

Establishing small scale coconut extraction units in the Nicobar Islands

DST Project No. SP/TSP/047/2006

PROJECT FINAL REPORT

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PROJECT SUMMARY

DATE OF START	April 1, 2008
SCHEDULED DATE OF COMPLETION	March 31, 2010
Extended until :	June 30, 2010

TOTAL SANCTIONED COST	₹ 9,98,480
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TOTAL EXPENDITURE	₹ 9,07,806
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TOTAL EQUIPMENT ACQUIRED

8 Presses

2 graters

SUMMARY

The objective of the project was to design and introduce presses for making coconut milk, and then convert this coconut milk into virgin coconut oil. The locale for the project was car Nicobar Island, in the Nicobar District of the Andaman & Nicobar Islands.

The project got off to a late start because of two problems. Firstly, there were major design problems with the press, which took over a year to resolve. Modifications suggested by the fabricators did not stand the test of field trials. In the process the design was considerably modified and four presses had to be discarded. Secondly, the Andaman Administration refused to issue a tribal area pass for the Nicobars for whimsical reasons. This was overcome after several months, and included intervention by DST.

A local Nicobari youth group consisting mainly of young women, the Dosti Group, was identified as the focus group for the project. One of them was employed as the field coordinator, and machines were then sent to the Nicobar Islands. Demonstrations were held, and modifications made until they were happy with the final design.

The use of electrical coconut graters was attempted. This was abandoned since the village women, who traditionally did the grating, complained that they could not converse during what was a community activity.

The youth group members have begun extracting the oil hygienically. They buy grated coconut at the rate of ₹ 130 per litre, process it into oil and sell it at ₹ 150 per litre. This works out to around ₹ 10 per coconut, more than double the existing rate of ₹ 4 per coconut.

INTRODUCTION

The main export of the Nicobar Islands is copra. The Nicobari tribals who live on these islands are almost entirely dependent on copra exports for all their external needs.

The Northern Group of islands in the Nicobars, mainly Car Nicobar, produces about 250 metric tonnes of copra per month; the Central Group (Nancowry, Kamorta, Trinkat, Katchal) about the same before the tsunami. The trade used to be controlled by a single family in Port Blair; in the 1950s a tribal cooperative, Ellen Hinango Limited (EHL) was set up.

EHL pays less than the minimum support price (MSP) for copra, which is now ₹ 32. The current price being paid is ₹ 20 per Kg. The Nicobaris are often forced to sell at a lower price because otherwise the copra goes bad. This has meant that the islanders are not self sufficient, and major government subsidies are required at the moment. Tourism has been proposed as a mechanism to eliminate the subsidy, but a rapid survey among the residents shows that they do not favour this option.

Rather than the export of copra, an option is to convert coconut kernels into virgin coconut oil (VCO). This is used as a health food, raw material for pharmaceuticals, and as a base for soaps and cosmetics. It fetches between 4-5 times the price of ordinary coconut oil. The Nicobaris prepare this for their household consumption, but its production on a large scale has so far not been done due to technical constraints.

It should be noted that VCO produced from this coconut is organic, and thus will command premium prices from the pharma and perfume industry. This includes agencies abroad who find it extremely difficult to source organic coconut oil.

This project was therefore aimed at producing a low cost extractor for coconut milk (from which the oil is made), solving the social and technical issues that might arise, and enabling a marketing mechanism for this oil.

OBJECTIVES OF THE PROJECT

- 1.To introduce household presses in the project area and thereby improve profits for the tribal groups involved in the coconut industry.
- 2.To build local capacities in the operation and maintenance of these sets.
- 3.To facilitate the setting up of a press manufacturing unit of household presses.
- 4.To establish a transport and marketing mechanism for the coconut oil.
- 5.To establish local waste treatment and recycling units for the coconut waste.

PROJECT AREA

The project area is the Northern Group of the Nicobar islands, consisting of Car Nicobar and its nearby islands. This area was extremely badly hit during the tsunami, and efforts at rehabilitation have not been very successful. One of the reasons for this is that decision making is being done without consultation with the communities, often by outsiders unfamiliar with the culture of the islands.

COMMUNITY BACKGROUND

The population of the islands consist of Nicobari tribals, as well as a recent influx of traders from Tamil Nadu. The Nicobari population is 20,292 according to the 2001 census; tribal leaders say that approximately 4500 persons died in the 2004 tsunami (Fig. 1).

Car Nicobar has 15 villages. Each village has an elected Captain. Together, all the captains form the Tribal Council, which is presided over by the Chief Captain. Within each village, there are clans called '*tuhets*', which are extended family. Land is communally owned by each *tuhet*. There are a total of about 300 *tuhets*, each of which also has an elected leader. The elections are carried out by the villagers themselves. The election system is being taken over by the Government following a new Act this year.



February 2005 Satellite Image of Car Nicobar. Note the tsunami damage

METHODOLOGY

The project involved the optimisation of the coconut presses in the first phase, and later arrangements for the manufacture of these presses, either locally or on mainland India. It also involved training beneficiaries in its use.

Marketing linkages were developed through both Government agencies as well as private entrepreneurs,. Waste treatment proved to be unnecessary as all components were recycleable.

DEVELOPMENT OF THE DEEGANPRESS

Presses were designed which would squeeze grated coconut to extract coconut milk. This coconut milk was then processed to make virgin coconut oil (VCO). The initial press was a screw type press, one of two prototypes that was used for trials before this project was funded.

The press was named *DeeganPress*, after the British alpinist Paul Deegan, who funded the first two prototypes.



The First Press: Screw type

This consisted of a piston pushed by a rack and pinion arrangement into a perforated cylinder. While this press was light and cheap, it could develop less than one tonne force, which was insufficient for proper extraction of coconut milk.

It was decided to switch to hydraulics for the second press. This produced a force of 20 tonnes, but the

machine was too large and heavy. One unit was taken to the Nicobars, but loading and unloading it, and assembling it posed major logistical problems. It was also extremely costly, both for production as well as for transport.



Press 2: A trial on Car Nicobar



Press 2: A closeup

The specifications then decided for the final version were:

- It should cost under ₹ 25,000
- It should weigh under 45 Kg
- It should be able to process at least 60 coconuts/hour (after grating)

The third press: the first built with DST funds - was also based on hydraulics. It was much smaller, but proved to have design flaws. A connecting rod snapped under pressure, and the manufacturer was unable to rectify this flaw. Also, leaks of hydraulic oil were observed, and it seemed possible that this could contaminate the coconut milk.

Press 4 incorporated a radical design change. It was horizontal, and used commercially available hydraulic jacks. The first version of this had a flat plate in front of the piston, and was supposed to squeeze the grated coconut in between the rectangular piston and this plate. In practice however, there was insufficient space to load the press, so this became a very time consuming process. Also, the grated coconut would come out from the sides, and thus there was a great deal of wastage.



Press 3 - Smaller than before



The crossbar in press 3 snapped



Press 4 : Spillage from the side



The final version of the DeeganPress

All these limitations were overcome with the final design, pictured above. This version met all the design specifications. It was mounted on a pivot, enabling it to be raised to the vertical for filling. This modification proved unnecessary in the long run, since the users began wrapping the grated coconut in mosquito mesh, greatly simplifying its handling.

The final DeeganPress was manufactured by Ms. Aureka Ltd., Auroshilpam, Auroville-605101, Tamil Nadu. The designs are being made available under a Creative Commons 3.0 Attribute Share Alike Licence. This means that anybody is free to copy, manufacture and use the design, as long as the attribution is given to DST, FERAL & Aureka. Any modifications made to the press have to be made publicly available under the same licence, with a similar condition being imposed. More details on this licensing mode is available at <http://creativecommons.org/licenses/by-sa/3.0/>

COMMUNITY INVOLVEMENT

Contacts were initiated with the members of the Tribal Council before the start of the project, and considerable interest was generated. The the Chief Secretary, Shri Vivek Rae and the Deputy Commissioner, Car Nicobar, Shri T. Sreekanth were also briefed and given periodic updates during the course of the project.

The Dosti Group in Car Nicobar was identified as the organisation to execute the project. This is a self-help youth group, consisting mainly of women, which has one or two representatives from every village. They are in the process now of registering themselves as a cooperative.

The choices for executing the project were many. The Tribal Council was approached, and declined stating that making VCO was women's work. The Church of South India showed interest, but would not have been inclusive. The Mothers Union and the Dosti Group were the remaining two choices, and the Dosti Group was selected because they all had received training in sustainable development from the Tata Institute of Social Sciences.

One person from the Dosti Group was selected as the field coordinator for this project, but in practice all the members participated. Training in enumerating tree densities was given as well as training in how to use a GPS, which was donated by FERAL. Results from these activities have still to be gathered, and these are hampered because of the absence locally of computer access. A workshop was set up by the Dosti Group in Small Lapathy village to extract coconut milk, fill it into 20 litre jerrycans, and then send it to Port Blair for further processing.



Production Unit in Small Lanathy Village

MAKING THE VCO

Grating the coconut

Traditionally, a piece of Cane (*Calamus* sp.) stem is used. It has small spines on it. The coconut kernel, extracted in large pieces out of the shell, is rubbed against the cane stem to grate it.

Nowadays electric graters are commonly used. It takes approximately 45 seconds to grate a coconut using electric graters, as opposed to 8 minutes using the traditional method. However, the women preferred to continue using the traditional method, since grating is a community activity and women converse with each other during this. The noise of the electric grater makes conversation impossible, so they do not like it. Grating was therefore not done at the project site; growers were asked to grate the coconuts at home and bring the grated material to the workshop.



Traditional Grating



Testing an electric grater

Extracting the milk

The press is used to extract coconut milk from the grated coconut. Here, traditionally, the grated coconut is mixed with water, wrapped in a fine cloth and repeatedly squeezed. However, the amount of oil that is finally made from this method is very little, as the extraction percentage is very low. The actual percentage has not however been calculated yet.

The Nicobari method of making virgin oil is extremely simple. A little hot water is added to the milk, and then it is squeezed through a fine cloth. The strained milk is then kept out in a container in semi-shade. By the next day the Virgin Coconut oil has floated to the top under a layer of foamy residue, and can be scooped out. There is a layer of water below this. The oil is slightly milky because of the water in it. Keeping it in the sun for an hour turns it transparent again.



. VCO being scooped off the top from the mixture after it has been kept aside for a day

Waste treatment

It is not necessary to do any waste treatment since all the wastes are recycled. The husk and shells are thrown back into the fields and left to rot for manure, and the residues after the milk extraction are used as animal feed .

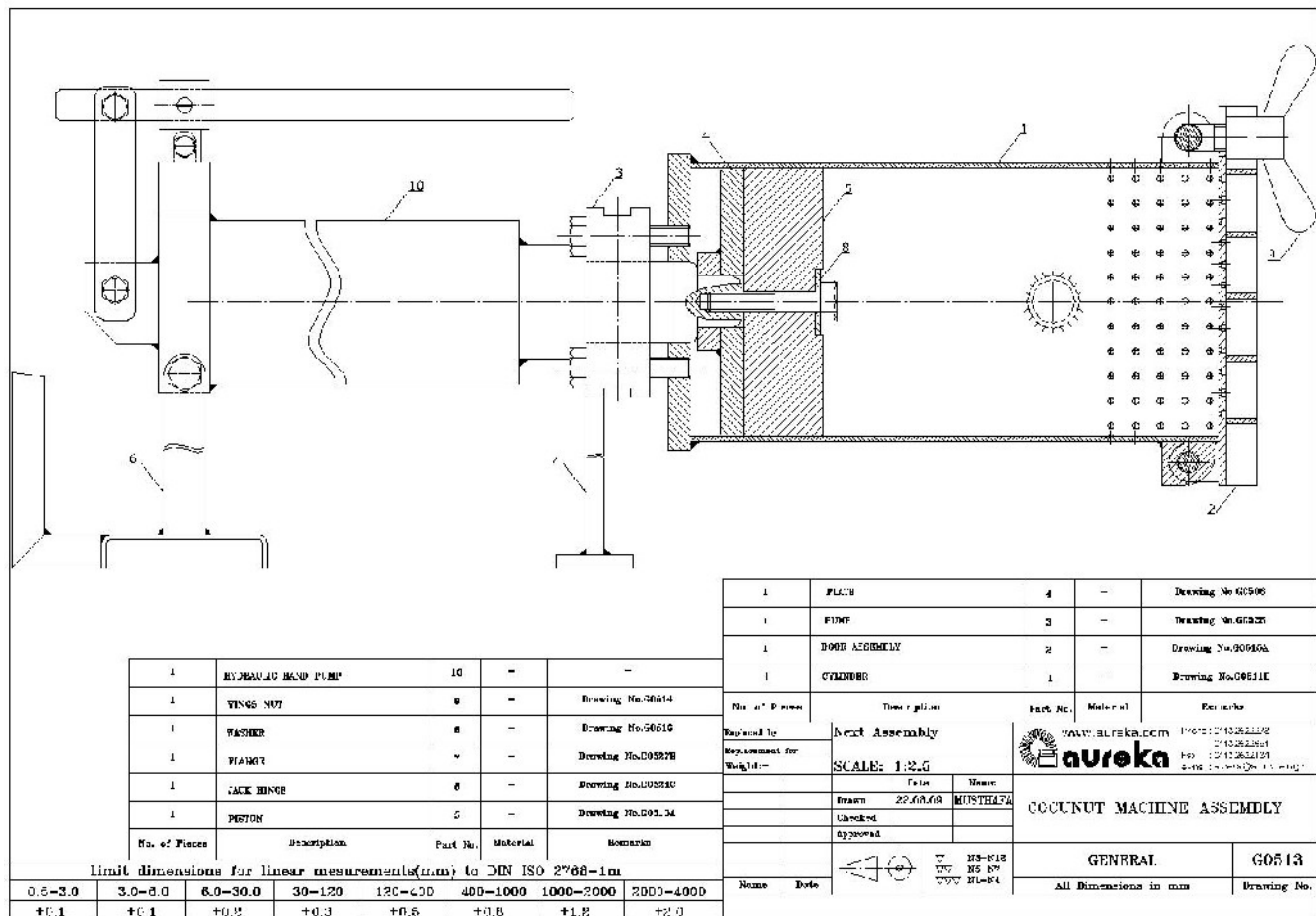
However, there is a possible and valuable use for the residues left after the oil is separated. If these residues are fried then ordinary coconut oil is left behind. This can be used to run diesel motors. This is worth doing a follow up project on, since there is a perpetual shortage of diesel.

TECHNICAL DETAILS

The final press has been fabricated by Ms. Aureka Ltd., and is licenced under Creative Commons 3.0 Attribute ShareAlike licence. The drawing will shortly be available on

<http://www.feralindia.org/files/Nicobar/DEEGAN-PRESS-ASSEMBLY-.zip>

or can be got from the author of this report (rauf@auroville.org.in).



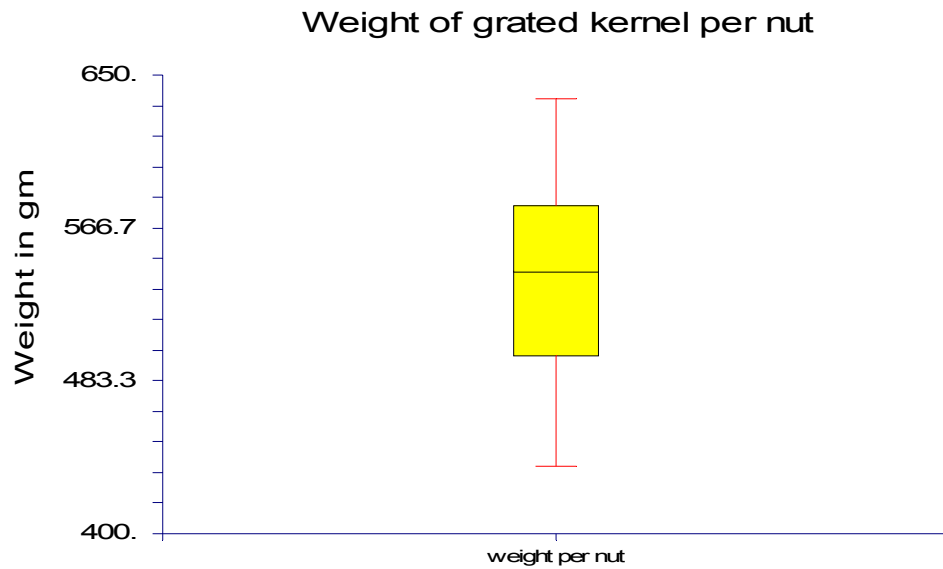
Full Assembly Drawing of the Deegan Press

VCO QUALITY

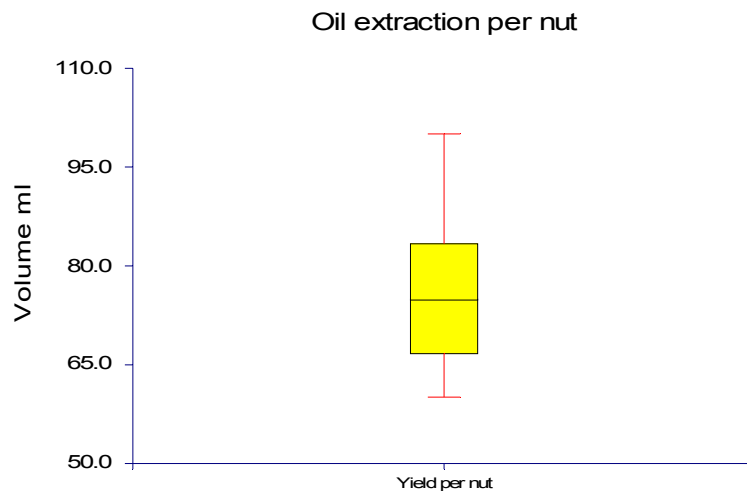
One batch of oil was tested at the National Test House, Eastern Region, Govt. of India, Ministry of Consumer Affairs, Kolkata. Two samples were tested, one of VCO, and another sample ("Normal" CO) where the grated coconut was heated slightly before the coconut milk was extracted. There is a slight difference between the two, as can be seen in the chart below:

TEST	UNIT	Normal CO	VCO
Colour	Lovibund Scale	0.300	0.100
Caprylic Acid	% by mass of fatty acid	3.342	3.588
Linoleic Acid	"	0.000	0.000
Capric Acid	"	2.86	3.38
Lauric Acid	"	44.348	45.859
Myristic Acid	"	22.490	22.500
Palmitic Acid	"	7.640	7.208
Stearic Acid	"	1.240	3.160
Oleic Acid	"	3.300	11.860

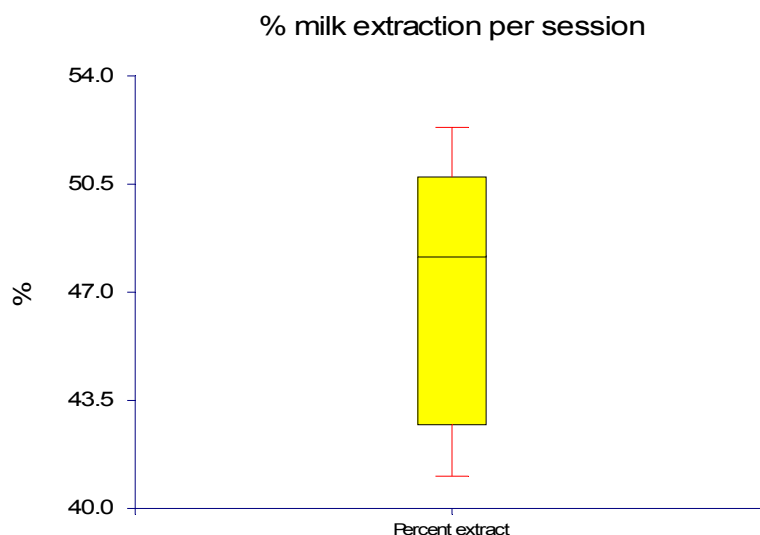
QUANTITIES EXTRACTED



An average 539 gms of grated kernel were extracted from each nut (n= 852).



An average of 75 ml of oil was extracted from each coconut after gaining some experience with the machine. (n= 852). This contrasts with 69 ml obtained from the first few trials, as the users were familiarising themselves with the machine.



An average of 47% extraction of coconut milk was extracted from the grated coconut, by weight, over 15 trials. The earliest, screw type press, gave an extraction percentage of 39%; The results with the latest press compare well with Press 2, which gave a yield of 45% milk.

Until now, a total of 90 litres of VCO have been manufactured. 40 litres were distributed as samples and for testing; A sample of 50 litres is being test marketed in Pondicherry, and buyers are very prepared to offer the price of ₹ 350 per litre.

ECONOMIC ANALYSIS

Traditionally, the Nicobaris did not have a money culture, so the sale of commodities for money is still a relatively alien concept. This was repeatedly raised by bureaucrats in Port Blair, who described them as 'lazy'. I have found absolutely no evidence of the above. Growers, especially the women, are very ready to participate in making VCO.

The current system: The grower supplies copra to the village cooperative (*Panum Hinango*) at ₹ 20/Kg. This money does not go to the grower, it goes to the *tuhet* (clan) captain. This local cooperative sells it to Ellen Hinango Ltd. (EHL) for ₹ 30/kg, essentially for transporting it across the island. EHL transports it to Port Blair and sells it to the traders there at the Minimum Support Price of ₹ 44.50. This translates to ₹ 4 per coconut.

It is pertinent to note that the *Panum Hinango* in each village is controlled by the captains of the village, and all the profits go to them. At the island level, the members of the tribal council constitute the board of EHL, which is advised by a few large coconut traders in Port Blair. The growers do not benefit from this arrangement.

The possibility here: The grated coconut is bought by Dosti Group (or whichever other agency gets involved) at ₹ 130 per litre of extracted oil. Dosti Group transports it to Port Blair, where it is sold for ₹ 150 per litre. Given that each coconut yields 75 ml of oil on average, this translates to ₹ 9.75 per litre.

There are several factors that affect this pricing. Once proper markets are developed, the Port Blair

price will increase. It is low at the moment since a ₹ 50 margin has been kept for transportation upto Chennai. The actual shipping cost is ₹ 30 per litre. This is exorbitant, and other arrangements need to be worked out. Also, the shipping charge from Car Nicobar to Port Blair has not been taken into consideration.

The transport linkage to Port Blair is informal, and the oil is carried in jerrycans up to Port Blair by well-wishers. During the course of this project, arrangements were being developed with the Andaman & Nicobar Island Forest Plantation Development Corporation Ltd. (ANIFPDC) to purchase and market this; however since the end of this project the Governing Board of ANIFPDC has decided that it will not enter any new business, so it has withdrawn. The Andaman & Nicobar Island Industrial Development Corporation (ANIIDCO) has been tasked by the Chief Secretary to provide the transport and marketing links, but has failed to do so. A verbal commitment by the Andaman & Nicobar Administration to buy a minimum of 3000 litres per month of VCO for local sale has also not been followed up.

TRAINING

At the end of the project a training workshop was held at Small Lapathy village on Car Nicobar. The Chief Guest was Mr. Vivek Rae, Chief Secretary, Andaman & Nicobar Administration. Also present were the Deputy Commissioner, Nicobar District, Mr. T. Sreekanth; the Development Commissioner, Mr. Tapan Mandal; the Director, Tourism, Mr. Binay Bhushan; the Director, Civil Supplies, Mr. N. Cherian; the Director, Youth Affairs, Mr. George Lucas; and the Director Agriculture, Dr. M.A. Salam.

The training workshop was organised by the Dosti Group, and a number of ladies from different villages was present. The presses were demonstrated, and the Chief Secretary gave verbal instructions that the Administration would buy 3000 litres of VCO a month to market in Port Blair.



Dosti member Irene Mary addresses the training workshop



Showing off the bottled VCO

FUTURE DIRECTIONS

Negotiations are going on informally now with potential bulk buyers. The biggest constraint is the transport of the oil from the Nicobars to Chennai. EHL currently ships the copra; however it has a monopoly on this. As a business it cannot be expected to support an initiative that will eat into its profits. The Andaman & Nicobar Administration have to ensure that this transportation mechanism is set in place and that the Deputy Commissioner plays a key role in ensuring that the whole system is run transparently.

Once VCO production reaches a certain minimum of about 10,000 litres per month, (which is achievable by the end of this year if bulk buyers are found), there is the possibility of processing the waste material in the production of the VCO from the coconut milk, into lowgrade coconut oil. This can be used as a diesel substitute. It will be cheaper than diesel, and given the perpetual shortages of diesel (this year there was a period of two weeks when there was no electricity because the diesel to run the generators was unavailable), will be of great economic benefit, as well as lowering the carbon footprint of the island.

CONSTRAINTS OF THIS PROJECT

Since no good maps are available of the area, and no ground surveys of village boundaries have been done, it is difficult to estimate the likely longterm impact of this project.

The current dispensation in the Nicobars ensures that the lions share of all income from coconuts goes to the captains, both at the village and at the Tribal Council level. Therefore, opposition to this project would be expected from the captains once its economic effects start being felt.

The equipment budget was insufficient to allow experimentation. The reduced travel budget meant that fewer trips than required were made. The marketing linkages could not be finalised during the course of the project, and work is still being done on this.

ACKNOWLEDGEMENTS

This project owes its genesis to a conversation with Dr. Ravi Sankaran. He arranged for the initial prototypes to be built, and spent time in the early phases in the Nicobars to ensure this projects' success. He also prevented me from giving up when things became hard. It is tragic that he is not around to see the outcome.

This project was funded by the SEED division of the Department of Science & Technology. My special thanks to Dr. Vinita Sharma for her help and support throughout this project. I would also like to thank Mr. Rajinder Singh of SEED for his patience in guiding me through the various administrative requirements.

In Port Blair, Mr. Taroon Coomar, MD, ANIFPDC helped in more ways than can be enumerated. Mr. Vivek Rae cut through the bureaucratic maze for me. Mr. T. Sreekanth helped with many useful discussions on how to take the project forward. Mr. Udai Singh helped unstintingly with the logistics in spite of his skepticism about the whole project. Mr. Dharma Sundaray, TISS, became involved at an

early stage and helped with coordinating with the Dosti Group.

In Car Nicobar, the Chief Captain, Mr. Aberdeen Blair wholeheartedly encouraged this project and got the Dosti Group involved. The former Industries Promotion Officer, Mr. Ahmed Ali arranged demonstrations and provided introductions with the Tribal Council. Greatheart provided logistic assistance as well as good company. Irene Mary and all the other members of the Dosti Group contributed heart and soul to this project.

I would also like to thank Mr. Vishwapati Trivedi, Ms. Pratibha Pande, Mr. Ajai Saxena, Mr. Taj Hassan, Ms. Tasneem Khan, Saw John and Mr. Manish Chandi for their constant encouragement and support. Last but definitely not least, I thank my colleagues in FERAL, especially Ravi Bhalla, for their constant support.

A handwritten signature in black ink, appearing to read 'Rauf Ali', with a stylized, cursive script.

Rauf Ali
Investigator

Date: October 23, 2010