

The Goa Garbage Times

Published by the Goa Foundation

Also published on the Internet at <http://www.goacom.com/goafoundation/gtimes>

Garbage in Goa:

Small State, Big Mess

The Goan public has to decide now on whether they should contract to get a garbage processing plant that will first take our entire political leadership, from councillors to the Chief Minister.

India's most beautiful state, the darling of the Indian Union, is steadily getting buried by the day under mountains of garbage, litter and filth. There are hundreds of very effective solutions, but the politicians only want big projects.

Panjim city has no place to dump its garbage. Mapusa is in the same condition. So is Ponda. Only Vasco has a site which is located (despite an entire Planning Department) in front of a newly constructed hospital! Margao has a secure site, but the city fathers there have recently forced the Goa Foundation too to abandon the site. (The city fathers and mothers were busy getting rid of Chairpersons and spending all their energies fighting for positions: another case of Rome burning while Nero fiddled!)

Yet, the government of Goa remains fixated on huge plants.

Any garbage processing company in the world is free to walk into Goa and offer plants that seem a dream. There are after all 14 Ministers, each can promote one, according to what is offered.

The Chief Minister proclaimed the arrival of a plant from Shogun. After the initial announcement, the plant disappeared, but our garbage has remained.

Then the Environment Minister announced a plant from Malaysia.

Earlier, there were proposals to import plants from the Karnataka Compost Corporation. All those proposals have been salted and composted.

The Curca site of Chaka-Chak Panjim city has a mountain of 1,75,000 tonnes of garbage, mostly plastic and trash which no one wants. After several proposals and tender announcements, the trash still remains. The cost of removing the accumulated garbage is estimated to be not less than Rs.3 crore.

Serious proposals on no-profit, no-loss basis have been made to the various authorities. These are not being considered simply because there are no commissions offered.

Panaji city is entitled to get a central government grant for a model garbage processing plant. However, the CCP has been unable to forward an effective proposal because it lost Curca. Panjim lost Curca because officers of the CCP used the site as personal property and allowed hundreds of tonnes of garbage from all areas of Goa to be dumped there on payment of tipping fees which went directly into their pockets.

The Bombay High Court passed a detailed order directing the Panchayat of Calangute to maintain its site at Saligao in an environmentally safe manner. The Court provided detailed directions of what should be done there. The Panchayat has simply ignored the High Court's directions.

The Goa government promised to set up two new sites for garbage in North and South Goa. Both sites selected have been killed by public opposition. No one trusts the Government of Goa. Or its officials. Or its councillors or chief officers. Everyone knows that if any municipality gets a site, they will only dump garbage and not process and treat it as required under the law.

After the Goa Government gave up its two sites, it notified a new proposal selecting certain villages to function as garbage disposal sites for clusters of villages around them. That plan too has been effectively killed because no village wants to be the recipient of garbage from other villages.

Everyone knows that if a panchayat is allowed to dump its waste in another panchayat, it will not be bothered about what happens at the site. Remember the old proverb: out of sight, out of mind!

So, what do we all do now?

Exasperated Goa Foundation says bye-bye to Sonsoddo

Unable to stand the indifference of the Margao Municipal Council



*Sonsoddo site below (on the day it was handed over to the Goa Foundation)
Sonsoddo site above (three months after the Goa Foundation took it over)*



The Goa Foundation (GF) took over the garbage site at Sonsoddo from 6th September 2004. The MOU signed between the MMC and the Goa Foundation required the Foundation to train the MMC's workers to process the wastes coming to Sonsoddo using earthworms and EM and also to segregate the non-biodegradable waste using rag pickers. The Foundation was to supply technical knowledge and guidance to the MMC free of cost since the MMC is doing a statutory service, with the assumption the MMC would run the project on its own within a year or, at the most, two years.

When the Goa Foundation took over the site it was in a really bad state. There was no place to dump the waste and as a result the waste had now reached the public road. The garbage was put everywhere even inside the existing Komex shed. The situation was so bad that even the meeting with the

then minister (Digambar Kamat), the Director of Municipal Administration and the MMC officials was held on the road outside the site.

Forty tonnes of un-segregated mixed waste come to the site every day. This waste has to be turned after it has been sprayed with EM, which can be done only with a JCB.

The most difficult aspects was to ensure that this equipment is provided at the site. The MMC was never able to provide the equipment at the site on time. The provision of JCB was always delayed and at times it did not come to the site for weeks. There was always a great backlog due to these delays and thus the JCB had to work almost three times more than the normal hours i.e. 16 hours instead of 4 hours, costing the MMC extra money.

Only one JCB operator in the whole of Salcette was willing to work on a garbage site. But after some months



Sonsoddo site before it was taken over by the Goa Foundation



Sonsoddo site after it was taken over by the Goa Foundation

time the owner of even that JCB was not ready to send the equipment since his bills were not cleared on time by the MMC.

In the end, because JCB bills were not paid in time, the GF was reduced to paying for the diesel so that the JCB would come to work at the site and make place for fresh garbage. The diesel cost was, however, reimbursed by the MMC when bills were submitted. The delay in equipment resulted in a gradual garbage build-up at the site. The Goa Foundation asked urgently for a Hitachi to be provided at the site in the month of April 2005 so that the area could be cleared as well as the site prepared for the rains. The Hitachi was given to the GF only in the month of September (after the monsoon). Now there is a huge mountain of waste at the site.

Workers: The MOU required the MMC to supply 30 workers for two months and thereafter 10 workers for training. Let alone 30, not a single worker was made available for the first two months....

Finally, we were given five workers for 15 days in the months of November and thereafter every month. They were trained by us and worked till March 2005 when their services were terminated despite our protests. Thereafter the MMC provided us with five regular (municipal) workers at the site. These workers reported only for 2-3 hours in a day. When we refused to mark them present for the whole day they threatened to approach the union. The MMC finally issued a formal order on 21 June 2005 to assign ten municipal workers to the site. All refused to come!

Trained MMC worker bales plastic waste for disposal to recyclers



Through all this, the Goa Foundation had to employ workers, and pay them salaries to see that the work at the site was somehow continued. The Foundation hired the same 5 workers it had trained. In addition, the GF trained 5 additional workers who were employed on daily wages. All the workers were promised a work order which was finally issued to them only on 20th of December 2005!

Specific work done by the Goa Foundation at the Sonsoddo site, is as follows:

- Repair of the existing approach road with proper gate and locking system.
- Construction of the compound wall on the eastern side of the site.
- The Komex shed was cleared and 1,700 bags of compost that were present inside the shed were sent to mining sites;
- Full time day and night security (with security cabins) to keep a check on all the trucks coming into the site.
- No unauthorized trucks allowed to dump waste at the site unless they produced written permission of the MMC.
- Renovation of the existing toilets with water connection.
- Workers' room and storeroom constructed, and electricity provided.
- Water sump and a motor pump installed.
- The site is now fully fenced, therefore there are no cattle permitted into the premises.
- There are no fire outbreaks at the site any more.
- The rainwater is diverted through the drainage channels outside the

garbage area, thus preventing a great quantity of rainwater from entering the garbage and getting contaminated.

- Some plastic waste is segregated, baled and disposed of to the recyclers.

- 10% of the waste is segregated and treated with EM to form compost.

- The entire site is sprayed with EM in order to control the smell at the site.

- Ten Municipal workers are trained in composting operations, preparation of extended EM, plastic waste baling, vermicomposting, etc.

- A platform area was created in front of the Komex shed for segregation and treatment of waste.

It required so little of the Council to turn Sonsoddo around from its old status as one of the worst dumps in the history of Goa. The entire work of cleaning up the site was funded by the Goa Government on a proposal made by the Goa Foundation. Despite the fact that Rs.25 lakhs was released, it can be seen that because an NGO was involved, only a little more than half was spent. For the coming year, Government promised to fund machinery needed. However, the Council was unable to forward the proposals already submitted to them by the Foundation. Unable to do anything further at the site than just shifting the garbage around, and since the workers had no work to do as far as composting operations were concerned, the Foundation finally decided to quit on March 21, 2006.

Many people, including Margao Municipal Councillors, thought that the Goa Foundation was paid a contract to manage the site. This was not the case. The Goa government issued a sum of Rs.25 lakhs to the Council which then released the money to pay for services, wages and equipment directly. The Goa Foundation was not involved, except in those cases where the Foundation had to pay for diesel to be put into the JCB simply because the Council could not process the bills on time.

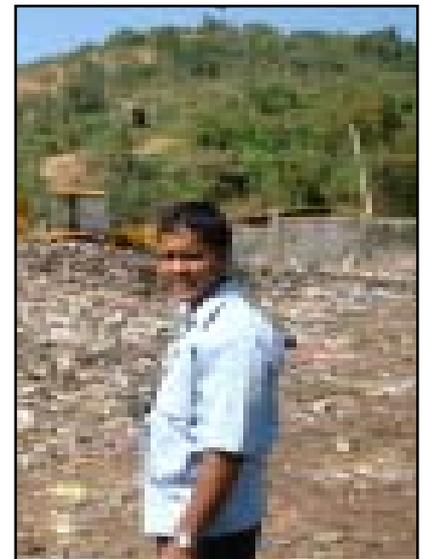
The Goa Foundation did not charge the MMC for its services for one year and three months.

The Foundation's work at Sonsoddo has proved that with a site manager and a dozen workers, and earthmoving machinery, garbage can be effectively tackled. Huge sums are not required.

The MMC, however, refused to accept that Sonsoddo was one of its

priority items. Therefore it was not concerned whether the Foundation had the necessary assistance from the Council when it was most needed. The Foundation's staff was very often reduced to needless visits to the MMC, and to pleading with the staff for cooperation which rarely came.

Margao is the only city in Goa to have at the moment an assured site for



Ryan Rodricks of the Goa Foundation managed the Sonsoddo site almost alone for more than 16 months!

garbage processing and for a landfill as well. But do not be surprised if the indifference of our elected representatives leads to even this secure site becoming unavailable in the future, if it is allowed to deteriorate, as it was in the past.

In the meanwhile, let us all pray for the Madgavkars. Their elected leaders are still fighting among themselves, modern Neros fiddling away while the garbage crisis looms.

This newsletter on municipal solid waste management in Goa is brought to you by the Goa Foundation, G-8, St. Britto's Apts., Feira Alta, Mapusa, Goa - 403507. It was prepared by Dephnie Lobo, and edited by Claude Alvares. Layout is by Chhaya Chodankar. Telephone: (0832) 2263305, 2256479 email: goafoundation@gmail.com

Margao citizens pioneer environment friendly waste disposal

Margao is a very big town and has two fish markets i.e. the wholesale market and the SGPDA market. It also has one meat market (Gandhi market). One of the well-known meat and fish processing industries of Goa, Costa & Costa's, is also located in Aquem, Margao. All these places generate large quantities of waste every day.

Earlier all the fish and meat wastes from the above areas was taken to the Sonsoddo site and this created a lot of problems at the site. As all of us know, this waste generally creates a bad stink and is difficult to treat ordinarily. Such wastes could still be treated if they were brought in segregated or without being mixed with other waste. But the Municipal Council, despite numerous written requests from the GF, was not able to do such a simple thing. The waste was brought to the site mixed with other market waste, which made a difficult situation worse. The Goa Foundation therefore tried other means.

1. Costa & Costa's : This fish and meat processing industry is situated in Aquem, Margao. It generates about one to two tonnes of fish/meat waste every day. Before Goa Foundation took over the Sonsoddo site, all this waste was being dumped at Sonsoddo. The company paid the Margao Municipal Council more than 12,000/- per year to take the waste for dumping to Sonsoddo. The MD of the company was not in favour of this system but had no option but to go along with the practice.

The Goa Foundation approached the company and explained to them how they could treat the waste. They were interested and invited us to demonstrate the technology.

The waste was taken from Margao to Quepem and was treated on the company farm using the trenching system. Seven trenches were dug having a dimension of 7m x 1m x 1m. The waste was treated on a daily basis using layers of Bokashi and sawdust. The trench was then sealed with mud.

The process was so effective that in a few months' time the company decided to shift the treatment operations to the

factory premises since they would not be causing any problem to the neighbours. Compost is harvested every three months and the pit is re-used.

2. D.N.K Associates: For a long time the Goa Foundation requested the Margao Municipal Council to bring segregated vegetable and fish waste to Sonsoddo. Even after repeated reminders, the MMC was not able to do so. At this time, D.N.K. Associates represented by Adv. Bernard D'Souza proved to be a great help.

They came forward and said that they were interested in treating the fish and meat waste. A fish waste treatment unit has been set up now at Gogol, Margao under the guidance and supervision of the GF. The waste is collected by a D.N.K. owned rickshaw and brought to the farm where it is further treated. The unit is able to process about 300 kg of fish waste every day.

The waste is treated using the trenching system. There are six trenches and the waste is treated using the same system as that used in the Mapusa fish market. Four chambers are also constructed to treat the waste once the trenches are full.

Meat waste is also treated in a different plot. All the meat waste is put a trench and covered with soil. The trenches are dug in between the areca-nut plantation. The advantage is that cost of manure is reduced as the trees absorb the nutrients from the waste directly. And this kind of waste no longer comes now to Sonsoddo.

Panjim: "Mission Chaka Chak"

Faced with the prospect of having no permanent landfill site available in the near future, Panjim city is now working hard to compost its wet wastes.

One of CCP's major projects is the attempt to keep the city area clean in their "Mission Chaka Chak". The campaign aims to achieve 100 per cent dry/wet waste segregated at source (SAS) and to establish the required 173 composting stations in the city to treat all of its wet waste.

The mission also attempts to establish linkages with recyclers for dry waste.

The campaign also organised a successful exhibition cum sale for four days in the Panjim municipal garden on alternatives to non-recyclable material. They are also working at making Panjim plastic free and reducing residual waste sent to landfill. But the plastic lobby is objecting the any ban on the sale and use of plastic carry bags. The plastic bag manufacturers blame the citizens for throwing plastic bags into the environment after using them. They say they are not to blame even though the bags come from their factories and provide them with profits.

Above all, the CCP's main aim is to create civic sense and awareness on waste handling and treatment and eradicating the NIMBY mindset (not in my backyard syndrome).

The campaign put up a number of sponsored posters all over the city of Panjim: "If you care for Panjim, reduce, reuse, and recycle." "If you care for Panjim, then segregate your waste."

The CCP till date has set up 43 small composting units in Panjim. Thus they are able to compost 15 metric tonnes of garbage every day. This is a very big achievement for the corporation and the commissioner and his consultant Mr Clinton Vaz need to be complimented for setting up such a massive, decentralised garbage treatment programme. Probably they have succeeded because there are no councillors present. Patricia Pinto is the only steady fixture on the scene, helping out even though she is no longer a councillor.

Vegetable waste treated at the Panjim Municipal Market

The CCP has put up a waste treatment unit just next to the new market. The unit is designed in such a way that it can process 500 kgs of waste every day.

There are 10 treatment units that have been constructed, each having a dimension of 5m x 1m x 1m. The units have aeration vents to allow for air circulation. There is also a water channel surrounding each unit to prevent the ants from entering into the units. The units are covered by netting. All the 10 units are put under one shed.

Process used:

1. The vegetable waste is spread evenly inside the bin.

2. The waste is then sprayed with EM (1:10) dilution.

3. After this a bio culture called Bio-culum is sprinkled on top of the waste i.e. 10 gm for 10 kgs.

4. The waste is then covered with cowdung slurry.

5. The next layer is of pre-digested materials. This material is taken from the pit that is ready.

6. Neem leaves are then used to cover the material.

7. The last component that is used is a powdered culture called the Bio-sanitreat.

This process is continued till the bin is full. One bin can be used for 10 days. Once the bin is full, the material is left untouched for 15 days. After which the material is partially aerated by making holes on top of waste. This process is continued for another 15 days.

After this, the material from the unit is turned layer by layer, and the compost is harvested after one month. The compost once ready is then shifted to the compound of the animal shelter of the Corporation situated in St. Inez.

All the 43 units set up may not function well in the first few months. Citizens should bear with this. Composting of domestic kitchen wastes is a difficult enough job. The CCP is trying hard to succeed. All that it needs right now is a sympathetic and cooperative citizenry. Things will get better with time.



While Panaji is getting Chaka Chak, its garbage dump of 1,75,000 tonnes of waste lies in the form of a huge mountain at Curca. Leachate from the dump has contaminated the wells of the village which says it will not suffer any further garbage to be dumped at the site. Curca's opposition has proved to be Panaji's gain, stimulating the CCP's massive composting programme in the city.



The closure of Curca has ensured a firm determination in the CCP to find a permanent solution for its own wastes. The photograph above shows the bins erected for composting the vegetable waste generated in the Panjim market. The CCP should be congratulated for this massive effort to look seriously after its own wastes.

What some Goans who love Goa are doing:

Composting garbage with earthworms



Ms. Hazel Barros, Mapusa

Introduction: Every home in Goa is generating either small or large quantities of "organic" waste: kitchen wastes, food leftovers, garden trimmings including leaves and grass, coconut fibre, etc. In many village homes, such wastes are normally eaten by domestic animals, including chickens, cats, dogs, pigs and cows. But in a significant number of homes, there are no such solutions. Inmates pack the waste and dump it into bins or on the roadside. Our Goa is daily become a horror story because of such practices.

There are several things you can do with your organic wastes. If you simply bury them in a pit, they will compost slowly over several months into good manure. People have forgotten this simple technique. But you can also convert your house wastes into good compost more rapidly by using either EM (see our pamphlet on EM) or friendly earthworms.

Vermicomposting is the art of using earthworms to turn organic wastes into good and useful fertiliser for plants, crops and lawns. It can also be run as a small-scale industry and bring handsome returns to the owner of the vermi-unit.

What is vermicomposting ?

Earthworms feed on organic waste and can consume two to five times their body weight. They use a relatively small amount of their intake of waste for their growth and excrete the

mucus-coated undigested matter that has undergone physical and chemical breakdown through the activity of their muscular gizzard. The nutrients present in the vermicasts excreted by the worms are readily soluble in water and are easily taken up by the plants. Vermicompost – the result of such activities of earthworms on organic materials – is a rich source of micro and macronutrients, vitamins, antibiotics, growth hormones and micro flora.

There is a diversity of earthworm's species. One can, for example, use local earthworms. Or one can use "garbage processors" like *Eudrillus eugenia* (supplied by Green Goa Works). These earthworms are surface dwellers and are capable of converting organic waste into manure. They behave differently from local earthworms.

An important point to remember about earthworms is that they can only convert the organic component of the waste into manure while the inorganic part (mainly plastic) remains as it is, at times even hindering the efficient functioning of these creatures. It is therefore crucial that such waste (especially plastic) is separated or removed before it is fed to the worms.

Segregation of waste: Segregation of wastes into organic (wet) and inorganic (dry) at home is the best way to deal with such wastes. Before we put our waste into the vermicomposting pit, we should ensure that it is only organic. It should not be mixed with plastic. Once the segregation has been carried out, vermicomposting can be done following the steps given below:

Construction of Earthworm Composting bins:

1. Prepare the earthworm bins as per the design given by the Goa Foundation-. These bins are designed to keep out ants, rats, lizards, flies and other predators who also love to eat the worms (see the illustration on page 4).

2. The bins should not be more than a height of two and a half feet. At this height you can comfortably move materials while remaining outside the bin.

3. The base of the bin should be well laid out, with PCC, so that no ants can penetrate the base of the bin and enter it from underneath.

4. A water channel should be con-



Antonette Maciel, Moira

structed around the base of the bin so as to prevent ants from entering the bin and troubling the worms.

5. The bin has to be covered with a netting so as to prevent the entry of other insects or animals particularly rats and lizards.

6. The bin should be covered with a roof shelter so as to protect the worms from sunlight and rain.

7. The base of the bins should have a slight slope, so that the excess water drains out easily.

How to start the vermicomposting pit:

1. At first, at the bottom of the bin, you need to put some pebbles or stones. Over it put some leaves, grass, etc.

2. On this, put a layer of waste and cover everyday with a plastic sheet or gunny bag. Do this till the bin gets completely full.

3. Cover the bin with plastic and leave it for 40-45 days for predigestion (during this time the waste gets broken down and its heat is released)

4. Now you can start loading the second bin.

5. After 45 days remove the plastic cover from the first bin and if possible pour cow dung slurry on the top.

6. Check for the temperature (it should not be too hot) and then leave the worms gently on the waste.

7. The worms will start eating the waste leaving the vermicastings on the top of the predigested material. The

vermicompost can be collected, sieved and used as manure. After a few weeks, all the vermicompost is removed and the first bin is empty for use again. Now put the earthworms into the second bin and repeat the process.

The utility of worms and vermicastings:

1. Using these simply constructed bins, all organic waste – responsible for Goa's pollution – is converted into rich fertilizer by the activity of the earthworms.

2. Use of vermicompost ensures balanced nutrients to the plants and improves immunity against pest attack. It will have an unbelievable impact on your plants.

3. The product you grow will have better taste, keeping quality and no toxic residues.

4. Children simply love earthworm units. They will look after the earthworms better than adults.

5. Earthworms can live for days without human assistance. You can safely go for vacations and still find them there after you return.

THESE PEOPLE ARE NO LONGER A PUBLIC NUISANCE!

Since neither the Municipal Councils nor the Panchayats have a solution to the problem of garbage disposal in Goa, individual Goans are taking their own steps to ensure that they are not a part of the problem.

Over the past two years, a few housing complexes including Kamat

Milroc, Old Goa



Kamat Classic, Miramar, Panaji





Manjiri Raiker, Canca



El-Shaddai, Assagao



Kamat Kinara, Miramar



F.Foundation, Guirim



Romeo Coelho, Moira



J. Braganza, Assagao

Gardens, Kamat Classic, Kamat Kinara, Portofino Park, Sinquerim, hotels and individual house owners have approached either the Goa Foundation or Green Goa Works (headed by Wendell Rodricks) for putting up small scale highly successful composting units to dispose off their wet garbage.

Wet garbage (as opposed to dry garbage like paper, plastic, glass, metal) generates foul smell, flies and attracts ants, stray dogs and rats. The main strategy is to isolate wet garbage before it gets bad and to protect it in secured chambers where it can decompose peacefully, often with the help of earthworms.

The GGW/GF combine assists interested persons in constructing

individual bins as per the need of the persons concerned and then guides them on how to use them. It also supplies materials like earthworms or EM (effective microorganisms) to run the units.

Unlike other agencies, GGW carries out weekly monitoring for those who want it, in order to ensure that the earthworms are alive, that the units are functioning properly and without problems.

The earthworm units generate excellent ready-to-use compost, and more earthworms as well. GGW has a buy-back scheme: it buys earthworms from existing successful units and sells them to new units that are coming up. It also encourages people in villages

to rear earthworms and sell these to the company.

The units can function for as long as the bricks from which they are made survive (thirty years). Since they are sealed there is no smell and no possibility of rat infestation. They are tastefully designed to suit the architecture of each house.

A permanent two-chamber unit for a family of 4 to 5 members either in a bungalow or terrace or in a house compound will cost around 3000/- including bricks, sand and cement and an additional amount for an all-weather metal roof and covering. The GGW staff remains present during the construction so that the design is strictly as per requirements. Once the unit is

ready (construction time is 2 days) it can be put to use immediately. GGW will then supply the earthworms.

Better to light a candle than to curse the darkness. Take steps to handle your own garbage and don't be one of those who package their wet garbage and throw it in fields and rivers. Goa's environment is fast deteriorating because of litter, plastic, garbage and politicians. You have a chance to be different. If you need a vermicomposting unit, contact Ms. Dephnie Lobo at: 9326122609 or telephone Mr. Alphonso Travasso 9326151534/ Ms. Nancy D'Souza on 2263305/2256479.

Dempo Mining Corporation used Mapusa garbage to rehabilitate mine site



The Bicholim mine site that was given over to the Goa Foundation for its work of using garbage to rehabilitate mining dumps.



Vetiver grass cuttings were first planted at the site, before it was layered with wastes from Mapusa market (above)

The project of rehabilitation of a mine dump was started in the year 2002. Four affected areas were taken on a trial basis. Total area of rehabilitation is 1.1 ha. When the area was taken for rehabilitation the soil was as hard as stone, so hard that it could break a pickaxe. The soil was barren and dry with the total absence of any vegetation.

The Goa Foundation has always held that planting trees is not the solution for rehabilitation of mine sites.. Before the trees and their roots grow, which will be not less than three years if all good care is taken, soil erosion will have taken place. Thus we started with grass plantation. The main idea was that these grasses would then lead to natural pollination and the plot would then slowly develop on its own.

At the initial stage we planted two types of grasses: vetiver and stylo. Vetiver has a good rooting system which can go one meter deep. It helps in holding the soil and also prevents soil erosion. The grass grows to a height of 1-2 meters. At this stage, it can be cut and the material used as biomass and as soil cover.

Stylos grows as a carpet on the ground and prevents soil erosion during rains. These grasses were planted on the first, second and third bench. The grass did grow but its growth rate was very slow and in a few months it started withering. The main reason was the soil lacked organic matter as well as its water holding capacity was almost zero. The only way to give the grass

a chance to grow was to add organic matter to the soil.

The Goa Foundation worked an arrangement with the Mapusa and the Bicholim Municipal Councils. The system was that the municipal councils would bring their agricultural and vegetable waste to the Dempo mines and the mines would treat the waste. The compost generated would then be used as organic matter for the grass.

We commenced with the transport of the market waste from January 2004. All the agricultural and vegetable waste was taken to the site and composted. The Mapusa Municipal Council alone sent more than 600 truckloads to the site.

Treatment process: The composting process was done first in the cashew plantation. Municipal truck drivers had to unload the waste in certain places after which the following steps took place:

- The waste was spread on the ground.
- Plastic was segregated and removed.
- The organic waste was sprayed with EM
- The waste was arranged in windrows.
- The windrow was covered with plastic.
- It was turned after every 15 days.
- The compost once ready was then applied on the grass plots.

After the application of the compost



After a year, the area was filled with new grasses brought there by the wind and the birds. In addition to vetiver, the Foundation found there were twenty odd new grasses that had grown on the plot on their own.

the soil started improving. The grass started showing gradual growth. The water holding capacity of the soil increased. The top/first bench showed very good growth and is now having a diverse growth of grasses. There are more than 15 varieties of grasses, which have never been planted over there. Thus it was decided not to have any other type of grass artificially planted except for vetiver. It has been seen that the top/first bench is in the first stage of succession and in two to three years it will have shrubs also growing. Some tree seeds have also germinated on their own.

The soil quality has improved con-

siderably and algal growth in some places was also noticed. The area has become a habitat for wild animals such as rabbits, wild boar, snakes, etc. It is really amazing to see such diverse growth of plants on a mining plot, that too within the space of just two years, on a base established by treated garbage from nearby towns.

The system worked well and proved to be an example to all the Municipal Councils. But every good thing has to come to an end. During the Municipal Council elections, the Bicholim Municipal Council stopped the waste coming from Mapusa Municipal Council as both councils were under different political parties. It has not resumed



Once the soil improved, seeds from the market waste generated and produced vegetables, like this ash gourd. The mining staff had additional vegetables from what was earlier barren land.



Experienced solid waste personnel of the Goa Foundation and Green Goa Works: (Left to right) Dephnie Lobo, Claude Alvares, Vishaal Mulgaonkar, Alfonso Travasso, Krishna Porob, Vijay Shetye (inset) and Ryan Rodricks (pg. 2)

Mapusa Municipal Council starts fish waste processing unit



The fish market area before Mapusa Municipal Council constructed its fish processing unit with help of the Goa Foundation



The same area after Mapusa Municipal Council constructed its fish processing unit with help of the Goa Foundation

The Mapusa Municipal market generates large quantities of waste every day. The fish and meat wastes are the most problematic, simply because they were thrown by the generators in an open bin adjoining the fish market where they generate foul smell, nuisance and affect public health as large numbers of consumers visit the area and purchase food items from there.

The Goa Foundation submitted a proposal to the Mapusa Municipal Council (MMC) for treating the fish waste generated in the Mapusa market and for training the municipal workers to deal with such wastes on a permanent basis. Looking at the seriousness of the problem, the MMC approved the proposal and constructed the "Fish Waste Treatment Yard" as per the design submitted by the Foundation.

The construction was completed on 14th June 2005. The unit was commenced on the 16th of the same month. The Goa Foundation took up the project as an experiment since it had the expertise.

In the beginning, there were some serious problems with the unit. The first attempts to control the problems of smell and worms generated from the waste were not totally successful. Fish has a bad smell anyway, and composting fish can be worse, if the reaction is

not successfully controlled.

The Foundation sought advice from Trio-chem in Pune and Dr Sultan Ismail from Chennai. It also switched to alternative methods of controlling the generation of hydrogen sulphide. It finally succeeded by using acetic acid and cowdung.

Today the unit is considered by the MMC as fairly successful. It does not have any serious odour problem and what is most significant, the fish manure has a steady market. Consumers must approach the MMC directly, pay the amounts and take the compost. Ardent supporter of the unit is chief officer Ranjit Satardekar, who is keen to solve Mapusa's garbage problems once and for all.

The eventual success of this unit enabled the Foundation to initiate a similar type of processing unit for fish and meat waste in Margao.

Unit specifications:

No. of bins – 7 numbers

Size of each bin – 12ft x 3.8ft x 3ft

Capacity – 3 tonnes

Time taken for detoxification of fish waste – 30 days

For fish compost contact:

Mr. D. Mhamal (Municipal Inspector) (Mobile) 9823326532



Fish waste is placed in the large bins where it is mixed with EM bokashi and vegetable wastes



MMC workers layer the wastes. The final product (see below), which is first class fish manure, is bought by Goans who have great faith in fish manure



Vasco city:

Mission 'Plastic Free' is succeeding

Before the Corporation of the City of Panjim could get its act together, Mormugao Municipal Council had already announced a city free of plastic bags from January 26, 2006. The MMC was able to act because the entire area within the jurisdiction of Vasco was declared out of bounds for plastic bags by a notification issued in 2004 under the provisions of the Environment Protection Act, 1986. Despite the notification, nothing happened till Elvis Gomes, the CO of MMC, decided to enforce the law.

The impact of the campaign to ban plastic carry bags (of whatever thickness) has had major consequences for MMC's garbage treatment plant at Sada. The plant's waste segregation machinery had been continuously choking up on the volumes of plastic waste found in the MMC's garbage. In fact, the plant was shut down for several months because the entire

segregation drum had to be replaced due to this problem.

The decline of plastic litter in the garbage has been greeted by the plant's managers with a great sigh of relief.

Elvis Gomes says that the new campaign is working well and citizens are cooperating. He says he has not encountered any opposition from any quarter and that there is 95% compliance and enforcement.

Gomes, a young dynamic officer, takes his work very seriously and pushes to get things done. Since the media is located in Panaji, he does not get the kind of media exposure he deserves. But MMC citizens vouch for his efficiency in getting things done.

Unlike earlier chief officers, Gomes is going all out to support the work of Chemtrol which is processing the town's waste at their plant at Sada. As of now, Vasco is the only city to have a solid waste treatment plant

Goa discovers EM (Effective Microorganisms) solution

EM stands for 'Effective Microorganisms'. A liquid concentrate, EM comes in one litre bottles (cost: Rs.240). Goans at large are becoming dedicated EM users. The number of outlets in Goa is increasing. Green Goa Works, the company headed by Wendell Rodricks that distributes EM, recently opened an office in Margao.

EM stock solution contains around 80 species of microorganisms. None of these organisms are genetically engineered or dangerous. The liquid is therefore absolutely harmless. It is not dangerous to health, like Baygon or Phenyl (both deadly poisons). People are using EM when they go for a bath (a little EM dropped in the bucket) and for washing their clothes!

EM stock solution cannot be bought in the supermarket or off the shelf because most of the bacteria are in dormant form. They thus have to be activated or extended. Once you have activated the culture (with jaggery, sugar, rice water or molasses) you need to further dilute the culture to the required level for use. EM use is like homeopathic dosing: the more you dilute, the better the results! Thus, in addition to protecting the environment, you also save money!

Therefore, when you buy an EM bottle, you first 'extend' it by diluting it with water and jaggery. The mixture is then kept aside to ferment for 4 to 7 days. Thereafter, it is ready for use. One EM bottle is first used to produce 20 litres of 'extended EM'. It is then further diluted 100, 500 or 1000 times depending on what use you want to put it: compost, cleaning or as a growth promoter.

One of the most beneficial reasons for using EM is that it reduces foul odour emitted from any source, be it compost, animal or human residue, ponds, rivers, industrial waste, etc. EM also acts as a deterrent for mosquitoes and common flies. Besides this, EM can be used for other purposes such as agriculture, animal production, aquaculture, recycling of polluted wastewater, recycling of solid waste (city waste, kitchen waste etc.)

EM in composting garbage: Garbage is one of the major problems that most of us face. Household garbage contains a large quantity of moisture content thus it is difficult to burn; burning also leads to pollution and endangers the natural ecosystem. But if we segregate domestic waste into biodegradable and non-biodegradable waste then the problem can be simplified and solved. The non-biodegradable waste can go for recycling while the biodegradable waste can be composted.

A normal decomposition process takes a long time and is also associated with a number of problems. EM is widely used for treatment of solid kitchen waste for generating compost. The treatment process using EM is a simplified form of the earth's natural process.

EM in daily life: EM can be used in our daily lives in many different ways. It can be sprayed into toilets to remove unpleasant odour, used in the bathrooms as protection from fungus, in kitchens to remove smell of food, in washing machines along with detergents (Henko is recommended), in closets to protect cloths from insects, in shoes to remove odour, and in lawns and gardens to grow flowers fruits and vegetables.

Example of places in Goa where EM is used for cleaning:

1. Hotel Caritas, Panjim: It is one of the first hotels to use EM as a cleaning agent. The hotel staff was not willing to use EM at first. So the most dirty and stinking place in the hotel was taken as an experiment i.e. the toilets. EM gave results in only two days, convincing the staff of its effectiveness.

This is the only hotel, which works entirely on EM. EM is used for almost everything. The hotel toilets, bathrooms, floors, rooms, corridors, kitchen etc are washed with EM. The water after the cleaning is done is then used for gardening.

The well is also treated with EM thus keeping the water pure and safe to drink. EM did not only prove to be effective but also economic. The cost of cleaning is four times less than before.

2. Verem Villas, Verem: Verem Villas is a resort. It was facing a problem with its septic tank since there was some blockage in the soak pit. The water was not filtering and there was a very bad odour generated during the evenings. This also gave rise to another problem i.e. mosquitos.

As recommended, the villas switched to the use of EM. All the toilets were flushed with EM. And the use of other disinfectants was reduced. After one week there was no smell. The mosquito population was also reduced.

The sewage water after EM treatment was tested and had COD, BOD within limits, thus it could now be used for gardening.

Mandovi Farms, Bironda: Mandovi Farms is one of the organic farms situated in a village called Bironda near Valpoi. Stephen Pereira who owns the farm is treating all the agro waste that is generated in the farm with EM. The waste is sprayed with EM and is put in a heap and is covered with a plastic sheet.

Note:

* 1 ml in 10 ml is 10 times dilution

* 1 capful (10 ml) in one litre of water is 1:100 times dilution. Use the cap of the Bisleri water bottle as a measure of 10 ml. It is always easily available anywhere.

If any more information is required on this matter then you can contact:

The Goa Foundation / Green Goa Works

You can call us at:

Phone: 2256479/2263305.

Mobile: 9326122609/9326151534

Email: admin@greengoaworks.com

greengoaworks@gmail.com

goafoundation@gmail.com

Some of the places where EM can be used



HOW TO MAKE EXTENDED OR SECONDARY EM

Requirement

1 litre stock solution

1 kg jaggery or molasses or sugar

20 litres chlorine free or well water

Procedure

1. Take 20 litres of clean chlorine free or well water in a clean plastic container. Please note that the container should not exceed 25 litres in capacity. The main reason is that larger the container, the more difficult it is to maintain the evolution of gas.

2. Add 1 kg of jaggery (dissolved in hot water and cooled). Please do not use the purified form of jaggery. The cured form is better in flavour as well as performance.

3. Add 1 litre of EM stock solution and mix well.

4. Close the container and make sure it is airtight.

5. Keep the container airtight for 5-7 days.

6. Open the lid slightly daily (after 2 days) to release the accumulated gas and then close the lid. The gas has to be released so as to avoid the container from busting as well as to keep the pH normal.

7. After 5-7 days you will get 21 litres of extended EM having a pH between 3-4 ready for use.

Please note that the extended EM has to be diluted and then used. The dilutions differ on the use.

The trick to good EM usage is this. Never contaminate EM liquid by introducing spoons or other objects into it. Always pour out EM from the bottle.

Use EM as homeopathic liquid: less produces better results.

You can keep 'extended EM' for more than a month. However, once you dilute extended EM, use it all the same day.

WHERE YOU CAN GET EM IN GOA

- **The Goa Foundation**
G/8 St Brittos Apts,
Feira Alta,
Mapusa - Goa.
Tel.:2256479/2263305
- **Green Goa Works**
Socol Vaddo, Assagao,
Bardez, Goa.
Tel.:5621724
- **Green Goa Works**
Shop No. E1G7, Maria
Julia Complex, Next to
Fatorda Stadium, Margao
Tel.:9850452080
- **Maureen Printing Press**
Next to Patto
Bridge, Panjim, Goa.
Tel.:3092794
- **Fr. Inacio Almeida**
Nature Farm, Pilar.
- **Garden Glory - Panjim**
- **H. R. Prabhudesai, Ela**
Farm, Old Goa

**Available for sale
from
Green Goa Works**

**EM Stock –
Rs. 240 per litre**

**EM Extended –
Rs. 25 per litre**

**EM Bokashi –
Rs. 20 per Kg**

**Vermicompost –
Rs.15 per Kg**

**Fish compost –
Rs.10 per Kg**

**Earthworms –
Rs. 500 per 1000**