

Technology for All?

A History Teacher-Educator's View of the Introduction of Simple Solar Ovens in Lombok, Indonesia

Abstract

The Earthwatch Institute, an international conservation group, has recently been allocated funding by the Millennium Commission, to send 500 teachers on its projects. Peter D'Sena, a historian and teacher-educator, joined the 'Indonesian Sun Cooking' team working with people in Lombok to make simple solar ovens. He knew that solar energy had to be a 'good thing', but traditional values, social structures and economic aspirations have not always given technology and conservation an easy ride. This report gives an account of the implementation of this technology in its socio-cultural context and, in doing so, intends to provide an insight into the potential benefits of 'eco-tourism' of this kind for primary and secondary school teachers.

Technological innovation and change is not always welcomed by everyone. Moreover, some societies have viewed the negative by-products of industrial processes, such as pollution, occupational health risks and environmental degradation, as necessary evils. This, at least, is what the history of Britain in the 18th and 19th Centuries tells us. Not that I was expecting to meet machine-breakers and a host of people inured to the destruction of the rainforests when I went to Lombok. It did occur to me, however, that while some simple, yet powerful, scientific and economic arguments might work in favour of the successful introduction of solar technology, some social structures and entrenched cultural values might militate against it.

On paper, though, the signs are good: Lombok, Bali's eastern neighbour, is only 8° south of the equator and so – haze permitting – there is enough solar radiation to make this technology viable for about half the year; plus, there is an acknowledgement that change is endemic. In the people we met (though they were hardly a random sample, I suppose) there seemed to be a consensus of agreement and open-mindedness about the potential benefits of tourism, trade and 'modernity'. As a consequence, Lombok, which is currently sold as 'only 20 minutes (and some say 20 years) from Bali', is unlikely, for better or worse, to remain that way for long. Though in emulating the economic prosperity of their neighbour through attracting more tourists, there will, inevitably, be an environmental and cultural cost to pay.

There are other dimensions to the broader context of this Earthwatch project. National statistics produced by the Indonesian government have given a clear illustration for the need to introduce alternative forms of energy. Of a total population of 182 million in Indonesia, about 40% (or 10.44 million

families) use charcoal and fuelwood for cooking. The frightening consequence is, if one assumes that 1kg of wood is used for each meal and each family cooks twice a day, that 7.59 billion kgs of fuelwood is needed each year! Whatever the exactitudes, that's a lot of trees, a lot of smoke in people's lungs, a lot of time collecting wood and, more especially, a lot of small branches of trees in young secondary forests being destroyed. The implications are enormous, and not made better if you consider adding the amount of wood used annually by industrial processes. Conservation and economic arguments have an obvious link: wood costs money and 10 pence a day for wood is a great deal when the daily family income may only be 40 to 60 pence (about \$1, US). To the vast number of people in the villages, who use the classic double stove, saving the equivalent of a day's wage a week would make a major difference. As it stands, delicious as it smelt, chicken head stew is the most that some can afford, while the smoke produced by these stoves also takes its toll in terms of lung complaints. The centuries-old tradition and habit of burning wood might, then, quickly fall prey to both public health and domestic economy concerns.

Another significant factor is that of the many clearly defined gender divisions of labour. Many women's occupations – weaving and making pottery, for instance – can, importantly, be carried out in the home and make child-rearing and cooking possible. At home, therefore, cooking and more generally the preparation of food has unquestionably become women's work. In many ways, the success of the project depends on exploiting (and perhaps entrenching) the relative immobility of these domestic workers as solar ovens need regular attention: opening, closing, turning and so on. For some this may pose a philosophical dilemma because even though technology such as this supports existing socio-cultural norms that emphasise the pre-eminence of Muslim forms of masculinity and its freedoms, these are norms which fly in the face of more global trends associated with women and opportunity in this century.

The arrival of the Earthwatch team of 12, which included two Swedes there to make a documentary for STV's Ecology Unit, was very formally heralded by a three hour long ceremony. If the importance given to any project can be measured in bureaucrats and speeches, then we had good reason to feel encouraged! Certainly, our 'Principal Investigator', Herliyani Suharto, was well aware that the project's success is highly dependent on its contacts with Regency-based civil servants. In practical terms it is they who

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Figure 1 Cutting corners: measuring and sawing for two ovens at once.
Figure 2 The oven interior, showing the aluminium before it is sprayed.



liaise with local groups and recruit individuals and, importantly, continue to provide a notional and actual framework of authority during and after the ovens' construction. Indeed, one critical example is that of their role in the selection process. With men playing little or no part in cooking the involvement of women in the manufacturing process is imperative, even though construction of that kind generally falls into the realm of 'men's work'. Regency officials addressed this by targeting women's groups; as a result we were to find a good mixture of women, lesser local government workers and university undergraduates working beside us. Participation of this kind was intended to both create and strengthen a sense of ownership and technical understanding not only in the recipients, but also more generally in the wider community as the ovens took shape in the following week.

At this stage – the starting point – we were all left with simple questions and a book of technical drawings to puzzle over. What, for instance, did 'Matahari' have to do with it? (It turned out to mean 'Solar Oven'!) How can you make a Matahari using only local materials costing about \$25 (US) and simple tools? How do you get two solar ovens out of three pieces of plywood, four pieces of glass, two mirrors and some aluminium? How do you minimise the amount of sawing, very necessary in 35°C temperatures? How do four people speaking different languages get on with this task together? Nine groups, expecting to make two ovens each, would find answers to these questions before the week was out.

It is funny how five days of measuring, sawing, puzzling, gluing, nailing, re-measuring, sweating and sometimes getting a little irritable can enhance the creative faculties and develop the ability to cut corners. The dimensions of one oven were marked out and the plywood for the other tacked underneath: measuring and sawing halved! There were, however, no short-cuts to some procedures. Making the oven doors and more importantly, making them fit, took a whole day. As the cabinet took shape, each group found a tale of woe to tell. Essentially, we were building a small box-shaped wooden greenhouse and using a moveable mirror placed inside the lid to reflect sunlight into a U-shaped oven area. The interior, the aluminium sprayed black to be more absorbent, was surrounded by cavities insulated with cotton fibres collected from the pods of local trees. This is the fourth generation of oven and at 70cm square, 33cm deep and 17kg in weight it is small enough to be wheeled about, yet large enough to provide



Figure 3 Making the main cabinet of the oven.

for a family's needs (the oven capacity itself is best compared with that of a large microwave oven). Once completed, a day of field-testing ensued. The ovens were taken outside at 8 am and by 10 am 100°C was reached. By midday, temperatures of almost 200°C were recorded; and that level of heat was maintained for almost four hours. The team was jubilant as the previous high of 179°C was reached as long ago as 1989 with an earlier generation of oven which was both more expensive to produce and heavier.

For this technology, of course, the proof of the pudding is in the eating; and a final day of field-testing, using different foods, was to put this adage to a real test. Simple metal containers were used to cook fish dishes, chicken curries, desserts and the like, all local delicacies prepared by the ovens' recipients. Guidelines for maintaining a dish's moisture at the equivalent of Gas Mark 4 and optimum cooking times were given and followed. There proved to be enough solar radiation and insulation to use each oven for at least four consecutive episodes of cooking; not so much a food tasting in store then, more a feast!

Before eating there was a high-profile closing ceremony, the speech-making led this time by the Principal Secretary to the Minister for Women's Issues. Her status lent weight to the occasion and for the 100 or so present this was complemented by the very high quality of the food. It is one thing to raise public awareness, another to convince them: this was convincing. Again, after the food, ceremony was used to publicise the idea: this time in an evening of singing, dancing, theatre, stick-fighting, karaoke and, of course, more speech-making!



Figure 4 Field testing of completed solar ovens.

Figure 5 A school party, finding out about the ovens' construction.



For further information about the organisation of the project and its aims contact The Earthwatch Institute, 57 Woodstock Road, Oxford, OX2 6HJ. (Tel. 01865 311600.)

References

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We learned that the President, whoever that would be after Suharto, would attend the Project's climax in a few months time: the hoped-for spin-off, being that the commercialisation of the idea in the mind of the community, should reach the much larger sphere of a national audience.

The dissemination of information and the popularisation of the overall idea was given priority throughout. During the manufacturing process teenage schoolchildren and some undergraduates, using worksheets, were encouraged to investigate the mechanics of the oven and take the opportunity to practice their English language skills. The film makers, meanwhile, have enough material to produce a mini-series; and certainly enough to make a documentary for future fund raising and educational purposes both in Indonesia and the West. It is the participants, however, and the recipients most especially who are the initial, effective ambassadors of the concept. In travelling through Lombok it soon became apparent from their style of dress, education and jobs that none of our co-workers were from the poorest in society like those working in the traditional villages or along the seashore. For a while we were puzzled why these people were not targeted, though logic told us that a strong reason for linking with a different social class is that the dissemination of ideas and the fostering of technology is probably far more effective when placed in society's middle ground. Ultimately, the hope must be that if solar ovens become more widely available then they should percolate through to those most in need: the seaweed pickers on the beach who earn pennies and the

potters and weavers in remote villages who earn little more.

At the end of the project, travelling west towards the capital of Lombok, Mataram, we visited earlier recipients, assessing the degree of usage and the relative effectiveness of the older ovens which have an estimated 5 year life span. Here, it proved impossible to gauge with certainty the honesty and accuracy of responses: our strong suspicion was that a threat of 'use it or lose it' helped users to produce positive statements. However, when we found, for example that the mirror was removed for use in the bathroom or the cabinet had been transformed, through inactivity, into a glorified coffee table, the situation was clear. In these cases, the 'non-user' was too busy at a place of work outside the home to make this technology viable and found it easier and presumably affordable to buy benzene for a more modern stove. The overall impression, however, was that the general principles and the project in particular are worthy of wide-ranging political and economic support. Perhaps in this there are lessons that can be learned from history. In looking to the future, politicians would do well to remember that in pre-industrial Britain there were three vital elements which together transformed the nation: machines, money and people. Lombok proved that the machines can be built and also that a large number of people are willing – two out of three so far! However, just as in the 18th Century, a 'financial revolution' of investment is necessary if this technology is to make the crucial leap that will make any real difference. Let's hope that happens before the price we all have to pay becomes too great.