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From Lorena to a Mountain of Fire

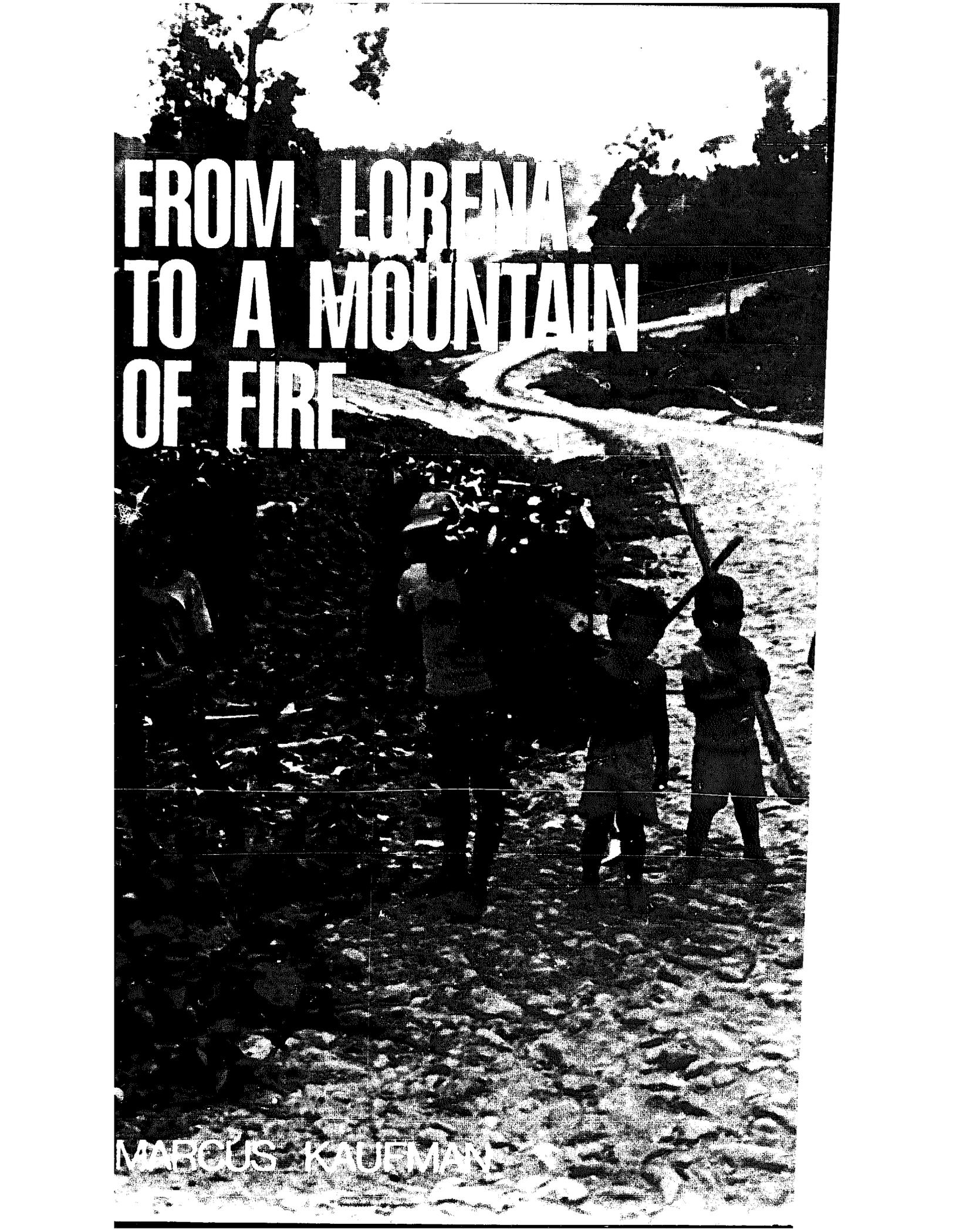
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# FROM LORENA TO A MOUNTAIN OF FIRE

MARCUS KAUFMAN

# **From Lorena to a Mountain of Fire**

*A case study of Yayasan Dian Desa's  
fuel efficient stove program  
(1978 – 1983)*

**MARCUS KAUFMAN**



Yayasan Dian Desa is a private, Appropriate Technology Development Foundation located in Central Java, the Republic of Indonesia. This case study of the Foundation's program for the development of improved wood burning cook stove technologies was made possible through the support and co-operation of The Asia Foundation, a U.S. based, non-profit organization. Reproduction of any or all parts of this publication is absolutely okay.

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**Yogyakarta, Indonesia**  
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**Cover design and layout : Haryoto**

**"Piece by piece, the rain forests and tropical jungles of the world are disappearing. Industry, agriculture and construction have all played a part – but most persistent of all have been the world's two billion wood burning cooks."**

**Ariyanto Soedjarwo**

**I**N DEVELOPING COUNTRIES throughout the Third World, people are struggling with a problem - a problem which threatens to grow far worse before it gets even a little better. It's the "twin curse" - firewood scarcity and forest depletion. A situation in part created by local tree felling for cooking, heating and agriculture, now made worse by accelerated industrial, commercial and urban exploitation of the world's rain forests and trees.

Firewood is *the* age old fuel of rural people. Given small population densities and intelligent use, firewood can represent a viable and renewable energy resource for domestic cooking and heating needs. Unfortunately, in many wood-fuel dependent communities, the above two criteria are no longer being met, and wood-fuel cutting for sale to towns and industry has thrown any equilibrium which may have existed at one time, hopelessly out of balance.

In the Republic of Indonesia, energy use is expected to triple or even quadruple by the year 2000,<sup>1</sup> and while fossil fuels will necessarily play an ever-increasing role in satisfying the domestic energy needs of Indonesia's growing population, it is the remaining forests and jungles of this island nation which will bear much of the visible burden. As government and private reforestation programs continue to have but a limited impact on the problem, it is not hard to imagine a day when this lush, tropical

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<sup>1</sup>Sumitro Djojohadikusomo, 1977, Indonesia Dalam Perkembangan Dunia, Kini dan Masa Datang, LP3ES, hal. 41.

setting will, once and for all, be denuded of its primary jungles and forests. This sad day will wreak immediate grief on Indonesia's people, both rural and urban, as victims of declining soil fertility, massive soil erosion and ever more frequent flooding will attest.



*Transmigration site in East Kalimantan: Another aspect of the problem.*

## **Think fast!**

What solutions are available to help stem this rising tide of wood consumption and subsequent deforestation? Do the so-called alternative energies of wind, solar and bio-gas hold the answer? WHAT CONCRETE STEPS WOULD YOU TAKE TO ADDRESS THE PROBLEM IN INDONESIA?

Consider that whatever solution or solutions you select will have to address a multi-faceted problem, i.e. that of long established rural and urban cooking and heating patterns, rural poverty and its links to wood cutting, the wide-scale use of wood fuel by industry (batik, brick, tofu, palm sugar, etc.) commercial cutting of trees for construction and charcoal production, the destruction of forests through agricultural and resettlement programs, and of course the multiple social, economic, cultural and educational factors which will certainly come into play if, by chance, you choose to introduce some new technology. Will you outlaw the cutting of trees? Opt for massive reforestation? Develop new synthetic fuels and building materials? Think about it.

## Mr. H. Singer

In 1960, Mr. H. Singer of the Central Forestry Association of Switzerland began to promote what he felt, was the answer to Indonesia's (and the world's) growing deforestation crisis.<sup>2</sup> His approach, which centered on improving the fuel efficiency of home cook stoves (thereby lessening the impact of wood foraging on the world's forest and trees) received little attention at the time. But Mr. Singer's research, stove designs, wood seasoning tips and other practical lessons, represent one of the first attempts to address the problem of deforestation at one of its sources, the inefficient open cook stoves in the kitchens of the world's rural population.

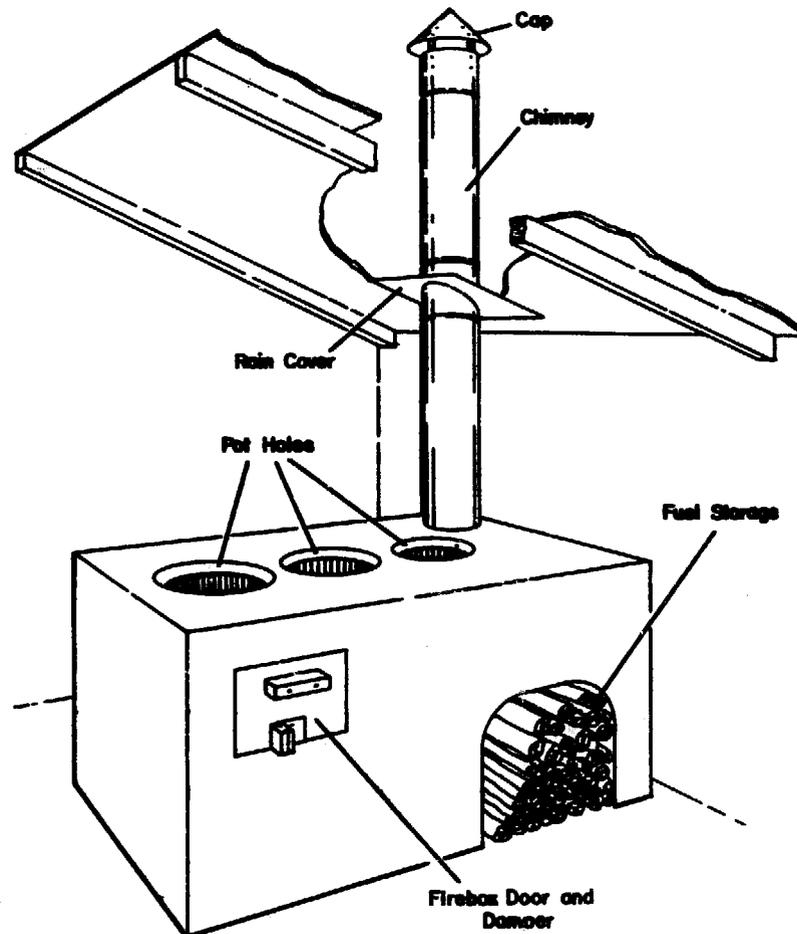
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<sup>2</sup>H. Singer, 1960, Tungku dan Sifat Sifat Teknis Pembakaran Dari Kayu - Bakar, "Masalah Bangunan" No. 2.

# The Singer Stove

Representing an array of Indian and European design concepts, the original Singer Stove is the two-ton Father of the wood conserving cook stove movement in Indonesia. Eclipsed by many more recent designs, the Singer Stove nevertheless continues to be promoted by stove practitioners in this Third World country.

## SINGER STOVE



From Wood Conserving Cook Stoves; Volunteers In Technical Assistance, 1980

Now, some twenty years later, Mr. Singer's work has become part of a growing international movement to design, promote, test and disseminate fuel efficient cook stove technologies in response to the problem of world-wide deforestation.

"improving the fuel efficiency of local cook stoves by 50% is like cutting the number of cooks and wood foragers in half...."

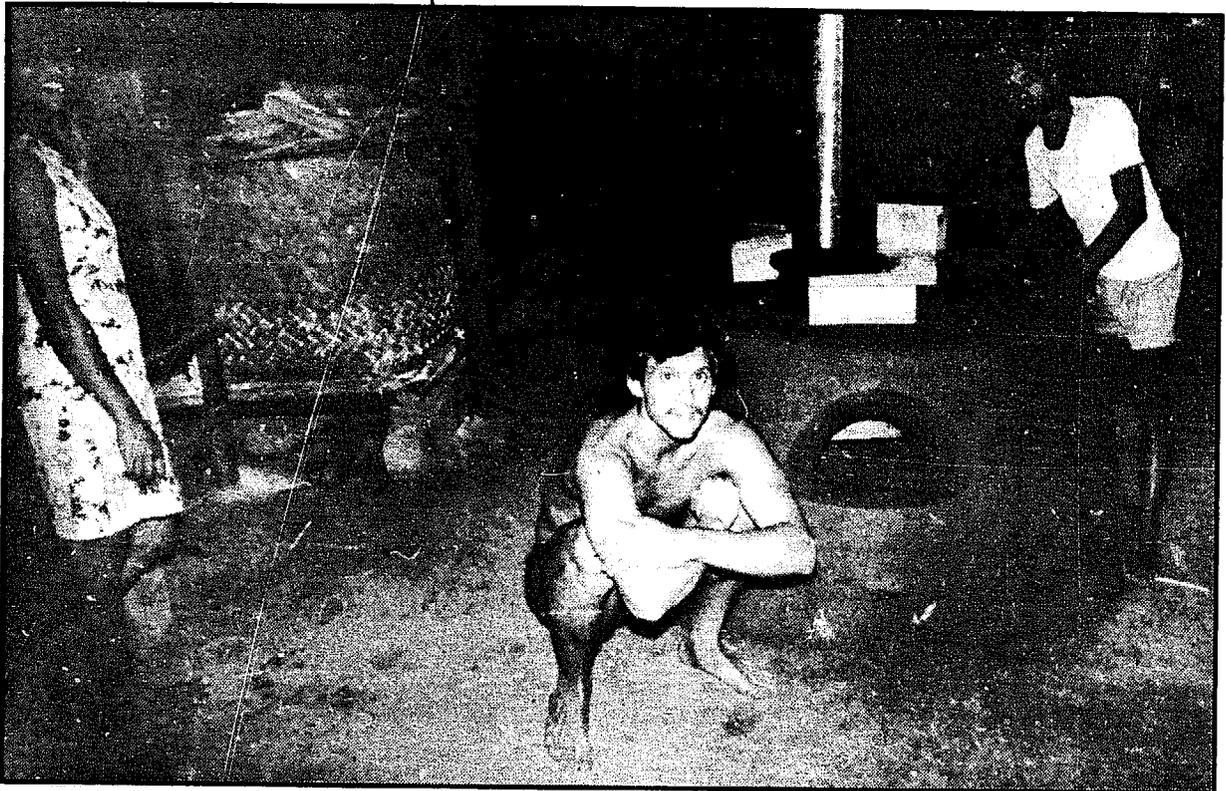
## Yayasan Dian Desa

One organization very active in promoting fuel efficient cook stoves at the rural level is Yayasan Dian Desa (The Village Lamp Foundation). Yayasan Dian Desa (YDD) is a locally run, non-government organization which points to the "self-help" nature of its innovative village-based projects as one reason for the foundation's relative success in Indonesian rural development. YDD's project activities cover a wide range: from water supply and small scale industry development, to training, social research and the publication of technical manuals and periodicals.

In 1978, with the help of an American volunteer from California's Volunteers in Asia, YDD embarked on Indonesia's most major foray into the research, development and promotion of fuel efficient cook stove technologies. YDD's approach, like Mr. Singer's and many more recent stove promoters, was based on the development of *owner-built stoves*, and their introduction and dissemination at the village level via stove project field workers and trained, local cadre.

Now, some five years after the initial pilot project began, YDD's "Stove Section" staff have revised their original approach

to the problem, and in so doing have raised some important questions regarding the extent to which "owner-built fuel efficient stoves" can contribute towards solving Indonesia's deforestation problem. The following is a brief case study of YDD's stove program, from its inception in 1978, up to and including the program's present status in early 1983.



*Don Flickinger in 1978.*

## **July 1978**

Don Flickinger (a young VIA volunteer, otherwise known as "Mr. Flick") arrived at YDD late one afternoon in July, 1978. No one at YDD really had any special plans for him, other than making him feel at home; so Mr. Flick was accordingly offered a meal, a mat, and a piece of the floor in YDD's all purpose office-

workshop-dormitory. In the weeks following his arrival, Mr. Flick involved himself in various local activities, including bee keeping, mushroom cultivation and experiments with snakes. Then one day, all of YDD was surprised to find Mr. Flick, stripped to the waist, pulverizing rock-hard lumps of clay in front of the office. "What *are* you doing, Mr. Flick?", they asked. "Building a stove," he replied somewhat stoically.

Well, no one had ever seen a stove "built" in quite this manner before, so for the most part, everyone just stood back and left him to it. "I helped him find some good sand," recalls Edwin, the head of YDD's publication section. "I don't know where he got the cow dung though."

Mr. Flick was building a "LORENA" stove and having a hard time of it too. "LORENA" are massive, sand-clay stoves first developed at the Estacion Experimental Chiqui in Guatamala (see box). The exact recipe of sand, clay and other materials used in the Lorena mix varies with each stove, depending on the binding quality of the clay, amount of organic silt in the sand, and so on. Mr. Flick never did quite hit upon the right mixture or shape for this, the first LORENA in Indonesia. Recalls Edwin: "He was so mad! He kept reworking the mix, but the stove body kept developing big cracks right down the middle. The cracks would grow and grow and then the whole thing would split and fall to pieces on the floor. We (the YDD staff) were full of suggestions by this point, and advised him to do away with the outwardly sloping walls. Pak Rembun suggested adding a little cement."

Mr. Flick's next attempt to build a Lorena was at the 8th Annual International Forestry Conference, Balai Sidang, Jakarta. Together with another VIA volunteer and with the support of

"BUTSI" (the Indonesian Government's domestic volunteer corp), Mr. Flick attempted a slightly different design of Lorena stove; this time with inwardly sloping walls and a carefully tested mixture of pure clean clay and construction quality sand. All told, this second Lorena took almost a week to complete, but the finished product was a reasonable facsimile of a fuel efficient stove. Recalls Mr. Flick's co-worker: "The conference participants (at least those who managed to make their way outside of the air-conditioned conference hall) were certainly interested and impressed. We were passing out leaflets about the stove and serving hot tea, rice and steamed cassava - all cooked simultaneously on the Lorena with just a few scraps of wood. The chainsaw and tractor displays also drew some pretty big crowds though."

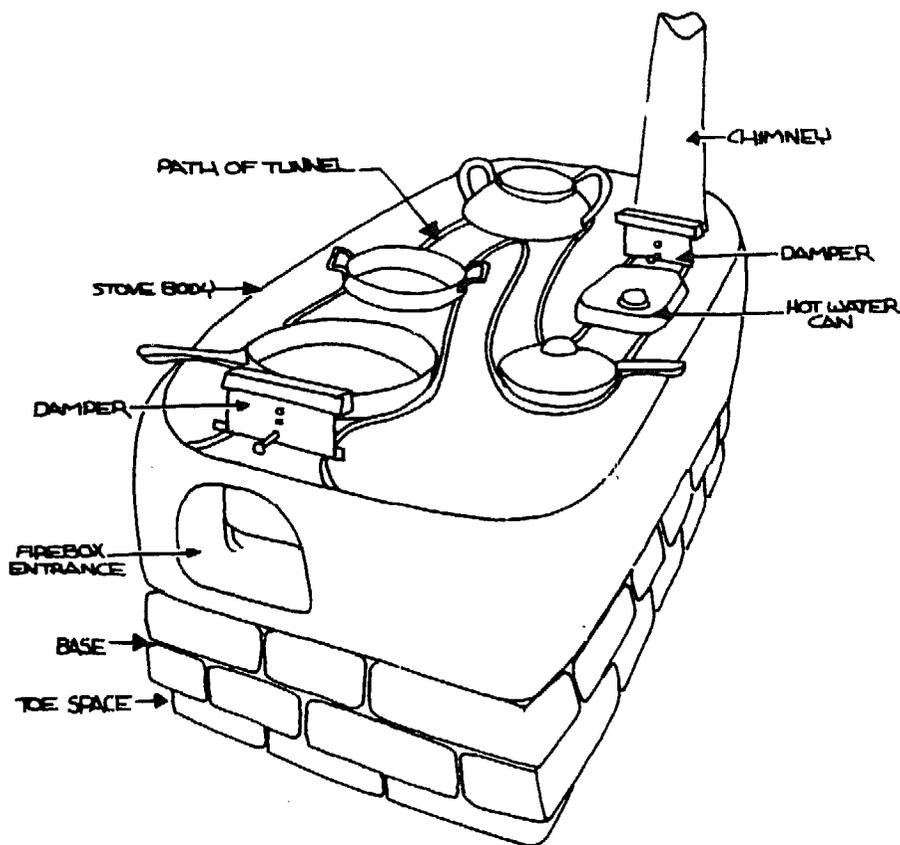


*Marcus Kaufman: Outside the air-conditioned conference hall.*

# The Lorena Stove

The stove is built from a mixture of sand and clay (sometimes also adding wood ash and cow dung). This mixture is called *Lorena*, from the Spanish - *lodo* (mud) and *arena* (sand). The Lorena is applied in layers to form a solid block. The chimney hole, cooking ports, tunnels and firebox are then excavated before the Lorena hardens.

Construction takes from six hours to several days, depending on the size of the stove, weather conditions and the skill of the builder.



From Wood Conserving Cook Stove; Volunteers in Technical Assistance, 1980.

Further stove experimentation was conducted by Mr. Flick in various locations in Java and Bali. These first stoves all had several things in common: they were extremely large - waist high with four to six cooking ports; they all took a considerable length of time to build; they all suffered from varying degrees of cracking; and their relative fuel efficiency compared to local stoves was a totally unknown factor. "We kept telling people that these stoves would use half the normal amount of fuel," recalls Mr. Flick, "but really at that point in time we were just repeating what we had read or had been told." In fact, it wasn't until the Lorena stoves were already being actively promoted in several villages that Mr. Flick even attempted any controlled efficiency testing. He explains: "In those early months, we were more concerned with just learning how to build the stoves properly than we were with conducting efficiency tests. In any case, our initial pilot project was so low budget that a program of efficiency testing would have been like buying a \$20 leash for a \$5 monkey."

## **Ngestirejo**

The "initial pilot project" began in early 1979 when Ir. Anton Soedjarwo (YDD's Director) asked Mr. Flick to consider introducing the Lorena stove to a dry, mountain village where YDD was already conducting a number of water supply projects. The village, Ngestirejo, is located in the coastal hills southeast of Yogyakarta, in an administrative and geographic area known as Gunung Kidul (the "Southern Mountain"). In terms of relative need, Gunung Kidul is an ideal location for both regreening efforts and wood conserving stoves. The land has been largely deforested (occu-



*Moma and Popa in the kitchen.*

pying Japanese forces stripped the region of its teak forests during World War II, and local cutting of wood for home use and for sale has since finished the job. Subsequent soil erosion has left the terrain parched and dry and greatly devoid of nutrients and organic humus). Paradoxically, scattered pockets of land do exist which are replete with coconut, bamboo, leucena, jackfruit, koper and mlungding trees. It is these solitary oases, along with assorted brush woods and the ever present tropical ground cover, which constitute both the wood fuel resources of Gunung Kidul and the region's meager water shed.

Besides the basically straightforward reason that Gunung Kidul ( due to its advanced deforestation) would make an ideal site for the promotion of improved cook stoves, several other factors can be sited in support of YDD's selection of the area as the site for its pilot, fuel efficient stove project. Most important of which is that YDD's reputation in the Tepus region of Gunung Kidul was already becoming quite good; in part due to a highly successful rain water catchment tank project which was being conducted there by the foundation.<sup>3</sup> YDD's planners hoped that the villagers' growing trust and confidence in YDD would help speed the acceptance and utilization of the new stoves. An additional incentive came from numerous dialogues with local village leaders in which reference was repeatedly made to village energy needs and the increasing difficulty of procuring sufficient quantities of good quality firewood. Hence, the development and promotion of improved fuel efficient stoves was felt to

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<sup>3</sup> See: From Ferro to Bamboo: A Case Study and Technical Manual to Yayasan Dian Desa's Rain Water Catchment Tank Project, Marcus Kaurman, et al, YDD, 1983.

be a reasonable and direct response to the villager's own expressed needs.

Mr. Flick began his work in the Kelurahan (hamlet) of Ngestirejo, Kecamatan (sub-district) of Tepus - together with four



*Ready to go: An experimental Lorena stove.*

local residents who had expressed interest in the project - in the dry season of 1978. As is usual with the introduction of any new "development related" technology at the village level in Java, the Lurah (village head) was at the top of the list of recipients. Hence a large, six-port Lorena stove was constructed in the Lurah's ample kitchen, using locally dug clay and crushed limestone as a substitute aggregate. (As was to be the case again and again, sand, one of the principal ingredients of the Lorena stove, was not available locally and was quite expensive



*Cooking four things at once on a big Lorena.*

when trucked in from outside the region). With the construction of several other large Lorena stoves (in the homes of other village leaders) and numerous smaller ones (in the homes of smaller farm families) the process of promoting the stoves in Ngestirejo truly began.

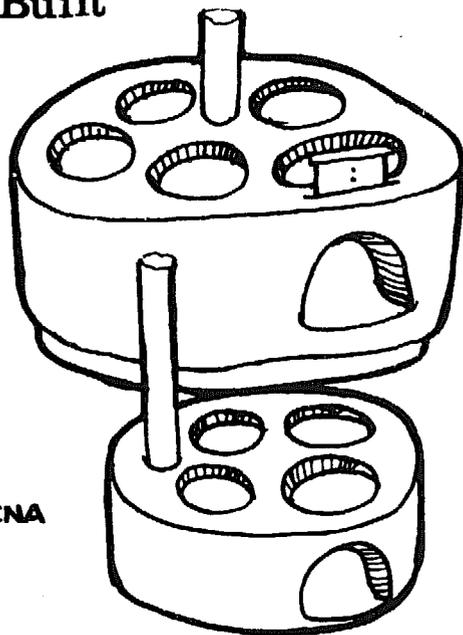
Early on in the work, it became apparent that one of Mr. Flick's co-workers, Pak Roharjo, was destined to play an important and principal role in Ngestirejo's stove program. "Pak Raharjo quickly grasped the basic principles behind the stoves," explains Mr. Flick. "He also quickly realized that the Lorena stove was in no way a fixed design, but rather a concept which

could and should be modified to meet local standards and conditions. Without Pak Raharjo, the project could never have progressed as far as it did, and my volunteer experience would have been nowhere near as meaningful and fulfilling. Pak Raharjo was the boss in Ngestirejo, not I."

With the ascendancy of Pak Raharjo to a position of leadership within the "stove team", it wasn't long before the other members also began to fulfill specific roles and establish a regimen or pattern of working together. In short, Pak Raharjo became the unquestioned "local motor" in the project. He, along with Mr. Flick, was responsible for controlling stove quality and experimenting with new designs. Sunarto, another of the key local "cadre", took on the role of "general assistant" and was responsible for raw materials procurement and the selection of recipient families. The two other local staff became the "project mules", constructing, along with the heads of the various households, the vast majority of new stoves. Yayasan Dian Desa itself was responsible for outside technical assistance, and the supply of the zinc sheet metal used for chimneys.

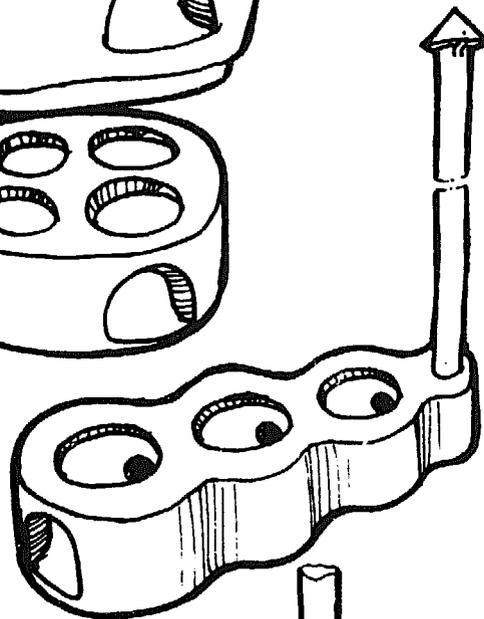
Throughout 1979, hundreds of stoves were constructed, both in Ngestirejo and in other bordering hamlets in the Tepus district. A wide range of problems were overcome by the stove team, including technical problems of cracking, inappropriateness of design and continually poor availability of raw materials. The Lorena stove underwent many radical changes in size, function, name and appearance from the original "large Lorena of Guatemala fame" (see box), and overall the "appropriateness" of the stoves improved with each new modification. The impetus for this continued transformation of the stoves design did not

# The 'Owner Built' Stoves

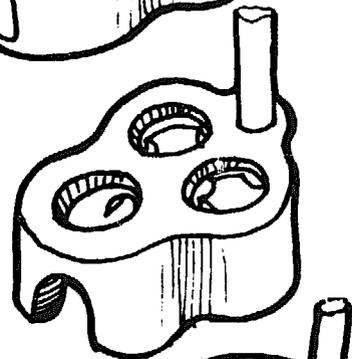


THE ORIGINAL  
"BIG" LORENA

THE LITTLE  
"EGG" LORENA

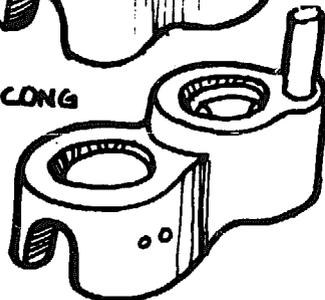


THE GITAR STOVE

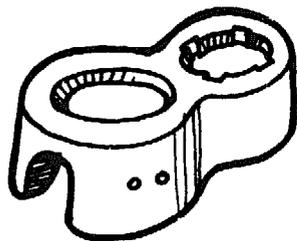


THE KATESAN

THE MENCONG



THE "CHIMNEYLESS"  
LOWON





*A new "Katesan" style Lorena stove (left) and a prototype "Mencong."*

however originate in YDD's laboratory. In fact the majority of these changes were made as a result of the stove team's growing understanding of, and appreciation for, the villagers own needs as regards wood burning stoves. States Mr. Flick : "The more time we spent in rural kitchens, the more we realized that other factors besides fuel-efficiency would have to be considered if we were ever going to design a stove the people would accept; speed of cooking, stove size and height, appearance, durability - all these things turned out to be much more important to folks in Gunung Kidul than how much time their kids had to spend foraging for scraps of wood".

It is worthy of note that this "first stage" in the pilot project was implemented with an extremely low budget - the only expense being a small monthly honorarium for the local cadre, Mr. Flick's transportation and food costs, and the expense of the sheet metal for chimneys (all other materials being procured locally). The project's scope was correspondingly small, which is perhaps one of the principal reasons technical quality remained high throughout and the stove team's responsiveness to local requests for modification in design was timely and thorough.

In late 1979, the Gunung Kidul Stove Project entered what conceivably could be referred to as "Stage II". Stage II was characterized by repeated attempts to widen the impact of the project through training programs for Government field workers and volunteers, and as well, village residents. It is somewhat to YDD's credit (although this is certainly debatable) that they instigated very few of these training sessions. For the most part, the pressure to quickly expand the scope of the project through "kilat" (lightning) training programs came from upper level Government officials who wished to see "development" take place quickly and in as large an area as possible.

Thus, in Stage II we say goodbye to the careful quality control which was the standard of the initial Ngestirejo project, and hello to thousands of new Lorena stoves built in the "asal jadi" school of thought ("asal jadi" is a particular Indonesian concept which basically means, "as long as you can count it, it's good"). Pak Raharjo (a prolific report writer) repeatedly described the poor results of the many kilat trainings he was asked to conduct. In a monthly progress report dated January, 1980, he states: "This month I was asked to train six TKS (volunteer field workers) from Patuk district. We had one day to teach both

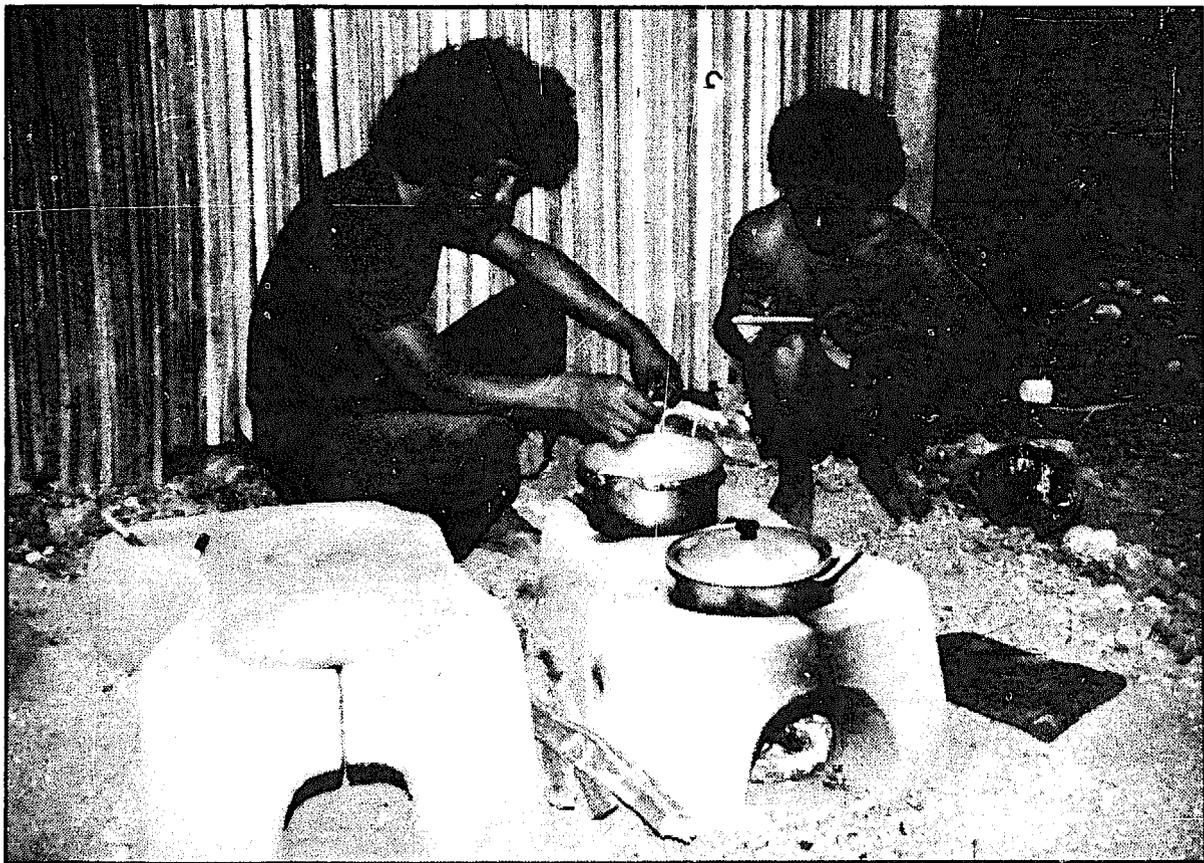
theory and provide hands-on practice in 'Katesan' style stove construction. After the training, the TKS returned to Patuk and built four Katesan stoves in the homes of poor families. I was invited to visit Patuk and I saw that the stoves had been improperly built, were all badly cracked, and were not being used by the poor families..."



*A scene from a one-day "kilat" training session.*

In late 1979, Mr. Flick, along with Stephen Joseph of the Intermediate Technology Development Group (ITDG), conducted efficiency testing on a large number of the stoves produced by field workers "trained" in Lorena stove construction. Their findings show that a large portion of the new stoves were no more fuel efficient than the traditional stoves they replaced; and in some cases were even less efficient and certainly far less "appropriate" given all the time and trouble it took to build them.

So from this point on, the stove project team would expend considerable energy in attempts to design the "perfect" training methodology; a methodology which could guarantee the trans-



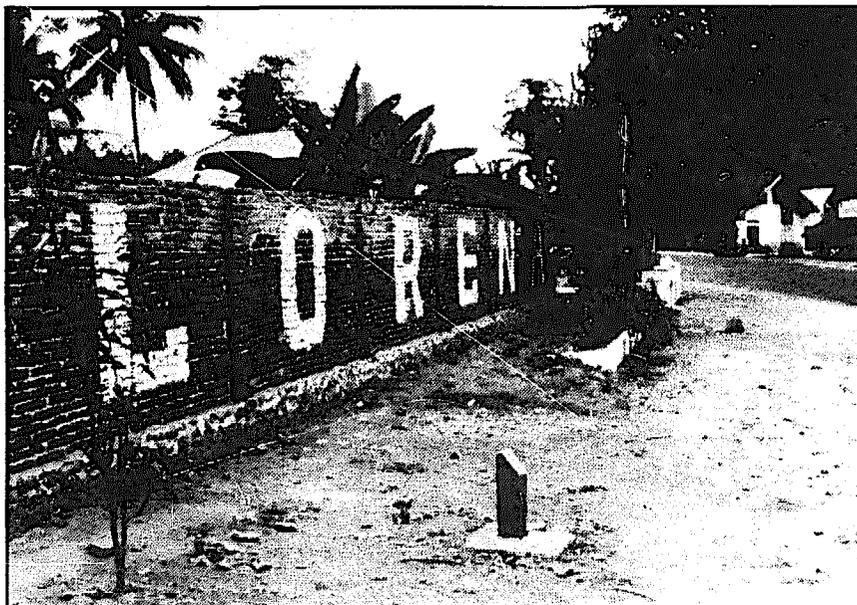
*Fuel efficiency testing in the lab.*



# Krasak

YDD's Director, Ir. Anton Soedjarwo, had for quite some time encouraged Mr. Flick to expand the stove program to encompass a village in the mountainous district of Wonosobo called Krasak. Mr. Flick had, for his part, resisted these requests preferring to keep the program on what he termed, "a small, managable scale." However one day, on a trip to Banjar Negara, Mr. Flick stopped in Krasak and paid a call on the village's young Lurah, Pak Rojai.

Pak Rojai is in every sense of the expression, a child of the village. But unlike the majority of his childhood friends, he, through his own efforts, was able to leave Krasak while still quite young and attend technical high school and college in the city of Yogyakarta. Not content to use his education merely for his own advancement, Pak Rojai returned to Krasak and has ever since played an important role in the development of his childhood home (see box).



*"The bus drivers all know where to stop."*

Mr. Flick was so taken by the enthusiasm of Pak Rojai (and he admits, by the excellent cooking of Pak Rojai's wife) that he decided to stay a few days and introduce Pak Rojai to the Lorena stove. On this first visit he and Pak Rojai built a single "Katesan" style Lorena. On a subsequent visit, Mr. Flick attempted to teach Pak Rojai a few other styles, for example the newly developed guitar-shaped Lorena. But for better or worse, Pak Rojai was already thoroughly sold on the compact Katesan, and would accept no substitutes. "Not only that," states Mr. Flick, "he was confident he already knew just about everything there was to know about Katesan style stoves, and why they were better than anything else available. While Pak Rojai was certainly the quickest convert and best promoter our program ever had, it was obvious from the start that very little "participatory development" or modification of the stove would ever take place in Krasak."

And so, the spread of Katesan stoves quickly began in Krasak and in a few surrounding villages as well. Mr. Flick and two former political prisoners (newly hired by YDD) made periodic visits to train cadre and build example stoves. One of the principal village-based cadre, the Pak Kebayan, recalled that Mr. Flick often conducted demonstrations on how to use the new stoves. He states: "Pak Rojai was instrumental in getting the stoves built, but Mr. Flick was more concerned with teaching the women how to properly use the new stoves. One time he cooked everyone a demonstration meal on a new Katesan, and then gave away all the pots and pans he had used. After that, he was very popular here in Krasak."

Many of the Katesan stoves built in Krasak and in surrounding villages were, in the later years, built by field workers



## Pak Rojai The motor behind the stove

Pak Rojai is the former village head of Desa Krasak - one of three principal villages involved in YDD's stove program. He is young, ambitious and very proud of his role in introducing Lorena stoves to his area. "Just tell the bus driver you want to get out where all the "tungku" Lorena are, and he'll drop you right in front of my house. Go into any home or warung (small eating establishment) in Krasak and you'll see a clean and orderly kitchen with a smokeless Lorena stove in good repair and in constant use."

And it is all true.

His promotion of the Lorena stove and other technological improvements in Krasak have made a development showcase of this relatively poor Javanese village. Neat cobblestone walks lead to brightly painted provincial homes - with zinc or tin chimneys poking out of the roofs of every single one. Government officials and interested foreign visitors stroll casually about admiring the village - with conspicuous hoards of children following close behind chanting, "Lorena, Lorena, Lorena..." In fact, things have progressed so far in Krasak, that YDD's field staff have long since bowed out; leaving any further promotion of Appropriate Technology in the quite able hands of Pak Rojai.

So, how did he do it? What special aspect of the Krasak stove project enabled it to blossom into such a "success?" "The villagers here trust my judgement and frankly do what I tell them to do," states Pak Rojai confidently. "The same holds true for our upper level Government officials. I am their window on the village world, and they listen to, and support what I have to say."

"From the very beginning of this project, our biggest problem has been the lack of awareness or understanding of the 'big picture' problem of deforestation. We felt we could spend years working on the educational side of things - and still not be sure our program would be willingly and enthusiastically accepted by the people. So instead, we have made the decision *for* our people, and have made it a sin not to own and use a Lorena stove. After all, these stoves are clean, safe and efficient, and so much better than the traditional stoves we used heretofore. So we use pressure. The Bupati (chief district administrator) has made it clear that no assistance will be extended to victims of household fires if the cause is found to be a traditional open stove. Build a Lorena stove, and you are a friend of 'development'; refuse, and you are out in the cold. It's as simple as that."

"So all of your problems are solved?" we ask in awe. "Not exactly. The stoves are still difficult to build for many of the field workers we have trained. In fact, we have yet to discover any method of assuring the stoves will be built correctly, again and again, short of building them all ourselves. The mixture has to be just right, the pots and pans have to fit perfectly, and the shape and size of the firebox, tunnels, ventilators and chimney have to be exact. This unfortunately turns out to be a pretty difficult feat for even our trained cadre - let alone the village folk."

"What do you think of the new 'Tungku Sae' that YDD has been working on?"

"It's a good idea, but the name has got to go. We've spent too much time and effort promoting the Lorena to tell people just a few years later that 'Lorena' is out and 'Sae' is in. If we ever do introduce them to Krasak, I think we'll call them 'Lorena express'."

Pak Rojai is 33 years of age and a newly elected member of the provincial DPR (People's Representative Assembly). He is married and has four children, the youngest of whom is named, "Lorena."

from the Government PKK organization. Some forty PKK (Family Welfare League) field workers were trained by Pak Rojai himself, to construct Lorena stoves and instruct village women on their proper use. States Pak Rojai: "The PKK groups were a good, existing mechanism for the dissemination of Lorena stoves. However, many PKK leaders, and other mid-level Government officials were often the hardest to motivate to participate in stove programs. The upper level officials and the villagers themselves would pretty much do what I recommended, but the middle level bureaucrats were always looking for some excuse not to join in."

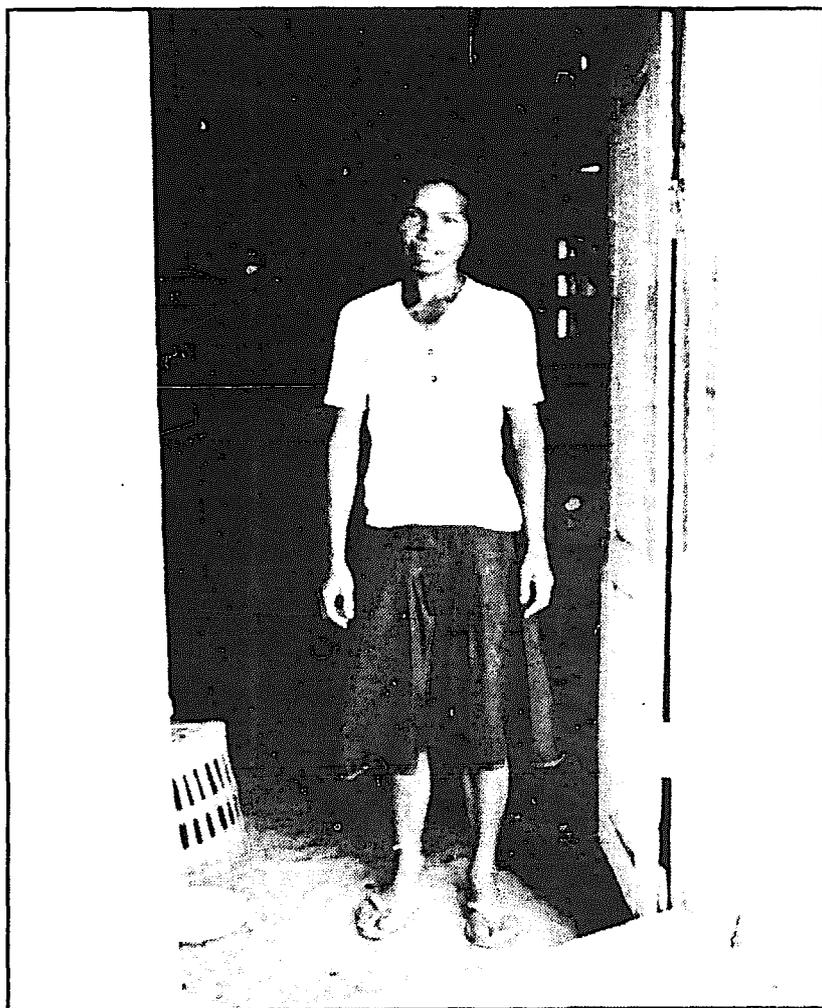


*The Krasak village cadre.*

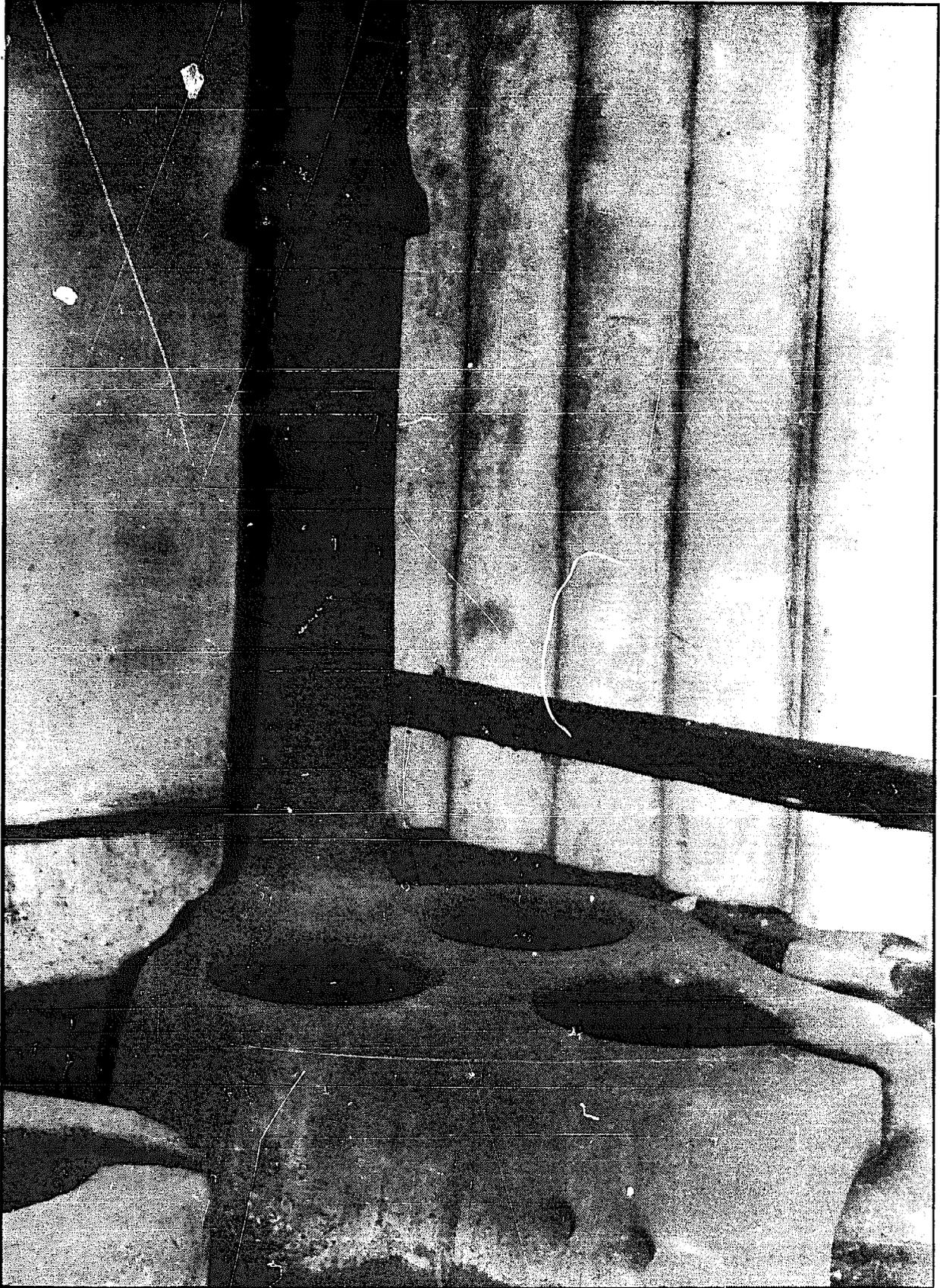
Concurrent with the stove project's expansion in Krasak, certain developments took place "back at the office" in the development dogma of YDD's fuel efficient stove program. This change or expansion in stove project principles was to a certain extent due to the increased international attention that YDD's work was receiving. Apparently, a growing number of stove promoters and development agencies were beginning to trade ideas, technical information and dissemination techniques with YDD. Still others hosted workshops and funded study tours to bring YDD's stove project staff together with other groups working in the same field. In this manner, the initial rationale of YDD's stove project, which was *already* expanding to encompass matters other than just "fuel-efficiency", expanded still further to encompass the newly verbalized concerns of stove promotor worldwide. Including :

- (1) Diminishing the amount of time needed for cooking and foraging, thus freeing women and children for more productive activities.
- (2) Enhancing the health of villagers, particularly mothers and children, by reducing smoke in the kitchen.
- (3) Improving or "upgrading" the basic kitchen environment.
- (4) Enlarging the role of village women in village development efforts.
- (5) Developing stove dissemination networks to more quickly and thoroughly spread improved stove technologies at the village, national, and international levels.

To address these wide-range goals, still more attention was paid by YDD to training, user-education, needs assessment, efficiency testing, and the search for a stove technology and dissemination mechanism which could effect change on a large scale. OXFAM, for example, funded YDD in some specific field research to investigate possible applications of charcoal burning stoves and also a means of incorporating the energy of village women in stove design and dissemination. It was also at this time that Ir. Anton Soedjarwo first told his "owner-built birth control" story (see box).



*Welcome to my kitchen: "Did you bring me a new chimney?"*



*"Katesan" with ceramic chimney.*

## Owner Built Birth Control

"In many ways cooking is like making love. Both activities represent the more personal and private sides of our lives, and the technologies we put to use in both realms reflect decisions made at the household, not community, level.

Now we can easily imagine the problems and barriers the family planning promotor faces when he or she attempts to change the long established norms of lovemaking. New birth control technologies, the male vasectomy for example, will have little chance of success in areas where such technology runs afoul of established social and cultural norms - in this case the Third World male machisimo. Likewise we can imagine the problems our family planning promotors might face, if instead of simply supplying the preferred birth control device or service, he or she attempted to teach the local acceptor to *make their own*. What a comedy this would be! And how miniscule the effect on the population explosion. Imagine, millions and millions of potential acceptors studying condom and IUD manufacturing as a prerequisite to birth control.

As ridiculous as this sounds, this is exactly the approach we (and many other stove promotors) have taken, in our search for a solution to deforestation. By embarking on fuel efficient stove programs which require local villagers to "build their own", we have resigned ourselves to years and years of work, which by all indications will result in but a small improvement in the problem. Imagine 30 million wood burning cooks in Indonesia all studying combustion theory and stove construction as a pre-requisite to acquiring a fuel efficient stove! How many training programs, how many field workers, how many years will it take?

After five years of work in just this vein, we are becoming convinced that the promotion of *mass produced* stove technologies (like mass produced birth control devices) would represent a far more viable and rational approach to the problem of deforestation.

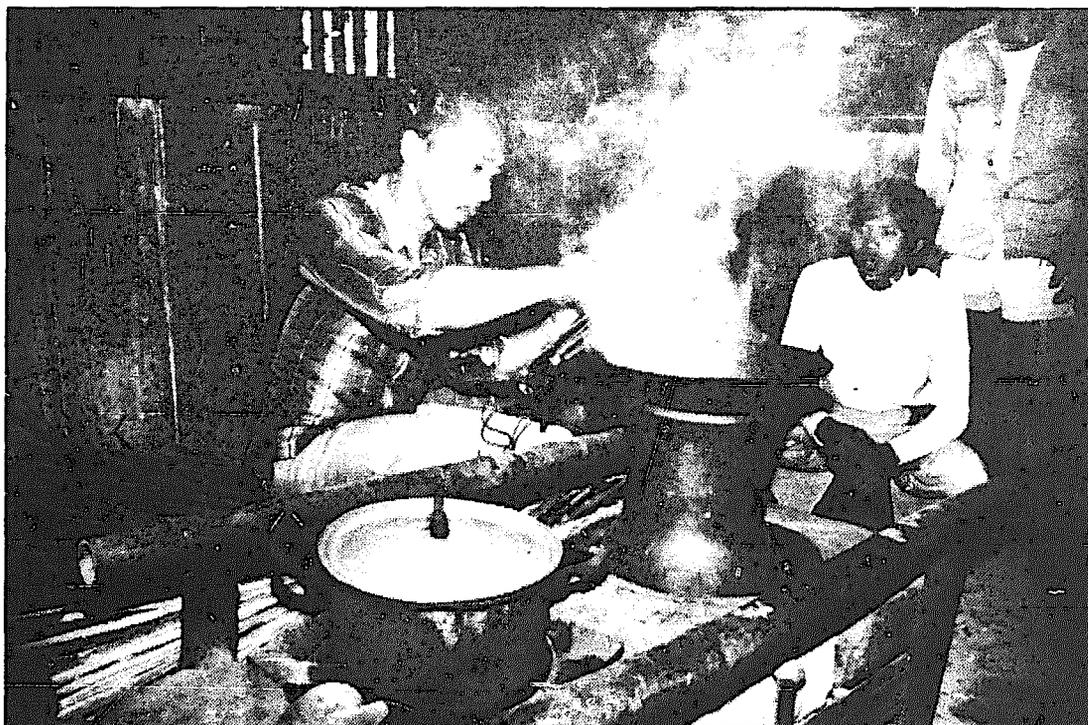
# Losari

In early 1979, YDD began its third program of Lorena stove promotion. This time in a fairly prosperous mountain village called Losari. Losari, like Ngestirejo in Gunung Kidul, had first come in contact with YDD through a water supply project. With that project's completion, YDD field staff suggested developing a stove program as a means of maintaining the "development momentum" which the water project had helped to create. Losari's Lurah had agreed whole-heartedly, and construction of the traditional example stove began at once in the Lurah's kitchen.



*Ariyanto Soedjarwo: Another stove "motor."*

Eighteen more example stoves of various designs were then built in homes throughout Losari. The problem of finding sand in this mountainous region was solved by using leftover sand from the water project, and when that was gone, by trucking in more from outside. The Lurah pitched in from his own pocket to provide the YDD staff and the locals they were working with, with other materials such as clay, water and food. As in Gunung Kidul, YDD supplied the expensive sheet metal for chimneys.



*Losari's Lurah conducting tests.*

It wasn't long before feedback began to trickle in regarding the form and function of the new stoves. As Losari is located at a fairly high altitude, the role of the open kitchen fire as a space heater would have to be considered. A further barrier to the whole-scale acceptance of any of the Lorena style stoves was the existence in Losari of a reasonably well made local stove, built from cut limestone slabs.

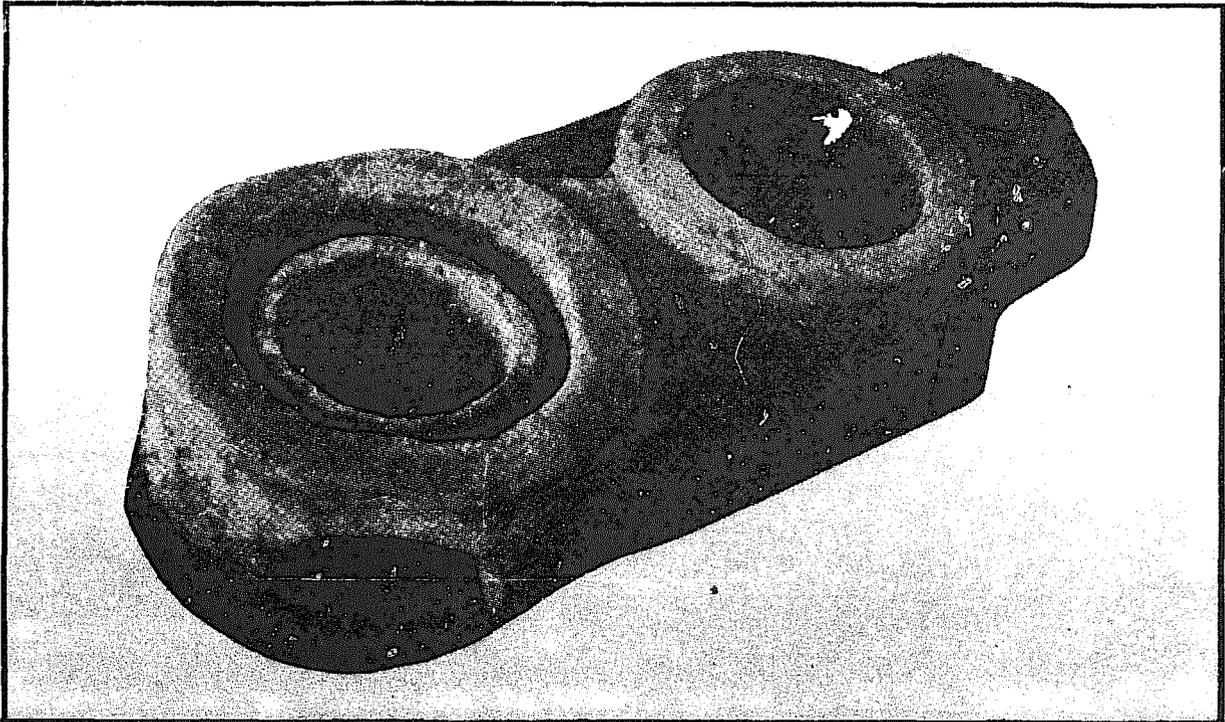
It became apparent that the Lorena, already modified several times to fit cooking styles in Gunung Kidul, would have to be transformed again, to please the chilly villagers in Losari and compete with their traditional "Luweng" stove. In Gunung Kidul, the large Guatemalan Lorena was repeatedly made smaller and simpler (development of the two-port "Mencong" and chimneyless "Lowon" took place at about this time). In Losari, it was clear that different, area-specific modifications would have to be made if the stove program was ever to "take off."

At this time (early 1980) Mr. Flick began to slowly remove himself from the mainstream of stove project activities. As his two-and-a-half year volunteer post was coming to an end, the time had come for turning the project over to one of YDD's permanent staff. Thus, the problem of transforming the Lorena to fit the Losari village situation fell to Ariyanto Soedjarwo, the current stove section head at YDD.

Ariyanto had seen a drawing of a Dutch stove in a book given to him by Stephen Joseph of IDTG. The stove, known as "the family cooker," was made of metal and had unique heat circulation properties which made it both a particularly good space heater and food cooker. Ariyanto modified the design somewhat and introduced the stove to Losari via one of the key cadre there. Ariyanto's "family cooker" (built with a Lorena style mix) utilized a unique cylindrical ceramic insert (see photo) which he felt had considerable potential for addressing the nagging problem of fire box flaking and cracking.

The life of the family cooker was however, very short-lived (only one-hundred or so were ever built) due to design and use problems which made the stove almost impossible to clean and maintain. Its development however, marks an important point in

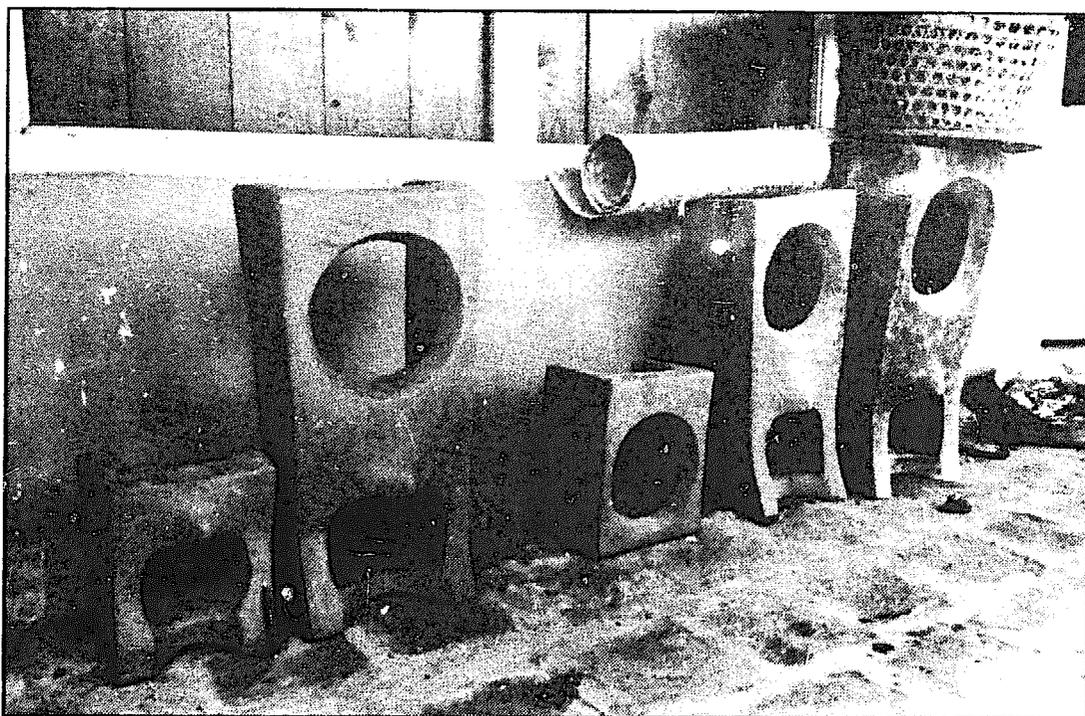
the stove project's history, as the family cooker was the first attempt by YDD to combine the Lorena mix with another medium, such as fired clay or brick.



*The Family Cooker: note the ceramic insert.*

Looking at the Losari stove project as a whole, it is difficult to say what, if any, positive impact the new stoves had on people's lives. As the project was conceived as merely an expedient means of following up a successful water project, rather than as an answer to a real felt need - this is not surprising. The generally good socio-economic standing of Losari (good land, low population density, semi cash-crop economy, coffee) and the fact that firewood is relatively abundant there, helped create a situation in which interest in the new stoves was low. No dynamic local figure arose to carry the stove banner and local women were, for the most part, reluctant to trade their traditional "Luweng" stove for any of the unfamiliar Egg, Mencong, Katesan or Family cookers.

A further problem affecting project success, concerned the conflict and competition between development efforts in Losari. Certain development activities (a President's order livestock project, for one) were repeatedly ascribed precedence over all other projects; thus stove project activities (relatively low priority) were often relegated to the "back burner" and so did not progress. Stove building skills, for example, remained quite poor amongst local cadre, many of whom were merely "on loan" from a YDD coffee processing project, and hence not particularly



*Good quality local stoves.*

committed to stove promotion. This matter of "development over-kill," when diverse development efforts compete for villager's limited time and energy is a serious problem which routinely affects project success, throughout Indonesia. In Losari, it contributed to the stove project's ultimate demise.

# From Lorena to a Mountain of Fire

By way of review, YDD had to struggle with a number of serious problems in their program of Lorena stove development and dissemination in rural Java. These problems included:

- (1) Sporadic availability of the stove's two basic raw materials, clay and sand.
- (2) Cracking, flaking and other technical problems which resulted in poor durability in the new stoves.
- (3) Lack of awareness at the village level as regards deforestation and its links to wood foraging.
- (4) Poor understanding amongst stove users as regards the proper and most efficient way to operate the new stoves (use of lids on pots, drying and curing of fuel before use etc.)
- (5) Wide diversity in cooking styles, fuel types, cookware and stove functions in virtually every community in which the stoves were introduced.
- (6) The inability of trained stove cadre to consistently build stoves according to design and effectively pass their skills on to others.

While all of the above problems caused innumerable headaches for the stove project staff, the last problem proved by far to

be the biggest initial barrier to the successful dissemination of fuel efficient stoves in rural Java. Ariyanto explains: "The actual development or transformation of the stove technology itself was relatively simple and trouble-free. Granted most of our research and development was of the haphazard or "trial and error" type... but in the final analysis we did develop a number of Lorena stove designs which were really pretty good. But no matter how good our designs were, we consistently failed in our efforts to train cadre and villagers such that they could build long lasting and fuel efficient Lorena stoves on their own.



*Village cadre studying "Lowon" style stove construction.*

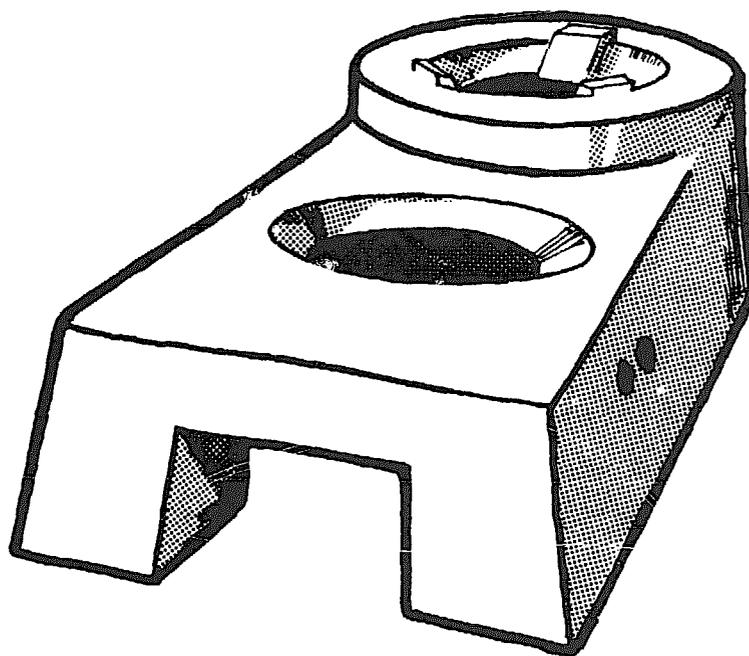
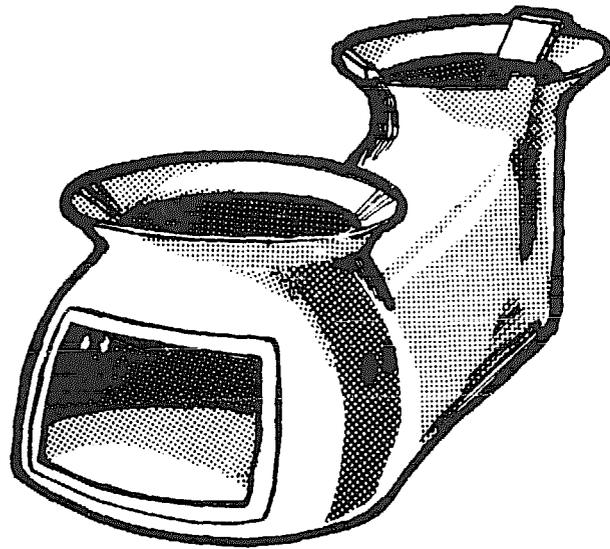
Consider that after four years of work in a relatively small area, we (and the many people we trained) managed to build some 5000 to 6000 stoves; many of which were improperly built and so were only marginally more efficient than the local stoves they replaced. While the Lorena 'concept' is by all means a good one, it became obvious to us that we would have to seek out some other, more easily reproducible type of stove for our program here on Java."

By 1981, YDD's stove section was in touch with a large number of organizations active in the promotion of fuel efficient stoves worldwide. These groups included: Volunteers in Asia, Intermediate Technology Group, The Sarvodaya Institute, Approvecho Institute, Appropriate Technology International, OXFAM, and many others. Individual stove promoters also in periodic contact with YDD included Bill Stewart, Ken Darrow, Ianto Evans, Stephen Joseph, Craig Thorburn and many Indonesian field workers such as Pak Raharjo, Sunarto and Pak Rojai. It is difficult to say who, among these organizations and individuals first contributed the idea, but by late 1981, YDD was experimenting with a new type of stove which many people feel may hold the answer to the recurrent problem of "reproducibility". This new stove type has been given the generic name of "stove liner" and consists of a fired ceramic insert plastered with a Lorena type outer insulation (see figure).

To understand the utility of stove liners, it is necessary to realize that in all fuel efficient cook stoves; the critical component is the stove's interior; the size of the firebox, the shape of the connecting tunnel, the angle of the exhaust flue - all these internal dimensions play a critical role in achieving efficient fuel combustion and complete heat utilization.

# The Tungku SAE

Stove Liner



with  
insulation

It was exactly these portions of the Lorena stoves built by trained local cadre which were consistently sub-standard and most susceptible to cracking and flaking. The beauty of stove liners, is that stove project staff can more easily and exactly control these crucial aspects of the stove's design by putting construction into the hands of skilled craftsmen. In this way, production of the stoves "heart" is accomplished by individuals already familiar with the specialized skills of pottery craft and not by someone for whom such craft is merely an unfamiliar or occasional pastime.

In 1982, YDD's experiment with stove liners went through several stages; stages in which many of the lessons learned



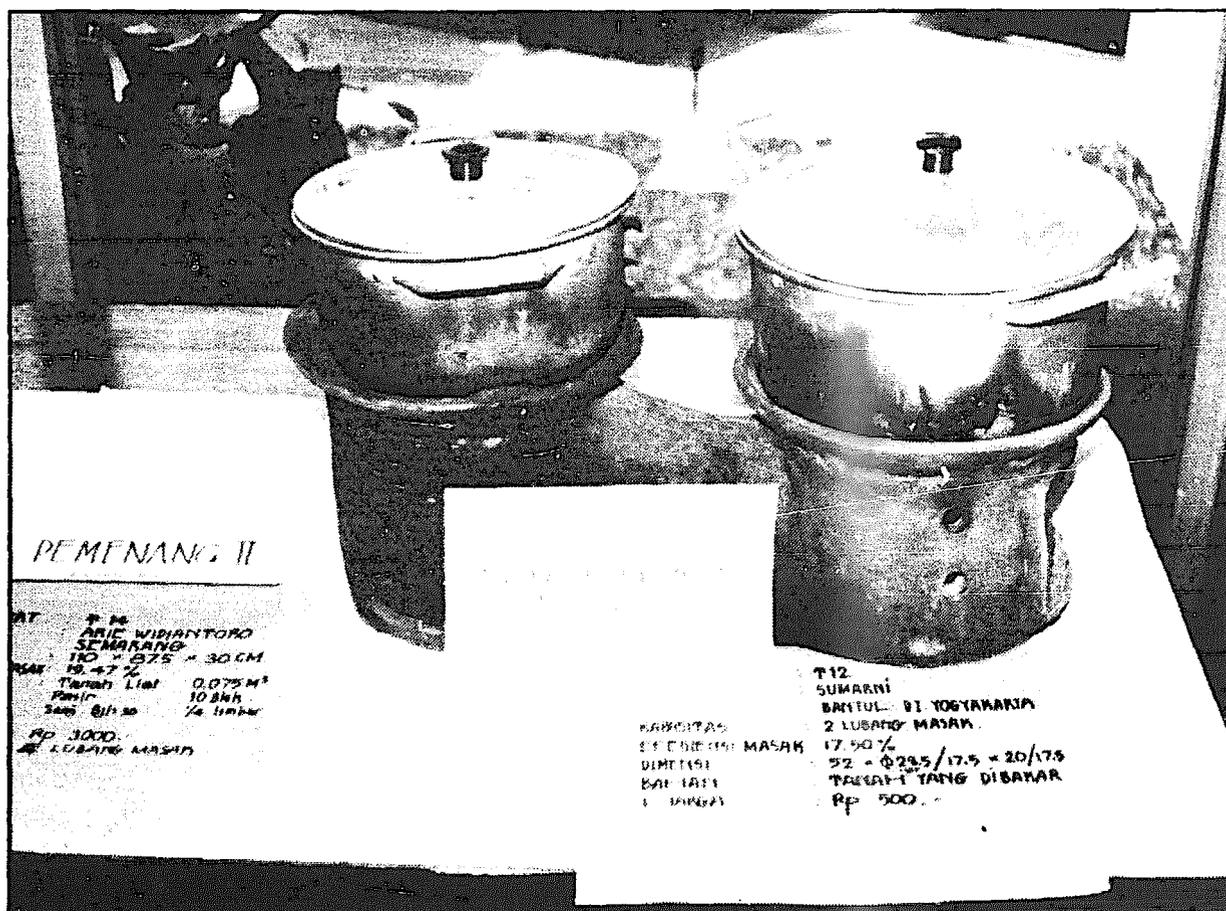
*A Sri Lankan prototype stove liner: Back to the drawing board.*

during Lorena stove experimentation were put to good use. For example, Ariyanto conducted systematic efficiency tests on each of his many stove liner designs before any large scale reproduction or introduction to the public took place. He also approached and trained many local potters - to determine beforehand whether the liners could indeed be produced in sufficient quantities to justify the time and expense of continued research. The investigation of marketing and dissemination networks which could be utilized for stove liner distribution also began at this time.



*"Tungku Sae" efficiency test.*

The ultimate result of this careful research and experimentation was a completely unique ceramic stove liner, called the "Tungku Sae", which has achieved impressive efficiency ratings of 20% and has won awards for Ariyanto and his assistant, Sumarni in National level stove competitions. The Tungku Sae (see diagram) combines many of the design features found to be most appropriate in the original Lorena stoves. "But now," explains Ariyanto, "instead of building the entire stove right on the spot, we can produce quantities of the critical internal portion elsewhere and then, when ready, distribute them to target villages in mass."



The Tungku Sae: Pemenang 1 (first prize).

Like the Lorena stove, the Tungku Sae is a very versatile stove concept; which means the shape and size of the Tungku Sae (within certain boundaries) can be modified to fit local conditions. Trained potters, for example, can produce the Sae in forms most suitable to an individual area's cookware. The stove can also be used with or without a chimney, and the thickness of insulating liner can be varied to produce a stove appropriate for cooking a particular staple food. (The thicker the insulation, the greater the heat storage capability of the stove. Thus, for beans and other slow cooking foods, long term peak efficiency is called for, i.e. thick insulating walls. For steaming rice or frying cassava, two fairly quick operations, thinner stove walls are comparatively more suitable).



*Steamed rice: A fairly quick operation.*

In designing a project for promotion of the Tungku Sae, YDD has had to consider three major points:

- (1) Tungku Sae production
- (2) Distribution and dissemination
- (3) User and field worker education

Ariyanto and his assistant, Sumarni have accomplished the first of these chores by cultivating a large following of potters in Central Java. Again, lessons from the Lorena stove project have guided them in their work: "Just as not everyone can build a Lorena stove properly, we have found that not every potter can produce the Tungku Sae," explains Sumarni, "so, we spend a lot of time with the potters, explaining, demonstrating, training.....until they can build the "Sae" just the way we want it, again and again and again. Throughout the process we buy whatever they produce - no matter what quality, and discuss improvements and provide encouragement whenever necessary. The whole process takes many months, and sometimes we end up saying, 'terima kasih' (thanks, anyway) and simply go elsewhere." This careful approach has yielded some fifteen potters who are now producing good quality Tungku Sae under various arrangements with YDD. In the aggregate, they are capable of turning out over 1200 stove liners a month.

One of these potters, Pak Amat of Kasongan, Yogyakarta is by far the most accomplished and skillful "Sae" potter in all of Indonesia. A former tukang becak (pedi-cab driver), Pak Amat now produces 125 beautifully crafted Tungku Sae each month. His motivation in this regard is thoroughly pragmatic. "I can make about Rp1,500 a day with my becak," he explains, "and about



# TUNGKU SAE

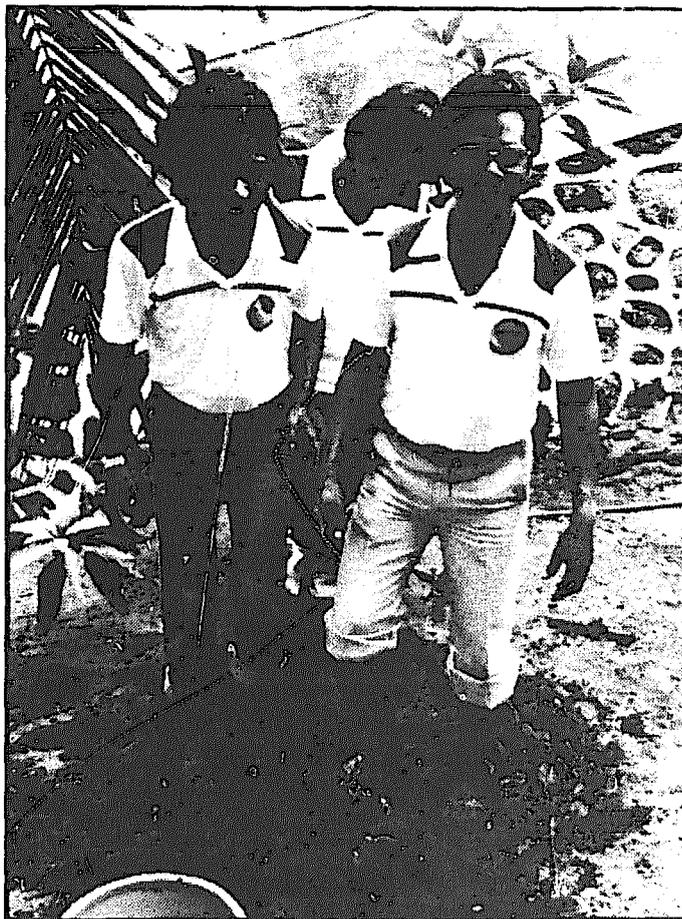


*Pak Amat of the Mountain of Fire stove company: each and every stove is stamped and labelled by the maker.*

Rp2,500 a day making Tungku Sae. And I can work even when it rains."

In mid-1982, Pak Amat was sponsored by YDD for a course in "Achievement Motivation Training" at the Realino Institute in Yogyakarta. He subsequently formed his own Tungku Sae factory, called The Mountain of Fire Stove Company, which provides him and four others with a steady monthly income - rain or shine. YDD's growing demand for Tungku Sae has in fact been a boon for many Javanese potters, who have lost much of their traditional market to Taiwanese and Japanese manufacturers and importers of plastic and aluminum kitchenware.

YDD has designed a number of programs to utilize these existing networks for Tungku Sae promotion and distribution. In every case, a training component has been included in the design to teach field workers the Tungku Sae promotional spiel, and as well the simple techniques for mixing and plastering the insulating outer wall of the stove. A number of Indonesian funding resources have been tapped to subsidize initial production of the liners, and two international funding agencies, MAF (the Canadian Aid Agency) and The Asia Foundation have recently promised support for stove distribution, staff salaries, equipment, and educational materials development.



*Uniformed Government field workers mixing it up.*

In its investigation of potential marketing and distribution networks for the Tungku Sae, YDD has made a simple realization; the best network by far is the one which already exists. Thus discussion and bargaining sessions have been held with a number of branches of the Indonesian Government which already have field workers in place at the village level. These include PKK (the Family Welfare League, which conducts weekly get-togethers with women in practically every village in Indonesia), BUTSI (the Indonesian Domestic Volunteer Corps, which fields thousands of volunteers throughout Indonesia each year), BANGDES (the Indonesian "village development" department which is directly responsible for carrying out Government Development programs) and several others.



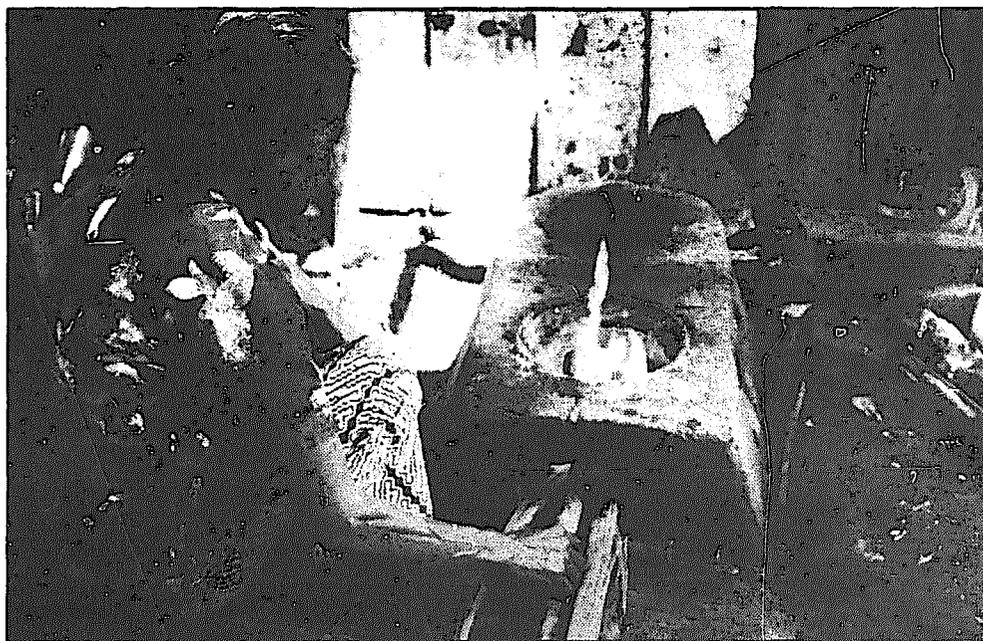
*Plastering on the protective insulating liner.*

As regards education, a program has been designed which will attempt to address the educational needs of all the various groups participating in the project (i.e. potters, field workers, villagers and Government and private aid agency officials). The curriculum of educational materials planned for the pilot Tungku Sae promotional program is as follows:

TARGET	TYPE	SUBJECT	MEDIA
Villagers	Informative	Effects of deforestation	Slide Show
Villagers	Informative	Introducing the Tungku Sae	Comic Book
Villagers	Informative	Using the Tungku Sae	Slide Show and Technical Poster
Villagers	Motivational	Saving fuel and time	Slide Show
Villagers	Motivational	Cheap, Safe, and Easy; the Tungku Sae	Maxi Flans
Villagers	Promotional	The "new" Tungku Sae	Poster
Villagers	Promotional	The "versatile" Tungku Sae	Poster and Banner
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Field Workers	Informative	How to present and demonstrate the Tungku Sae	Slide Show
Field Workers	Informative	Using the prepared instructional media	Manual
Field Workers	Informative	Facts and figures; the Tungku Sae	Manual

Field Workers	Motivational	Natural resources, the 1945 Constitution and the Tungku Sae	Lecture
Aid agency Officials	Informative	Complete program and technical information	Prospectus/ Manual
Craftsmen	Informative	How to construct the Tungku Sae	Technical Manual
Craftsmen	Promotional	"The Tungku Sae"	Color Calen- dar

The above educational materials will be first used in a MAF funded project to introduce and promote the Tungku Sae in twenty target villages in five separate districts in Java. Villagers willing to try the stove after participating in the educational program will be required to purchase their Tungku Sae for



*Trying out a new Tungku Sae.*

Rp350-400 and to assist in mixing and plastering. Thus local village contributions, (the traditional "self-help" component) will continue to constitute an essential aspect of the stove program, even in this "mass produced" phase of the project.

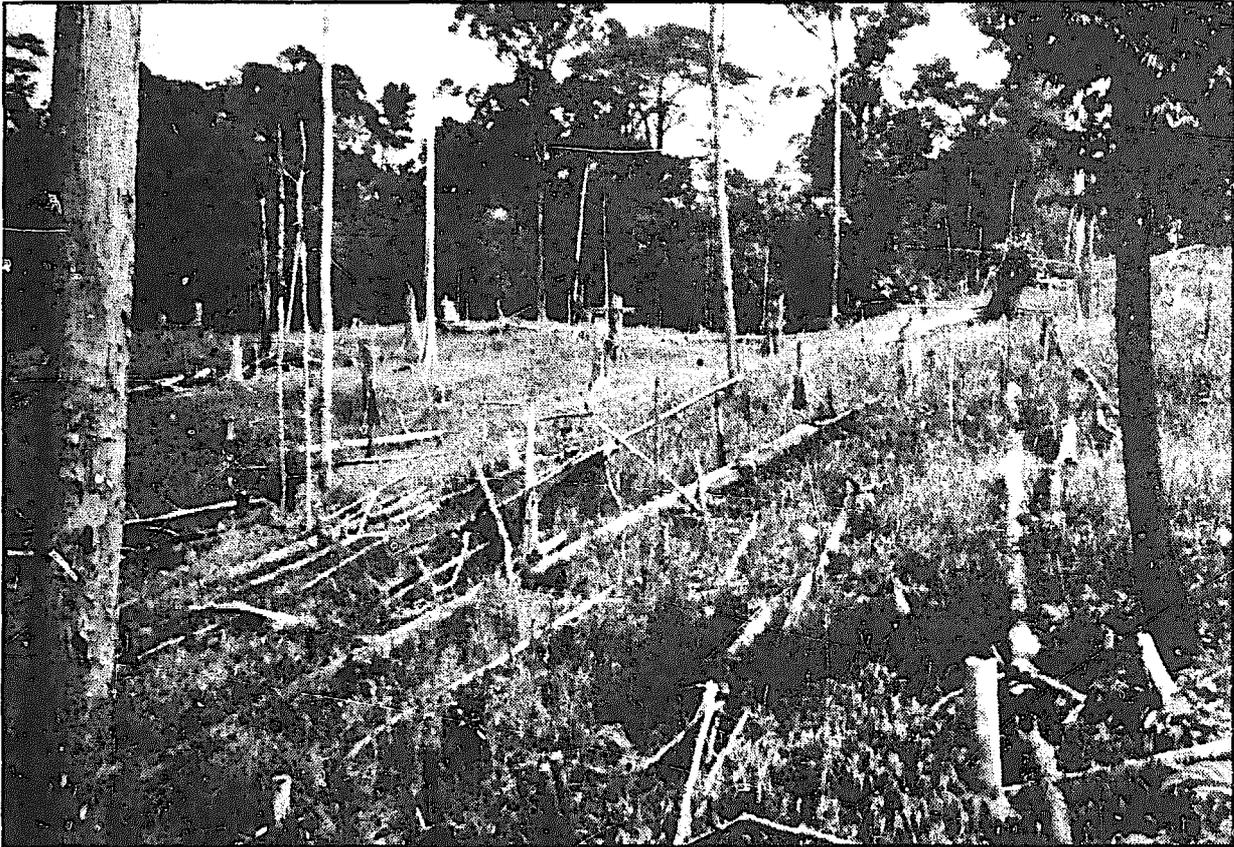
## Summary

Much can be said in favor of YDD's *current* approach to the promotion of improved stoves in Indonesia. A stove has at last been developed which is both easily reproducible and highly fuel efficient; the stove has been thoroughly tested prior to any dissemination taking place; an efficient utilization of Government and private resources has been planned, which will enlarge the scope and impact of the program beyond the limited capabilities of YDD itself; and finally, an integrated educational program has been designed which will address the needs of field workers, artisans and villagers in a systematic manner.

All of which is not to say that YDD's *former* program of Lorena stove development was comparatively a waste of time. The four years of experimentation with Lorena stoves represents a valuable learning experience, both for YDD's stove project staff and for the many villagers and field workers which participated in Lorena stove projects. *It is visibly apparent that everything good about the current program represents lessons learned in the long process of Lorena stove development and dissemination.*

Throughout this case study, importance has been attached to the role of dynamic stove promoters, often referred to in YDD's lexicon as "motors." Enough cannot be said regarding the impact such individuals can have on the life of a development project, or on what effect, if any, the project will have on a particular

development problem. "Motors" such as Mr. Flick, Pak Raharjo, Pak Rojai and Sdr. Ariyanto, provided the energy and enthusiasm in YDD's program without which little progress would have been made.



*Back to the forest: a multi-faceted problem.*

But what are (or will be) the results of all this energy and enthusiasm? To what extent will YDD's effort be visibly rewarded? Or in other words, to what extent will the promotion of improved cook stove technologies really contribute to solving Indonesia's "multi-faceted problem of deforestation?"

At best, the stoves must be considered a beginning; an initial point of entry into the vicious cycle of wood consumption and forest depletion. For until rural poverty becomes a thing

of the past, rural people will continue to cut trees; until environmental concerns outweigh economic ones, much of Indonesia's industry will continue to burn wood; until everyone has enough to eat, cultivated acreage will forever expand and forested land will become increasingly scarce. Thus, the stoves are assuredly not *the* answer to deforestation, but they are a start, and as such, they represent a worthwhile effort to do something *now* towards solving a problem which threatens to grow forever worse.

The effect that a single, isolated stove program can have on this problem of mass concern should be seen as being necessarily small. But if small pioneer projects, such as Yayasan Dian Desa's can someday be linked with companion efforts in other fields, then the likelihood of achieving positive results will certainly increase. But the time for such linkage is now. As Indonesia's Environmental Minister, Emil Salim has said:

"We are a big people, a people capable of changing ourselves, and our way of life for the better. But if saving our environment is our wish, if consigning future generations of Indonesians to life in a ravaged land is our fear, then we have to begin to work together now. The time for bargaining has long since passed."<sup>4</sup>

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<sup>4</sup>Mingguan Bima; Sehari Bersama Menteri PPLH Prof. Dr. Emil Salim;  
Minggu III/16 January, 1983, hal. III.