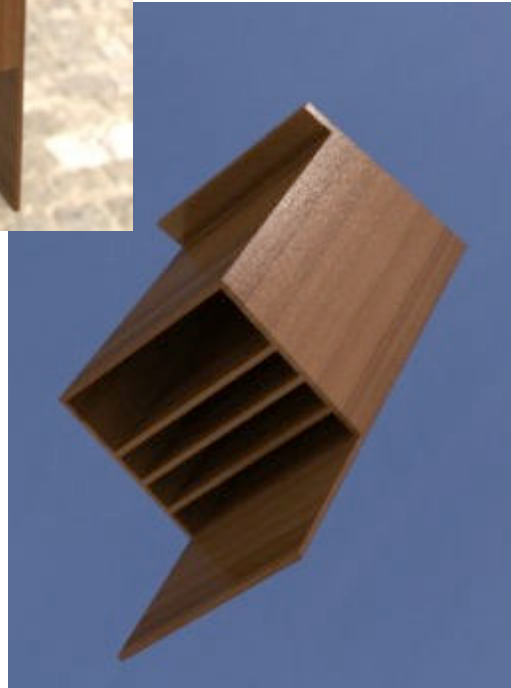


Bats are fascinating animals – the only true flying mammal, Bats play an essential part in the natural world and are indicators of a healthy environment and pollinators. 70% of bats consume insects, sharing a large part of natural pest control





3d model of the
Bat house



Actual model made in teakwood and kept in the forest

Habitat - Bee



Bees are flying insects closely related to wasps and ants, and are known for their role in pollination and for producing honey and beeswax.

The Pollination Work of bees

Bees are good for trees and trees are good for bees

Bees part of eco system/ food system-40%



Types of Indian bees:

There are four native species of honey bees in India and one exotic species. They are as

- The Indian honeybee (*Apis indica/cerana*)
- Giant rock bee (*Apis dorsata*)
- The little bee (*Apis florea*)
- The Dammer bee or mosquito bee (*Melipona iridipennis* Dal) and
- The Italian bee (*Apis mellifera*)



Types of Indian bees:



1. *Apis indica*:

It is the common Indian bee found both in the forests as well as in plains throughout our country. It is smaller than rock bee but larger than little bee.



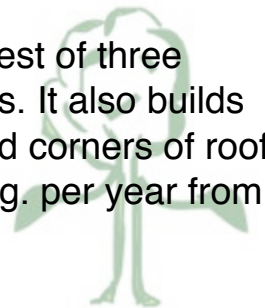
2. *Apis dorsata*:

It is the largest of the honey bees. It builds an open single comp of huge size about a meter in diameter. The comb is fully exposed and huge from inaccessible branches of trees, along the sides of steep rocks in the forest and even from the walls, rafters and other parts of buildings



2. *Apis florea*:

It is known as little bee since it is the smallest of three species of *Apis*. It is seen only in the plains. It also builds single but small combs on bushy plants and corners of roofs. It yields very little honey, about 0.5 to 1.0 kg. per year from a colony.





4. *Melipona iridipennis*:

Besides true honey bees, two species of stingless or dammer bees, viz. *Melipona* and *Trigona* occur in our country in abundance. The stingless bees have the importance in the pollination of various food crops. They bite their enemies or intruders. It can be domesticated. But the honey yield per hive per year is only 100 gms.



5. *Apis mellifera*:

It is the Italian bee which swarms less and has good honey gathering qualities, yielding about 45-180 kg per year.



Bee keeping methods

Natural hives



Traditional artificial hives

- Mud and clay hives
- Bee gums
- Skeps



Bee keeping methods

Modern artificial beehives

- Langstroth
- Dadant
- National hives
- The Beehaus



Bee keeping methods

Top-bar hives

Kenyan Log hive



Of all these types, the one designed by Rev.Fr.Newton is the most popular one in South India. Newton's hives, BIS hives and Marthandam hives are suited for rearing Indian bees.

Split Pot Hive:



Bee keeping methods



→ Bamboo sticks as top bars



→ Top part act as 'super' and the Bottom of the pot will be brood



Understanding the Sadhana forest
Geography for bee keeping

We divided the process of the project in to two stages and

Stage I :

- a. Designing sustainable bee hives using local material for the local need.
- b. Identifying suitable environment and creating atmosphere to attract bees.

Stage II:

- a. keeping track of the created hives and visiting bee varieties for long term and develop the most adopted one and increase its number.
- b. Creating a bee sanctuary and increase the bee population and pollination in the area.



Bee keeping methods

Stage I :

a. Designing sustainable bee hives using local material for the local need.

Sadhana forest is a vegan community, Hence the extraction of honey is completely avoided justifying the fact that honey saved by the bees is for their own use.

Also checking from the recycle hut and the tool shed, Wooden boxes can be made out of old planks can also be tried as hives, Old tyres can also be used in certain places and checked for the suitability.

which implies the non necessity of the split pot hive other than for the division of the colony.



Bee keeping methods

With these ideas in mind we went about finding materials and making it suitable for hives.



Bee keeping methods

The collected and made habitats are placed in different parts of the forest to check for suitability of the model.
To work with nature we have to observe, understand and wait for her to reveal.



Bee attracting plants of TDEF

ACANTHACEAE	1	Asystasia gangetica
	2	justicia procumbens
AMARYLLIDACEAE	3	Polianthes tuberosa
ANACARDIACEAE	4	Lanneacoremandelica
	5	Mangifera indica
APOCYNACEAE	6	Cassia spinarum
	7	Wrightia tinctoria
ASCLEPIADACEAE	8	Watakaka volubilis
ASTARACEAE	9	Tagets patula
	10	Centratherum punctatum
BALSAMINACEAE	11	Impatiens balsamina
CACTACEAE	12	Cereus pterogonus
CAESALIPINIOCEAE	13	Bauhinia racemosa
	14	Peltophorum pterocarpum
	15	Pterolobium hexapetalum
	16	Tamarindus indica
CAPPARACEAE	17	Capparis zeylanica
	18	Cleome viscosa
CASUARINACEAE	19	Casuarina equisetifolia
COMBRETACEAE	20	Terminalia arjuna
	21	Terminalia catappa
COMPOSITAE	22	cosmos
Famaly		Name
	23	Gaillardia pulchella
	24	Helianthus
		Melampodium paludosum
COMPOSITAE	25	Synendrela nodiflora
	26	Tithonia diversifolia
	27	Tridex procumbens
	28	Wedelia jacq.
	29	Wedelia jacq.
	30	Zinia

Next step is to plant bee foraging plants to attract more bees on seasonal basis. Here is the list of plant species.

CONVOLVULACEAE	31	Jacquemontia pentantha
CORDIACEAE	32	Ehretia pubescens
CRUCIFERAE	33	Lobularia maritima
CUCURBITACEAE	34	Cucumis sativas
	35	Cucurbita pepo
		Cucurbita pepo melo pepo
	36	
	37	Momordica charantia
	38	Mukia maderaspatana
EUPHORBIACEAE	39	Drypetes sepiaria
	40	Flueggea leucopyrus
	41	Manihot glaziovii
	42	Phyllanthus amblica
	43	Ricinus communis
FABACEAE	44	Pongamia pinnata
Famaly		Name
	45	Pterocarpus indicus
	46	Pterocarpus marsipium
	47	Peterocarpus santalinus
FLACOURTIACEAE	48	Flacourtia ramontchi
LABIATAE	49	Hyptis saueolens
LORANTHACEAE	50	Lorenthus longiflora
LECITHIDACEAE	51	Barringtonia acutangula
	52	Barringtonia racemosa
	53	Couropitia guianensis
LILIACEAE	54	Asparagus racemosa
LYTHRACEAE	55	Cuphea sp.
MAGNOLIACEAE	56	Michelia champaca
MALVACEAE	57	Sida acuta
	58	Sida spinoza
MELASTOMATACEAE	59	Memecylon umbelatum
MELIACEAE	60	Walsura trifoliata

Bee attracting plants of TDEF

MIMOSOIDAE	61	Acacia coleii
	62	Acacia leucopholia
	63	Acacia melifera
	64	Albizia sp.
	65	Calliandra heamotocephala
	66	Haematoxylon campechianum
Famaly		Name
	67	Leuceana leucocephala
	68	Mimosa pudica
	69	Milletia ovalifolia
MYRACEAE	70	Eucalyptus sp.
	71	Sizigium cumini
MUSACEAE	72	Musa paradisiaca
NYCTAGINACEAE	73	Boerhavia erecta
NYMPHAEACEAE	74	Nelumbo nuciferum
	75	Nymphaea
OXALIDACEAE	76	Averrhoa carambola
PALME	77	Borassus flabellifer
	78	Cocos nucifera
	79	Phoenix loureirii
PAPILIONOIDAE	80	Dalbergia paniculata
	81	Dalbergia lanceolaria
	82	Dalbergia sissoo
	83	Derris ovalifolia
	84	Derris scandens
	85	Gliricidia sepium
PEDALIACEAE	86	Seasamum indicum
POLYGONACEAE	87	Antigonon leptopus
	88	Antigonon leptopus
PORTULACACEAE	89	Calandrinia grandiflora
	90	Portulaca oleraceae

Famaly		Name
RHAMNACEAE	91	Scutia martima
	92	Ziziphus oenoplia
	93	Ziziphus xylopyrus
RUBIACEAE	94	Anthocephalus cadamba
	95	Benkara malabarika
	96	Canthium coromondolicum
	97	Canthium dicoccum
	98	hamellia patens
	99	ixora pavetta
	100	Pentas lanceolata
RUTACEAE	101	Citrus Sp.
	102	Glycosmis pentaphylla
	103	Murraya paniculata
	104	Todalia asiatica
SAPINDACEAE	105	Dodonaea viscosa
	106	Sapindus emarginata
	107	Sapindus mukorissii
SAPOTACEAE	108	Mimusops elengi
STERCULIACEAE	109	Duranta erecta
TILIACEAE	110	Muntingia calabura
TURNERACEAE	111	Tournefortia ulmifolia
VERBENACEAE	112	Citharexylum subseratum
Famaly		Name
VERBENACEAE	113	Stachytarpheta jamaicensis
	114	Vitex nigundo
VITACEA	115	Cissus vitiginea

Bee sanctuary



Stage II:

By planting these seasonal bee foraging plants and keeping track of visiting bees will give an idea of the different varieties of the area.

Also periodic review of every month can help for the future modification in design. With this data the plans for bee sanctuary has to be proceeded



Bee sanctuary



Stingless bee culture-Melipona culture

Beekeeping with honey bees is more profitable than with stingless bees, considering honey production and engaged people

Stingless rearing improves environment conservation

Stingless bees are highly diverse and common in nature

Management of stingless bees is easier when compared to other colonies





Sting less beehive,
Using split clay pot & bamboo

Hive for Stingless bee culture

Proposed a design is based on Bamboo and split pot hive for the stingless bees.

The design is yet to try out in the field.

Bee sanctuary



Additionally with the kenyan topbar/log beehive method we can avoid the elephant intrusion in agricultural lands and in living areas.



After the trial in forest the suitable model will be chosen and will be popularized in attack prone zones as a sustainable solution instead of electric fence or violent methods.





Wick Irrigation

Advantages of wick irrigation :

- 1) water consumption is reduced since evaporation is all but eliminated;
- 2) less time is needed for refilling containers;
- 3) there may be fewer problems with salt build-up, since the water will not evaporate at the surface and leave behind salt.



Wick Irrigation

The method is done by the recycled water bottles

Also there are products available in the market as self watering planter which are made out of plastic.

Wick Irrigation Bottles 101

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What will you need?

metal bar, or a drill (to make the holes in the bottle)
an empty bottle + cap
cotton rope, 60-65cm per bottle
plastic hose, 12-15cm
some M-Seal (about 16-20 per pack)
a bowl of water



stage 1 - make a hole at the bottom

Start a fire and let the metal bar warm in it.

Use the hot metal bar to drill a hole in the center of the bottom part of the bottle.

note: The hole should be about the same diameter as the rope is!

stage 2 - cut the ropes, 60-65 cm each piece!

Keep ONE ORIGINAL piece, to make sure
you're still cutting the correct length every now and then!

stage 3 - insert the rope, tie it, CLOSE the cap

Open the bottle.

Insert the rope through the bottom hole, and out through the top hole.

Untangle the edge and tie a small knot in it.

Pull the rope back down.

Close the bottle! note: The cap is important, don't lose it!

stage 4 - cut the plastic pipe, 12-15 cm each piece, and apply it

Cut straight!

Simply pass the rope through it, if hard, try to rotate the rope like a screw.

stage 5 - mix M-Seal and apply it

Only mix SMALL portion every time!

Use same amount of both compounds for the mixture, as in the instructions.

make a small "snake" and wrap it around the green plastic hose.

Dip your finger in the water bowl to smoothen the M-Seal and make it stick to the base.

Wick Irrigation

Market study



Table top planter

By fusing the method of wick irrigation in the planter I designed a sustainable self watering table top planter using coconut shell.

Coconut shell by nature has a eye opening at one half of the shell, which made that as a best material for the wick irrigation planter.



“Leave the place a little better
than how u get it”

“IF you want to help her go to her”

“Sit with her and observe
you will never reveal yourself to strangers”

“May there be many more
forests to grow people”

“Being Conscious”

By exploring the place and their method of living and understanding the conscious way of living with the environment open up lot of opportunity for sustainable design.

From the stay of four weeks time I experienced a complete different way of living by producing very less carbon foot print. I was introduced to varied techniques and understandings to live a sustainable way of life.

Things like washing dishes, hand wash, toilets, laundry, shower, kitchen, blender every thing has value of being conscious.

Their policies on schooling system , gift economy, no competition , no discrimination, veganism are adding more value to our lives and sadhana stand out as a model of living.

Environment conscious attitude towards design



Reference

<http://fao.org/>
<http://sadhana forest.org.org/>
http://agritech.tnau.ac.in/apiculture/fe_api_typesofhoneybee.html
<http://en.wikipedia.org/wiki/>
<http://www.green.aurovilleportal.org/forest/55-introduction-to-the-tropical-dry-evergreen-forest->
<http://permaculture.rickpickett.com/post/21464121134/simple-wick-irrigation-system-for-watering-in-dry-or-for>
<http://animal.discovery.com/birds/owl-info.htm>
<http://birding.about.com/od/Specific-Birds/a/How-To-Attract-Owls.htm>

Restoration of the Tropical Dry Evergreen Forest of Peninsular India by Paul Blanchflower
Beehive Fence Construction Manual by Written and Illustrated by Dr Lucy E. King

Book: The Romance of Scientific Bee Keeping by kshithish chandra das gupta

Thank You

