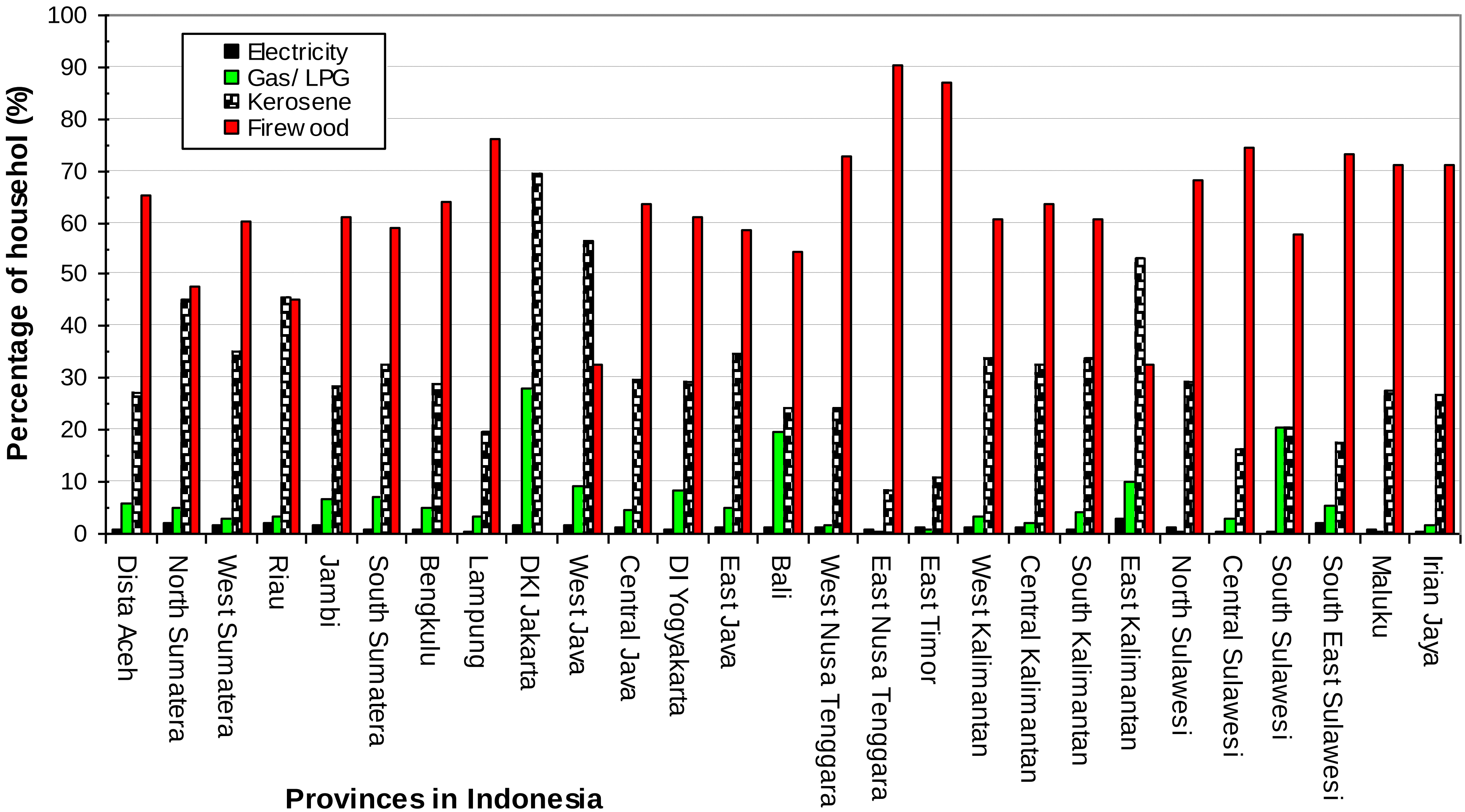
SUN COOKING

THE BEST PRACTICE IN INDONESIA

Herliyani Suharta

The Center for Energy Technology (BBTE) - BPPT
PUSPIPTEK, Serpong, Tangerang 15314, Indonesia.
E-mail: herli@iptek.net.id

NORWEGIAN SEA
ICELAND
NORWAY
SWEDEN
FINLAND
RUSSIA
UNITED KINGDOM
IRELAND
DENMARK
POLAND
GERMANY
FRANCE
SPAIN
PORTUGAL
UKRAINE
KAZAKHSTAN
MONGOLIA
MANCHURIA
CHINA
TIBET
JAPAN
KOREA
PACIFIC OCEAN
SEA OF OKHOTSK
BERING SEA
Sea of Japan
Black Sea
TURKEY
SYRIA
IRAN
AFGHANISTAN
PAKISTAN
INDIA
SAUDI ARABIA
OMAN
YEMEN
Arabian Sea
Bay of Bengal
THAILAND
VIETNAM
PHILIPPINES
Philippine Sea
SOUTH CHINA SEA
TAIWAN
Hong Kong
SRI LANKA (CEYLON)
INDONESIA
NEW GUINEA
SOLOMON ISLANDS
MOROCCO
ALGERIA
TUNISIA
LIBYA
EGYPT
MAURITANIA
MALI
NIGER
CHAD
SUDAN
ETHIOPIA
SOMALIA
KENYA
NIGERIA
LIBERIA
SIERRA LEONE
GABON
ZAIRE
TANZANIA
ANGOLA
ZAMBIA
MALAWI
NAMIBIA
BOTSWANA
MOZAMBIQUE
MADAGASCAR
MAURITIUS
SEYCHELLES
SOUTH AFRICA
Cape Town
INDIAN OCEAN
AUSTRALIA
WESTERN AUSTRALIA
NORTHERN TERRITORY
SOUTH AUSTRALIA
QUEENSLAND
NEW SOUTH WALES
TASMANIA
TASMAN SEA
CORAL SEA
Timor Sea
Arafura Sea
Banda Sea
NEW ZEALAND



. Percentage of Households by Province and types of cooking fuel (electricity / LPG / kerosene and firewood). More than 90% of total houses in East Nusa Tenggara Province use firewood to fulfill their primary energy need.

Source: Statistik Indonesia 1999, BPS (2000, p 127).

In 1999, the total kerosene used by household was about **10.475 billion litters a year** (BPS, 2000: p282). The government made the scenario to raise the price of kerosene by 29 % per 1 January 2002 to dismiss subsidized of Rp.30.377 10^{12} .

This issue had blown the price of kerosene from Rp.495-Rp.650 per liter to Rp.800-1200 per liter in the last two weeks of the year 2001 until the second week of 2002. People should queue for hours to get kerosene. Some just cut fresh trees, chop it then dry it

Decrease in subsidized for kerosene have driven the poor back to use fuelwood to fill their primary energy need for cooking.

KEY OF THOUGHT

- **Sun Cooking Program is a cheap tool to investigate problems in an effort to disseminate clean energy technology to a wider society.**
- ***It provides the path to penetrate deep into the root of the nation: the families.***
- **Educational approach is expected facilitating the sustainable dissemination of knowledge of this new technology.**
- If we fully involve public in the process of science we shall not only give them understanding, we shall give the world a future.

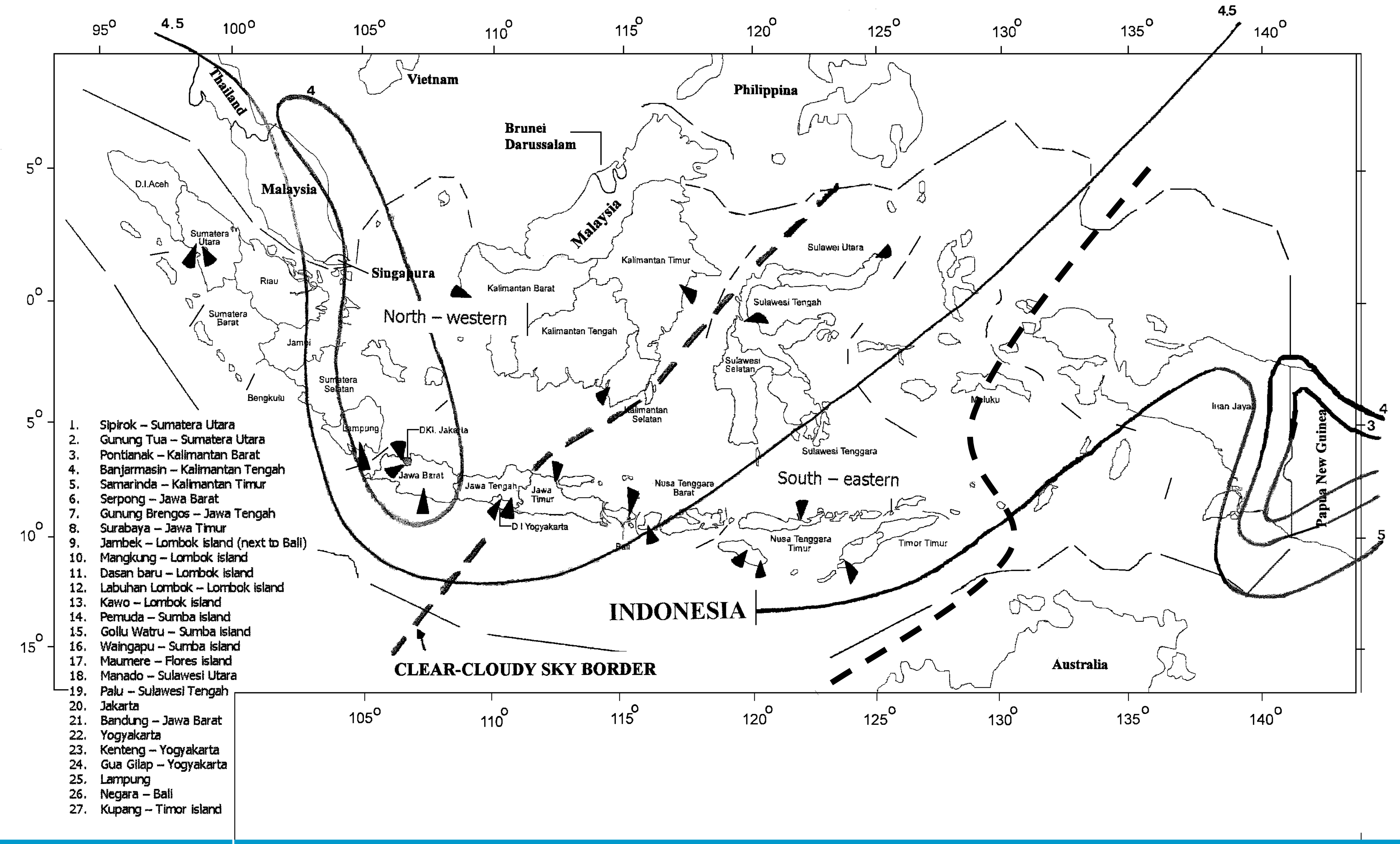


Fig. 1a. Twenty Seven Locations of Solar Radiation Measurement. Bold dash lines are Clear – Cloudy Sky Borders.


SUN

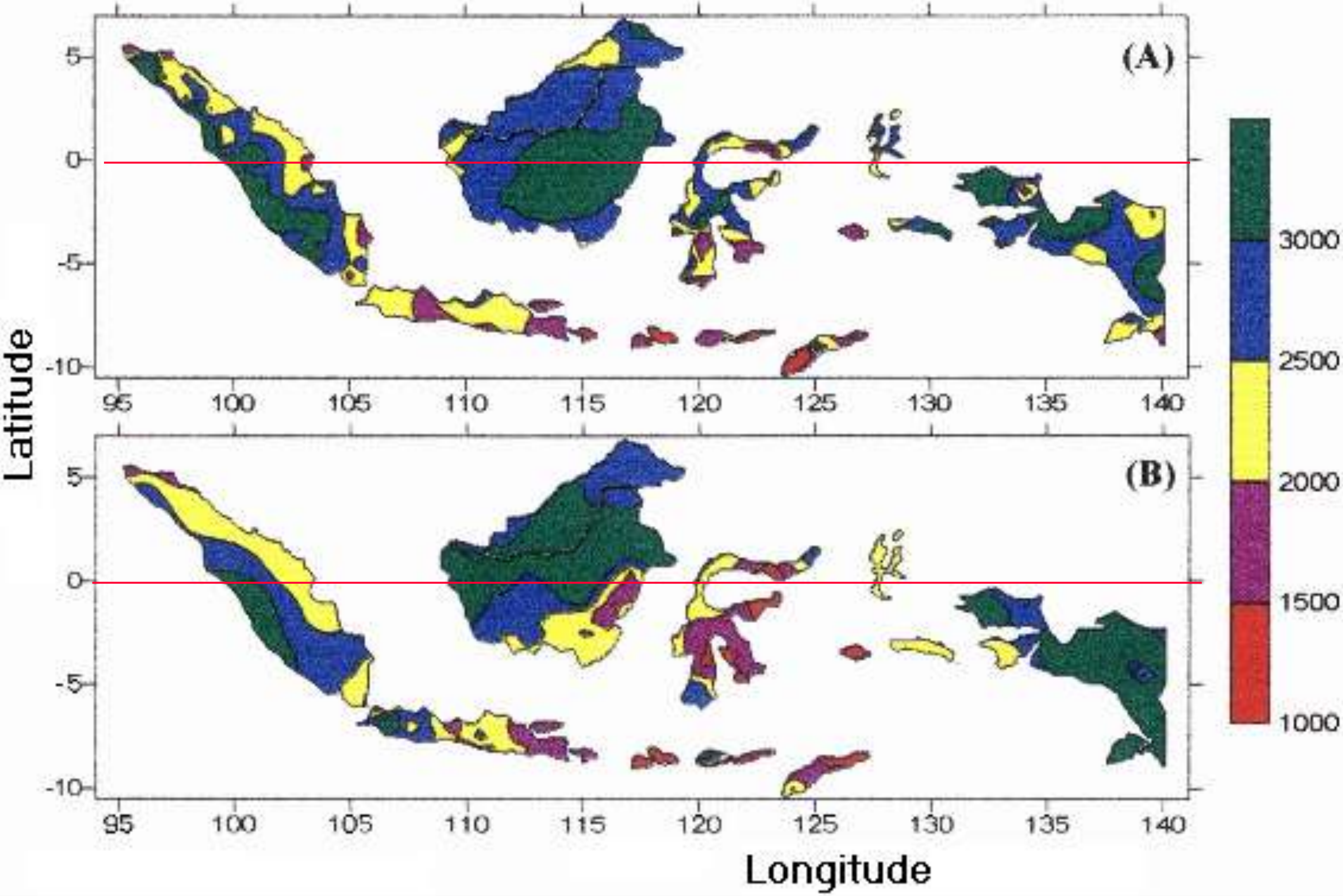


Fig. 1b Yearly average rain fall in Indonesia (mm) in the period:
(A) 1931-1960 (B) 1960-1990

Community Education

1600 local participants have been participated in these TT training's. They practice to make solar cooker and to witness the advantages of sun cooking. Also 100 foreign participants from 12 countries.

523 units have been disseminated.

A great number of government staffs were informed about the project and their possible contributions to tackle the future environmental problems related to people who desperately dependent on firewood.

Table 15. The dissemination of "Technology Transfer of Solar Cooker since 1995

	Date	Location (Note: trg means training)	Type of Solar Oven	Partners, which sharing the funding needed.
1.	June 1995	West Lombok Regency at Mataram city	16 HS 7540	Local government of West Nusa Tenggara + Earthwatch Institute
2.	July 1995	West Lombok Regency at Meninting village (2 trg)	17 +17 HS 7540	Local government of West Nusa Tenggara + Earthwatch Institute
3.	November 1995	Central Kalimantan at Palangkaraya city	1 HS 7540	Palangkaraya University + DJLPE -Department of Energy and Mineral Resources
4.	April 1996	Liquica Regency at Ulmera village	15 HS 7540	The Ministry of Women's Role + IPPTP Comoro + Local gov. East Timor
5.	July 1996	Central Lombok Regency at Praya city	17 HS 7540	Local government of West Nusa Tenggara + Earhtwatch Institute
6.	August 1996	Sumbawa Regency at Sumbawa Besar city (2 trg)	15 + 15 HS 7540	Local government of West Nusa Tenggara + Earthwatch Institute
7.	November 1996	Kupang Regency at Sulamu village	32 HS 7534	Local government of East Nusa Tenggara + BPPT
8.	January 1997	Sikka Regency at Maumere city	30 HS 7534	Local government of East Nusa Tenggara + BPPT
9.	April 1997	Bengkulu Regency at Kandang village	16 HS 7534	The Ministry of Women's Role + Bengkulu Univ.+ Local government of Bengkulu
10.	August 1997	Muko-Muko district	15 HS 7534	The Ministry of Women's Role + Bengkulu Univ.+ Local government of Bengkulu
11.	August 1997	Argajaya District	15 HS 7534	The Ministry of Women's Role + Bengkulu Univ.+ Local goverment of Bengkulu
12.	September 1997	East Lombok Regency at Selong village	18 HS 7033	Local gov. of West Nusa Tenggara,+ The Ministry of Women's Role + Earthwatch
13.	October 1997	Sumbawa Besar Regency at Kerato village	12 HS 7033	Local government of West Nusa Tenggara + Earthwatch Institute
14.	December 1997	Subang Regency	--/ training	Local government of West Java and of Subang regency (DEPDAGRI)
15.	December 1997	Ogan Komering Ilir Regency	--/ training	Local government of South Sumatra and of OKI regency (DEPDAGRI)
16.	December 1997	Surabaya city	--/ training	Local government of East Java (DEPDAGRI)
17.	December 1997	Sumenep Regency	--/ training	Local government of East Java and of Sumenep Regency (DEPDAGRI)
18.	February 1998	Jember Regency	--/ training	Local government of East Java and of Jember Regency (DEPDAGRI)
19.	March 1998	Bima Regency at Sila village	12 HS 5521+ 4 HS 7033	Local government of West Nusa Tenggara + Earthwatch Institute
20.	March 1998	Dompu Regency	6 HS 7033	Local government of West Nusa Tenggara + Earthwatch Institute
21.	March 1998	Probolinggo Regency	--/training	Local government of East Java and of Probolinggo regency (DEPDAGRI)
22.	April 1998	Sikka Regency at Kewapante district	14 HS 5521	Local government of East Nusa Tenggara + Earthwatch Institute
23.	July 1998	West Lombok Regency at Banyumulek village	40 HS 5521	Local government of West Nusa Tenggara + Earthwatch Institute
24.	October 1998	Bojonegoro Regency at Pajeng village	31 HS 5521	Local gov. of Bojonegoro & of Pajeng +The Ministry of Women's Role+ Earthwatch
25.	December 1998	Bogor town	---/training	Department of Internal Affair (DEPDAGRI)
26.	December 1998	Yogyakarta city at Matahari Hotel	1 HS 5521	DJLPE – Department of Mining and Energy
27.	January 1999	Yogyakarta at Kayu Manis Hotel	20 HS 5521	The Ministry of Women's Role + Village Development Office of Yogyakarta
28.	March 1999	Trenggalek Town	30 HS 5521	Local government of East Java and of Trenggalek Regency + Earthwatch Institute
29.	March 1999	Malang Regency at Kepanjen district	29 HS 5521	Local gov. of East Java & of Kepanjen +The Ministry of Women's Role +Earthwatch
30.	July 1999	D.I.Yogyakarta: 1-Sorosutan village , 2-Giwangan village and 3-Muja-Muju village (3 trg)	5+5+5 HS 5521	Village Development Office of Yogyakarta + Solar Cooker Application Group
31.	3 August 1999	Bandung city	2 HS 5521	DJLPE Department of Mining and Energy + Kodam Siliwangi Bandung
32.	5-13 August 1999	Donggala regency	26 HS 5921	Village Development Office of Donggala regency + Earthwatch Institute
33.	12-19 Sept.2000	Yogyakarta: 1-Semaki and 2-Tahunan village (2trg)	5 HS 5521+ 5 HS 6021	Village Development Office of Yogyakarta + BPPT
34.	8-15 April 2003	Manikin-Tarus, Central Kupang District	17 HS 6021	Yayasan Bina Usaha Lingkungan + Solar Oven Application Group
35.	26 -31July 2004	Banjarmasin, South Kalimantan	15 HS 6321	Local Government of South Kalimantan + BPPT

Performance test of SOLAR COOKER TYPE HS5521 and TYPE HS5921 at **Donggala,** INDONESIA, August 11, 1999.

THE NEXT GENERATION WATCHING SUN COOKING.

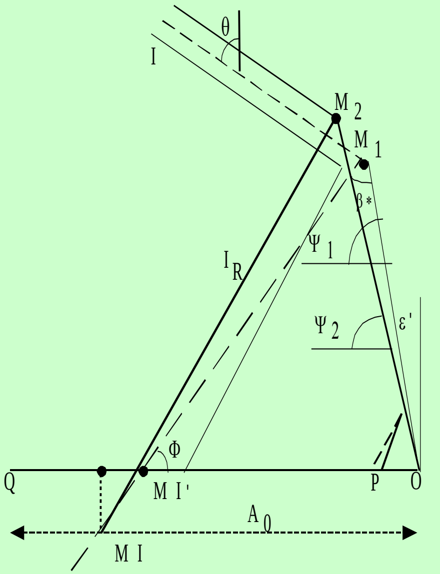
Solar Cooker Type HS5521 at **Trenggalek,** East Java, Indonesia, March 1999.

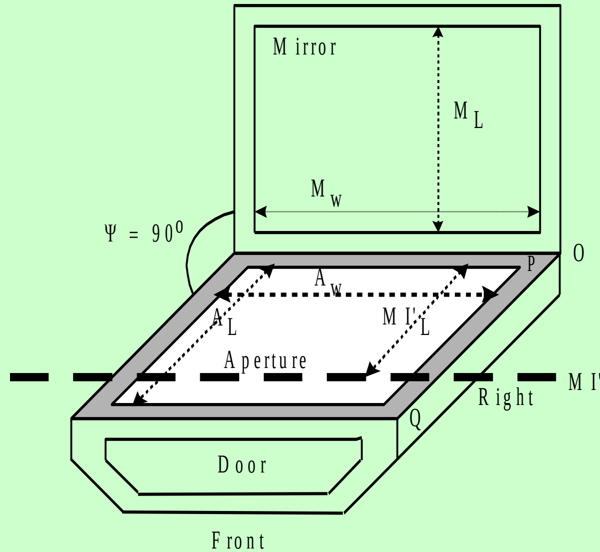
Designed by Herliyani S

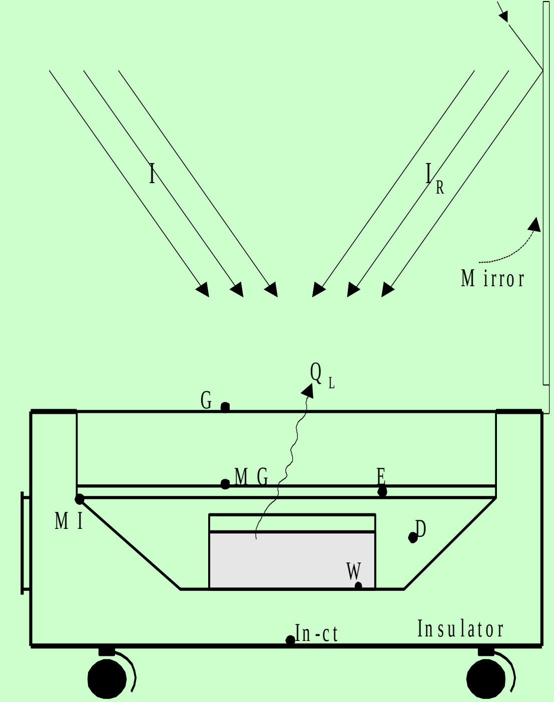
Giving direction during cooking practice (left),
The villagers are practicing sun cooking (right)
Donggala, INDONESIA, August 1999.

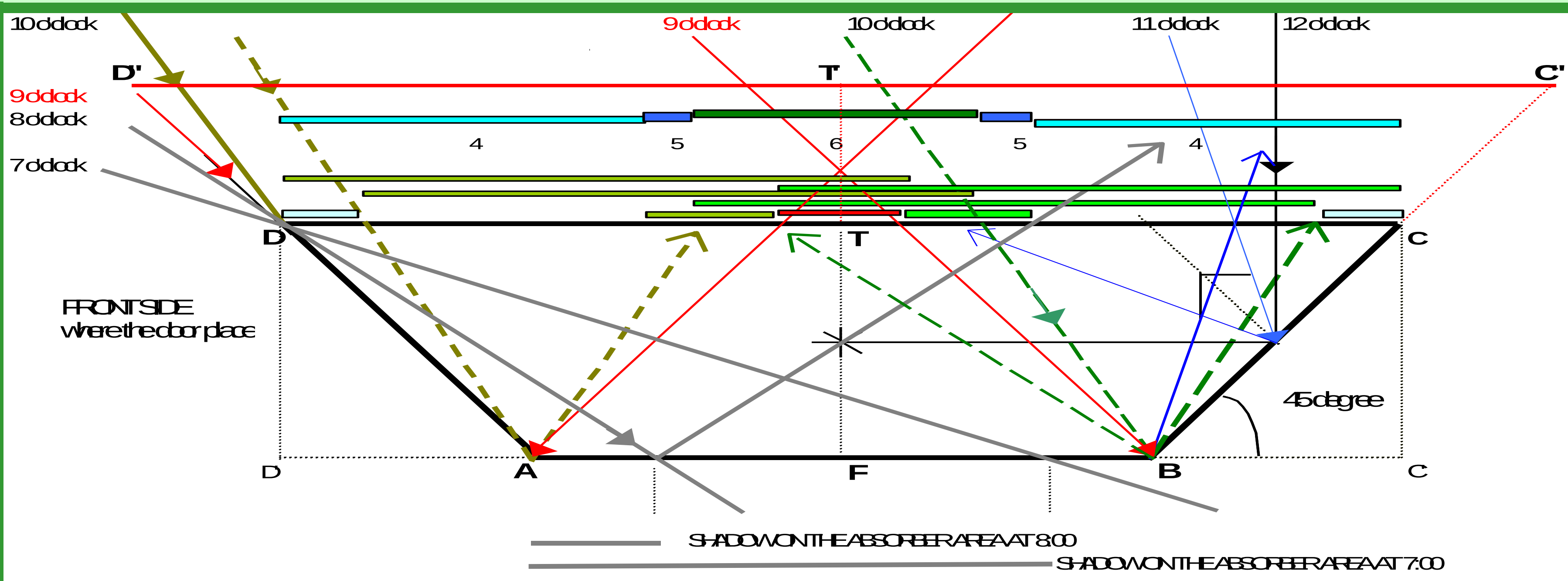
DESIGNED BY HERLIYANI S

DESIGN


θ
I
M 2
M 1
β*
I R
Ψ 1
Ψ 2
ε'
Φ
Q
M I'
P
O
A 0
M I


M irror
M L
M W
Ψ = 90 0
A W
A L
M I' L
A perture
P
O
Q
Right
M I'
Door
Front


I
I R
M irror
Q L
G
M G
E
M I
D
W
In-ct
Insulator


10 o'clock
9 o'clock
10 o'clock
11 o'clock
12 o'clock
D'
T'
C'
9 o'clock
8 o'clock
7 o'clock
4
5
6
5
4
D
T
C
FRONT SIDE
where the door place
45 degree
D
A
F
B
C
SHADOW ON THE ABSORBER AREA AT 8:00
SHADOW ON THE ABSORBER AREA AT 7:00

PERFORMANCE

TESTING

SOLAR COOKER TYPE HS 7033, Kerato village, Sumbawa island, Indonesia, October 1998

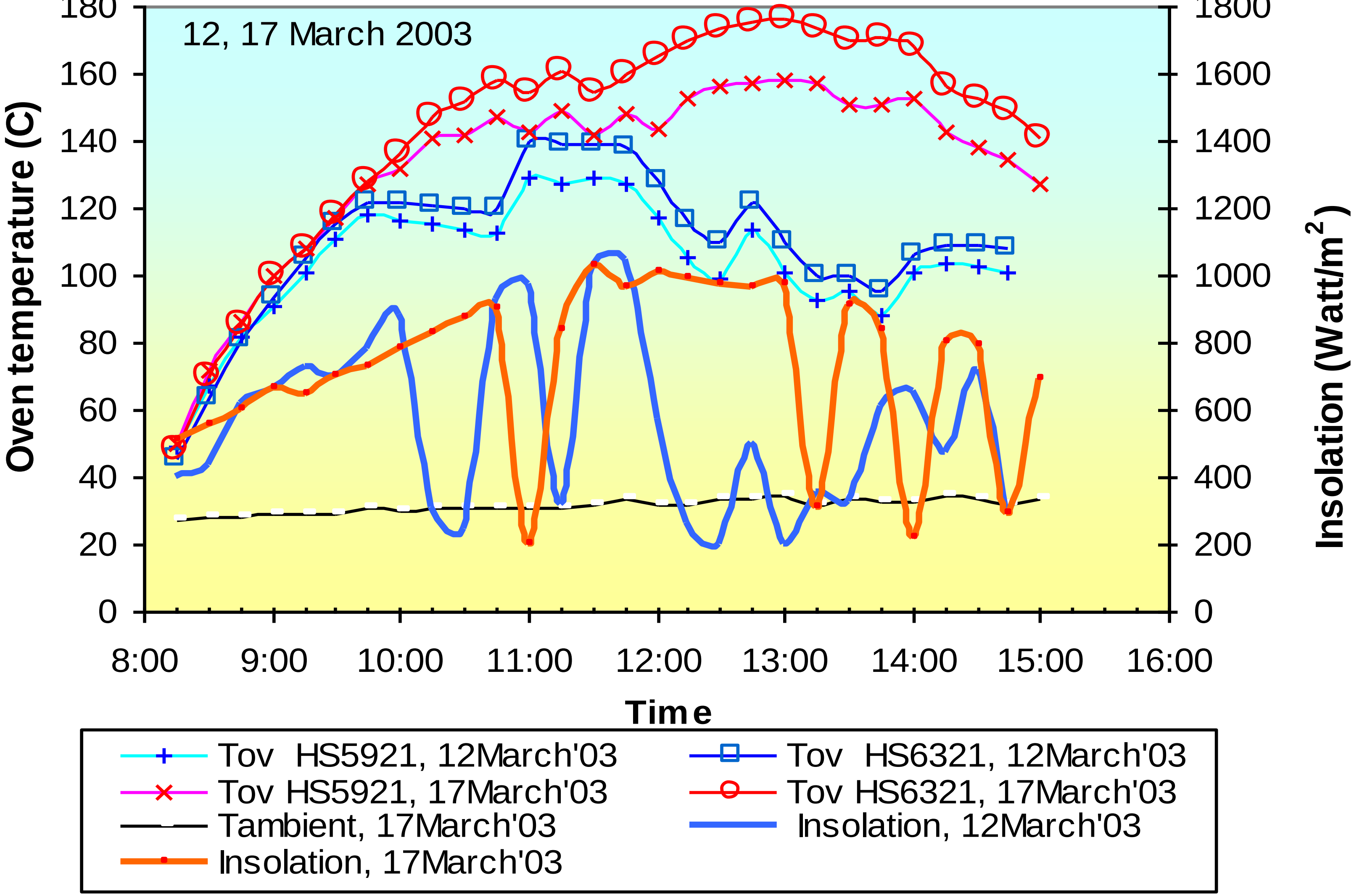
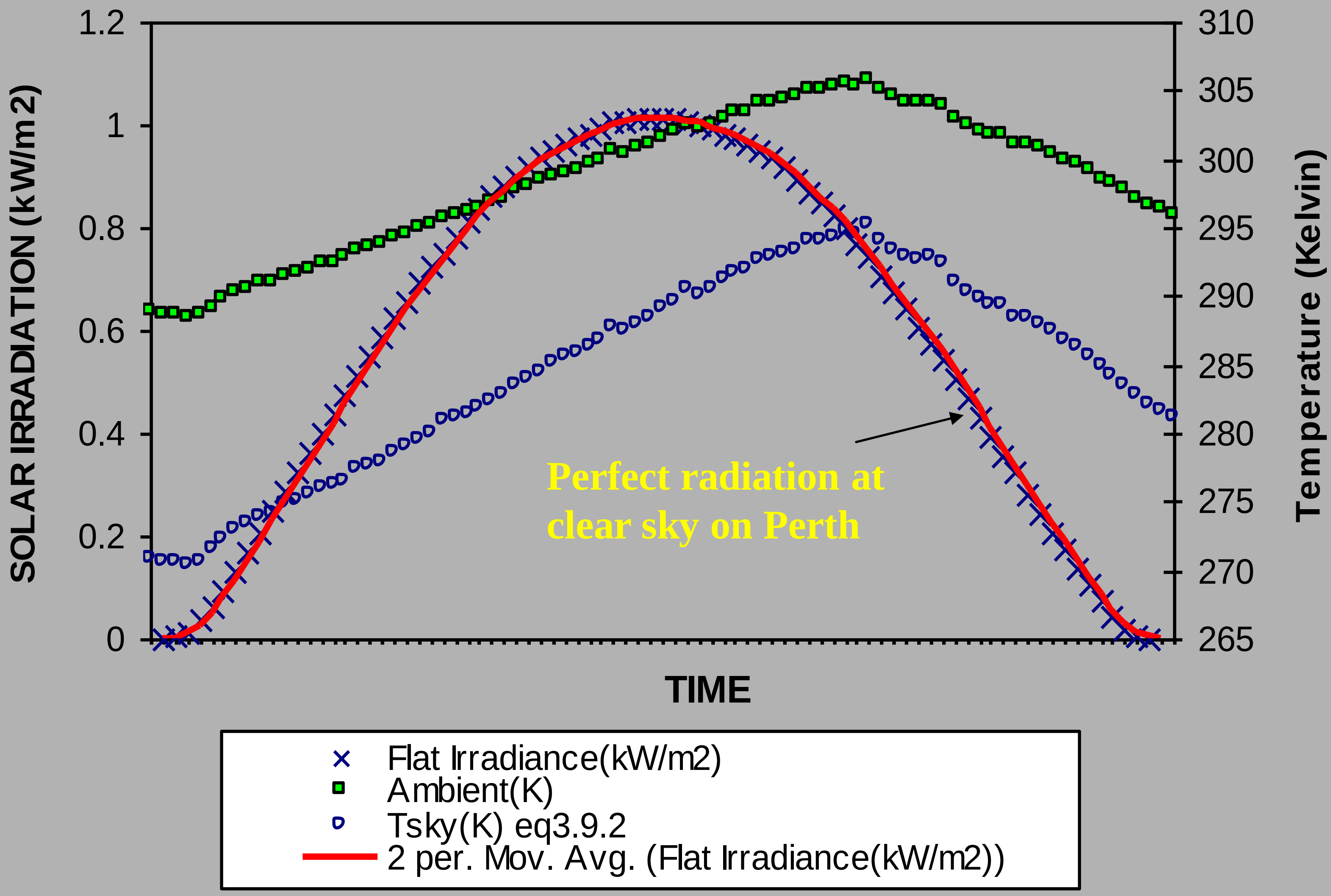
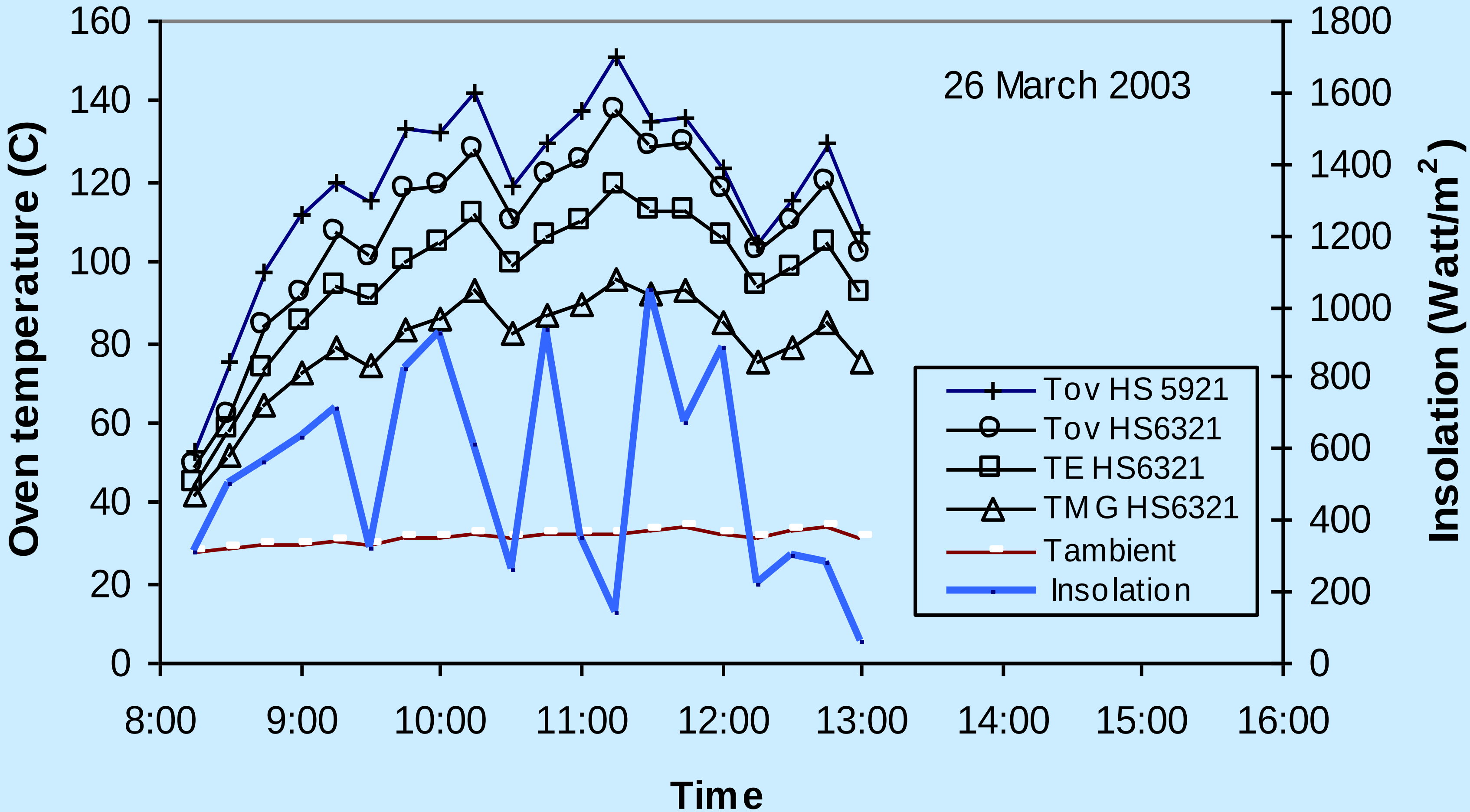


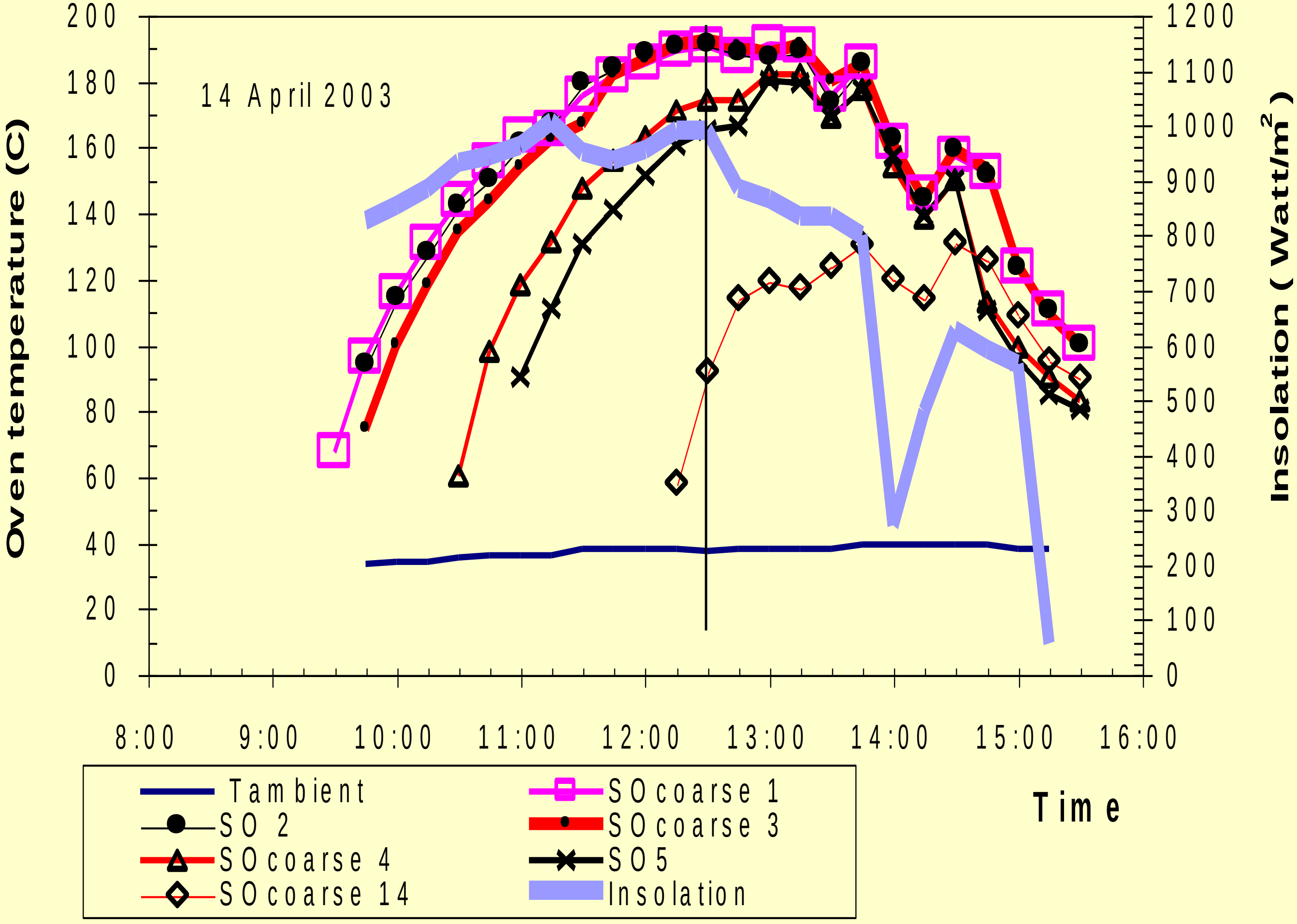
Fig. 68 On 17 March 2003 the solar cooker HS5921 and HS6321 apply a thin aluminium net lined on the oven chamber surfaces, while on 12 March 2003 these cookers applied no alumunium net. The oven temperature of HS6321 is always higher that that of HS5921. On 17 March 2003, the oven temperature of HS6321 reached 177 C at 13:00.



Solar irradiation pattern on Perth (31.5 south latitude, 115 east longitude) in clear sunny day on 15 February 1999.



On 26 March 2003, the oven temperature profile of HS 6321 is lower than that of HS 5921, while on 17 March 2003 is higher. It is deduced that the high temperature reached on 17 March 2003 has damaged the silicon rubber sealant and reduce the heat tight quality.

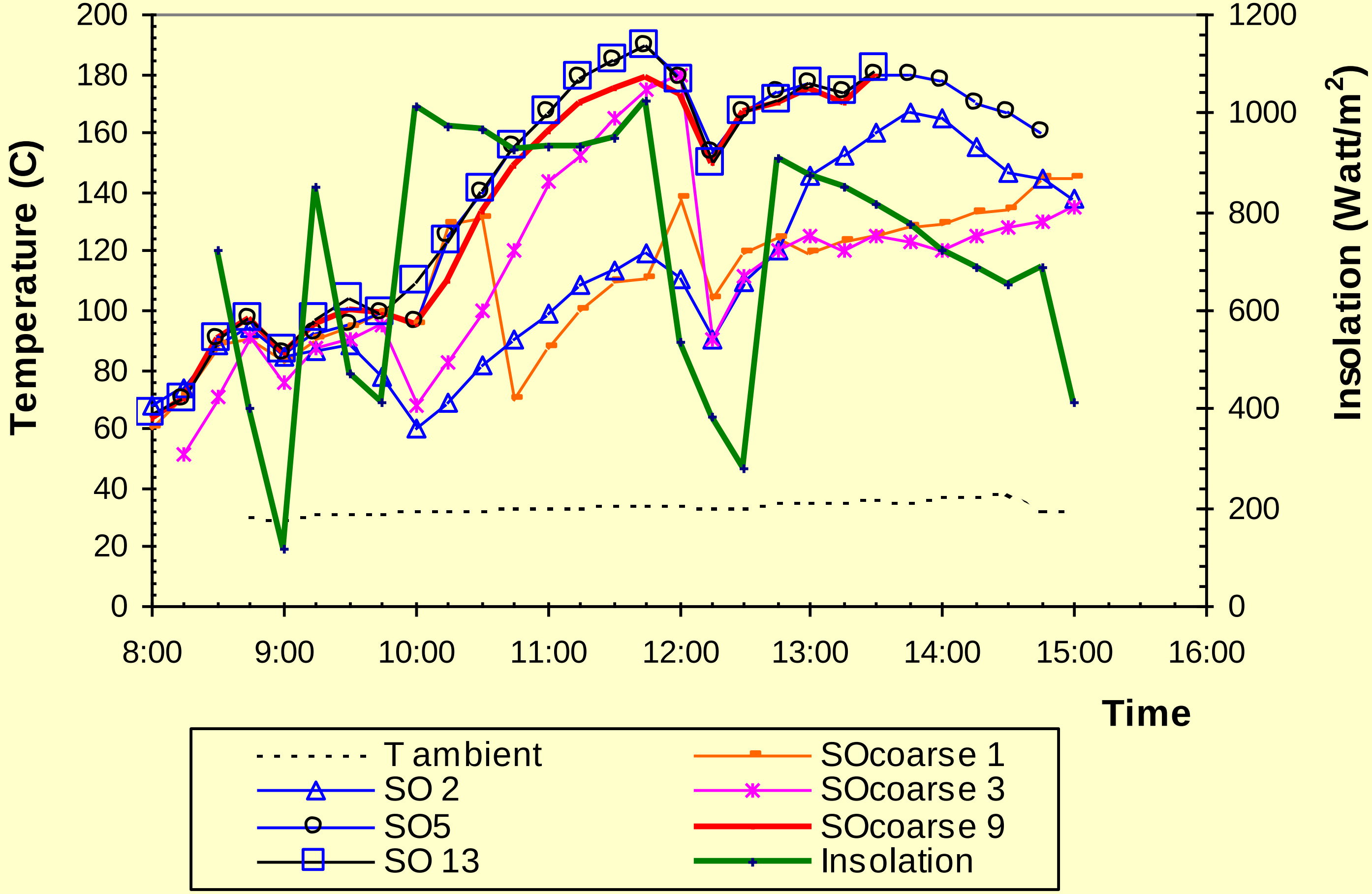


The performance of six Solar Box Cookers Type HS6021 at tested without load on 14 April 2003.

SO coarse1 reach 190 C at 12:30, SO 2 reach 191C and SO coarse3 reach 192C.

The solar cooker with thin aluminium net (to create a coarse absorber surface) performs slightly better than that without net.

SO coarse4 was exposed to the sun at 10:15, SO 5 at 10:45 and SO coarse14 at 12:00. On this day, SO 5 reached 180C at 13:00.



Performance of six Solar Box Cookers Type HS6021 at test with and without load on 15 April 2003. SO5, SO13 and SOcoarse9 were tested without load.

SOcoarse1 for cooking: 1.1 kg tempe (10:35 -11:50) & 1.75 kg rice in water plus nut (12:00 -end)

SO2 for cooking: 1.5 kg fishes (9:35 -11:20) & 1.6 kg fishes (11:45 -12:40) then empty

SOcoarse3 for cooking: 800gr fishes (9:40-11:00) and 2.1 kg corn cernel (12:00-end).

PERFORMANCE EVALUATION

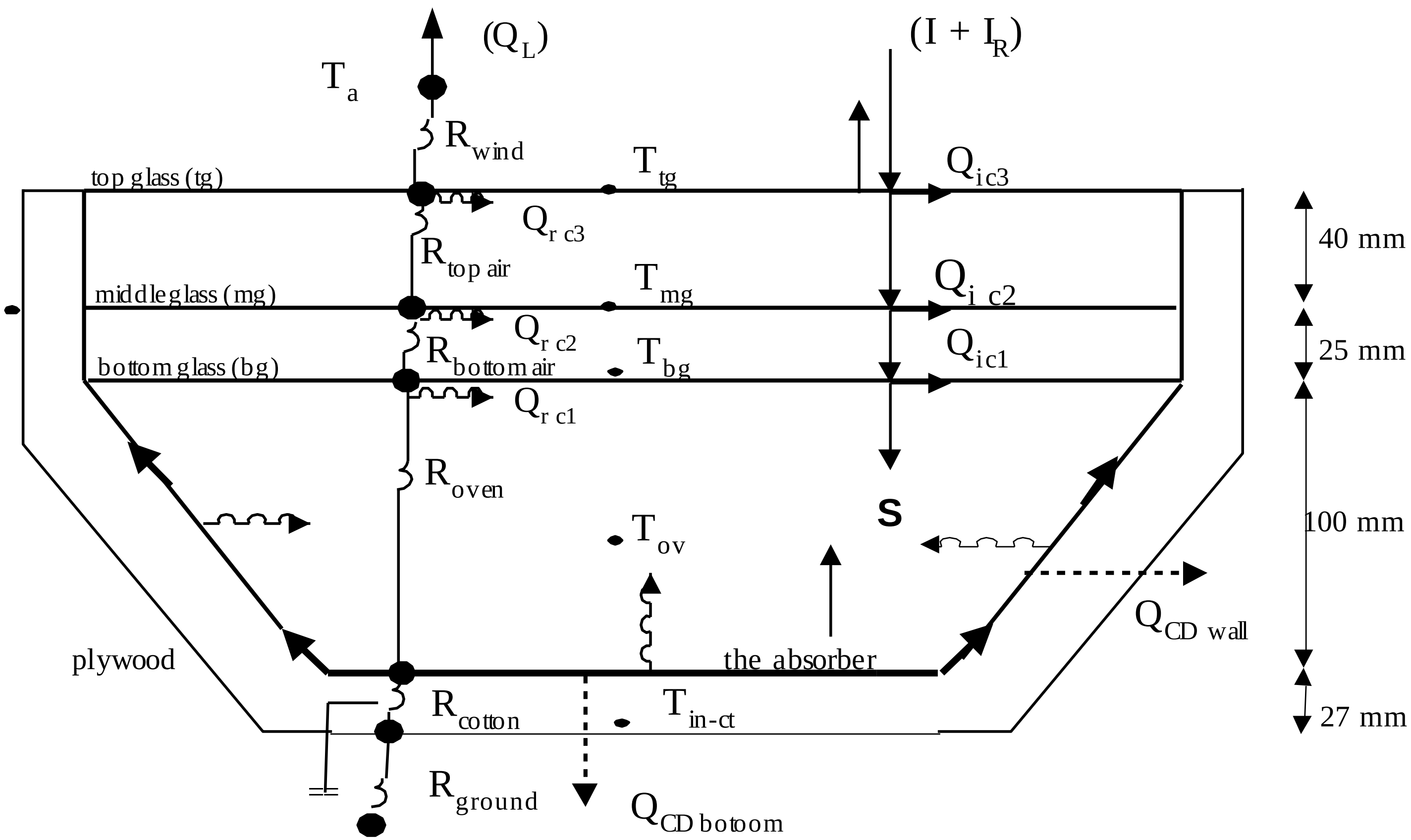


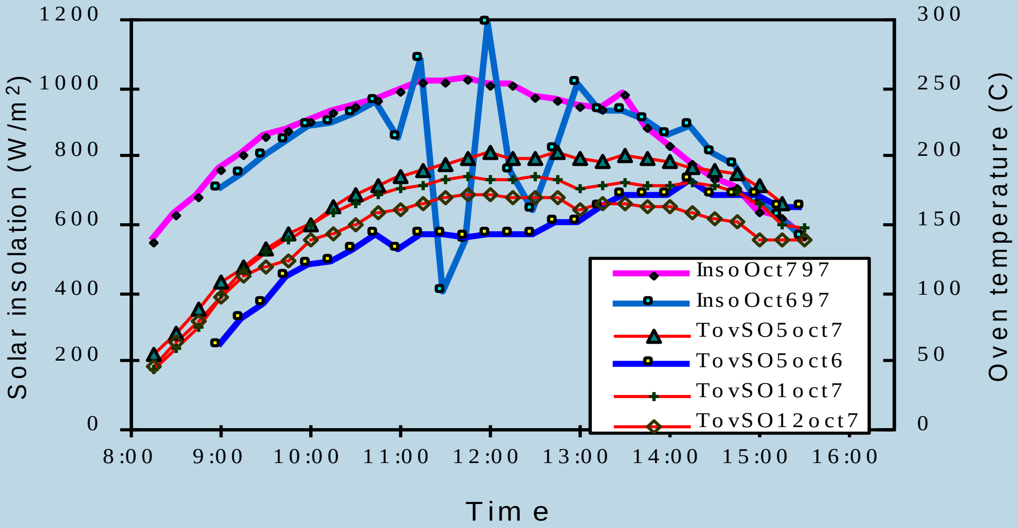
Fig. 2. The thermal network of solar box cooker type HS.

$Q_L = Q_{CDwall} + Q_{CDbotoom} + (Q_{cv} + Q_R)_{top\ cover}$ but $Q_{CDwall} + Q_{CDbotoom}$ is small and neglected.
The energy losses (Q_L) between the nodes are the same, it is written in term of heat resistance between the nodes at the absorber and at the bottom glass: $Q_L = (T_{ov} - T_{bg})/R_{oven}$, or in term of total heat resistance between the absorber and the ambient as: $Q_L = (T_{ov} - T_a) / R_{total} = (U_L)_{av} (T_{ov} - T_a)$

$R_{wind} = 1/(h_{wind} + h_{R\ tg\text{-}Ta})$ $\quad R_{top\ air} = 1/(h_{CV\ mg\text{-}tg} + h_{R\ mg\text{-}tg})$

$R_{bottom\ air} = 1/(h_{CV\ bg\text{-}mg} + h_{R\ bg\text{-}mg})$ $\quad R_{oven} = 1/(h_{CV\ p\text{-}bg} + h_{R\ p\text{-}bg})$

h is heat transfer coefficient, subscript CV represents **c**on**v**ection, CD: **c**on**d**uction, R: infra**r**ed radiation, p: absorber plate. The written dimension is belonging to the cooker type HS 5521. Spiral arrow is thermal flow. Straight arrow is solar radiation flow.



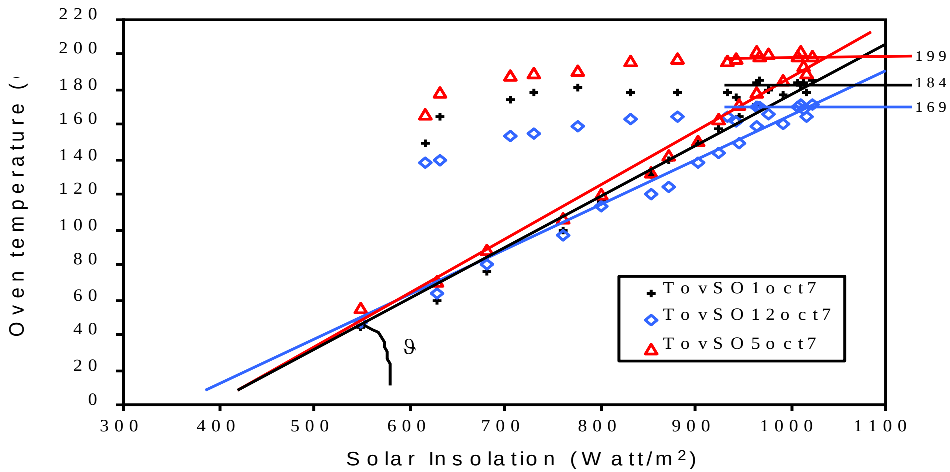


Fig.3a. T_{ov} profile (versus time) of the solar box cooker type HS7033 tested without load on October 6, 1997 for SO5 only and on 7 October 1997 for SO5, SO1 and SO12 at Kerato village, Sumbawa regency, Sumbawa island, Indonesia.

Fig.3b. The heat collection rate of three cookers: SO05, SO0, SO12. The bigger ϑ angle the better the performance in cooking. T_{ovss} of SO5 is 199ºC, SO1 is 184ºC and SO12is 169ºC.

DESIGNED BY HERLIYANI S

1. before steady state: data in the morning,
2. quasi steady state: data around the noon and
3. after steady state: data in the afternoon.

***The morning data* is shaping a linear trend line: $T_{ov} = \vartheta\,(I) - \Omega$,**
which is then named as a heat collection rate.

This line crosses the negative axis of temperature at Ω, which is named as dark ambient temperature.

Slope ϑ estimates the maximum temperature that might be reached by the cooker of different designs and estimates how low its dark ambient temperature.

This line gives information on how a solar cooker of a certain design will perform if it is operated in different sites where the insolation is greater or smaller.

***T_{ov} data around noon are gathering at the hook point.* This temperature level is named as "Quasi Steady State Average (QSSAV) Level" that dictates the ϑ angle of the HCR line.**

***The afternoon data* is shaping a polynomial curve.**

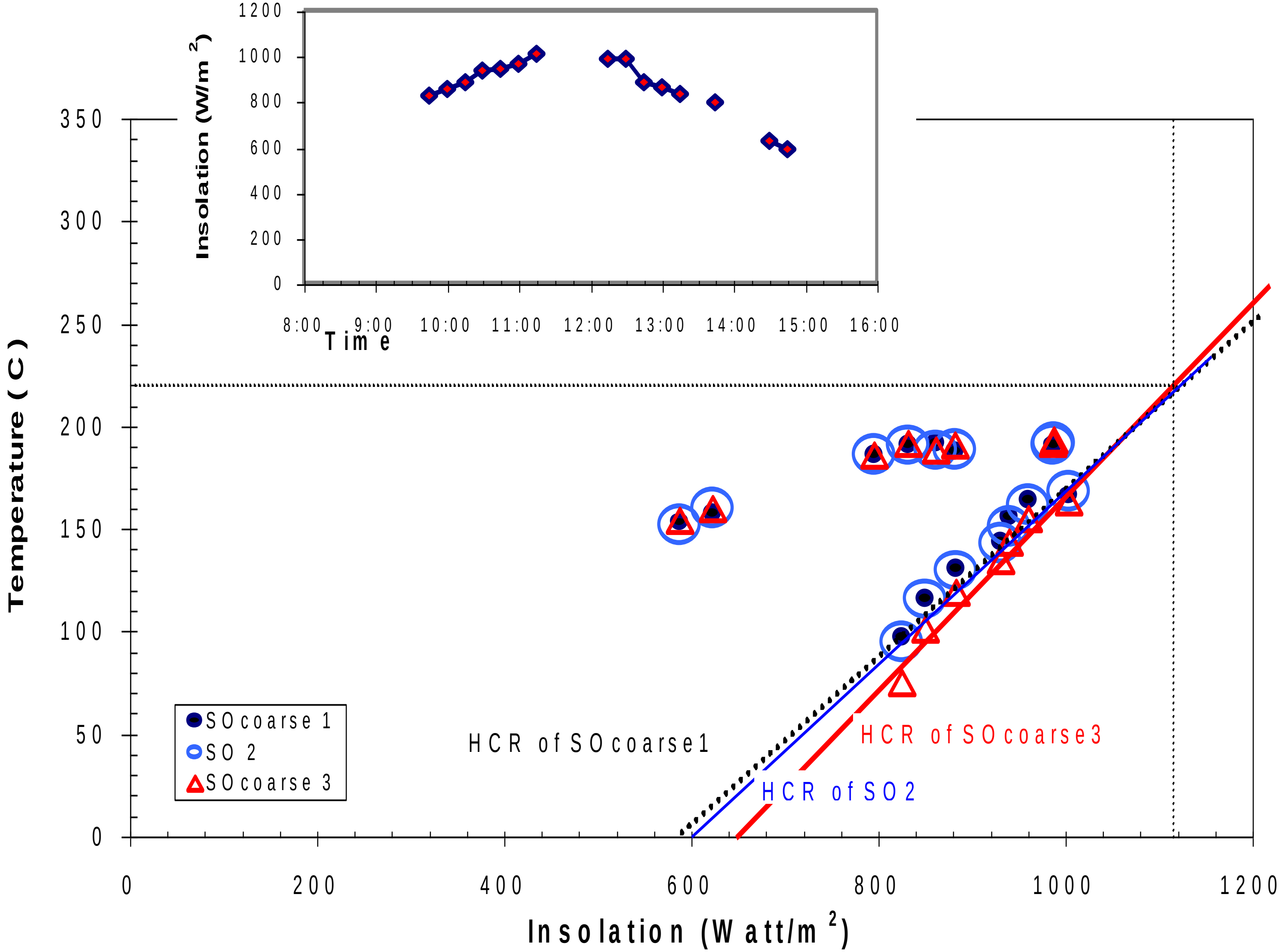


Fig.71 The linear trend of heat collection rate of three solar box cooker type HS6021. In order to get a heat collection rate some insolation data was deleted (see inset). The original solar insolation data can be seen in Fig.70. At the solar insolation as high as 1100 Watt/m 2 these cookers might reach temperature of 220 C

The thermal loss to the upper side per unit area:

$$Q_L = (U_L)_{av} \cdot (T_{ov} - T_a)$$

The convection and infrared radiation loss factors are lumped in $(U_L)_{av}$.

The solar energy absorbed by the solar box cooker:

$$S = (\tau\alpha)_{av} (I + I_R) = I (\tau\alpha)_{av} (1 + \rho_m \cdot f_R \cdot b)$$

I is the insolation on a horizontal surface (Watt/m^2).

I_R is the reflected insolation by the mirror reflector.

$(\tau\alpha)_{av}$ is transmittance and absorptance product.

ρ_m is the reflectance of the mirror. f_R is the design factor.

b is the surrounding factor. For the solar box cooker without reflector: b = 0.

At noon, the incident solar irradiation has no effect on the solar box cooker so that T_{ov} ripples about constant for a significant period.

The possible reason is: $S = Q_L$

At noon: $\theta = 0$ leads to a lesser ground and beam reflection hit the mirror, therefore b = 0, then we have:

$$\frac{(\tau\alpha)_{av}}{(U_L)_{av}} = \left(\frac{\overline{T}_{ov_{ss}} - \overline{T}_{a_{ss}}}{\overline{I}_{ss}} \right)$$

The efficiency: $\eta = Q_u/A_o * I = (\tau\alpha)_{av} (1 + \rho_m f_R b) - (U_L)_{av}(T_{ov} - T_a) / I$

Parabolic Cooker,

promoted by GTZ, Germany during World Summit on Sustainable Development.

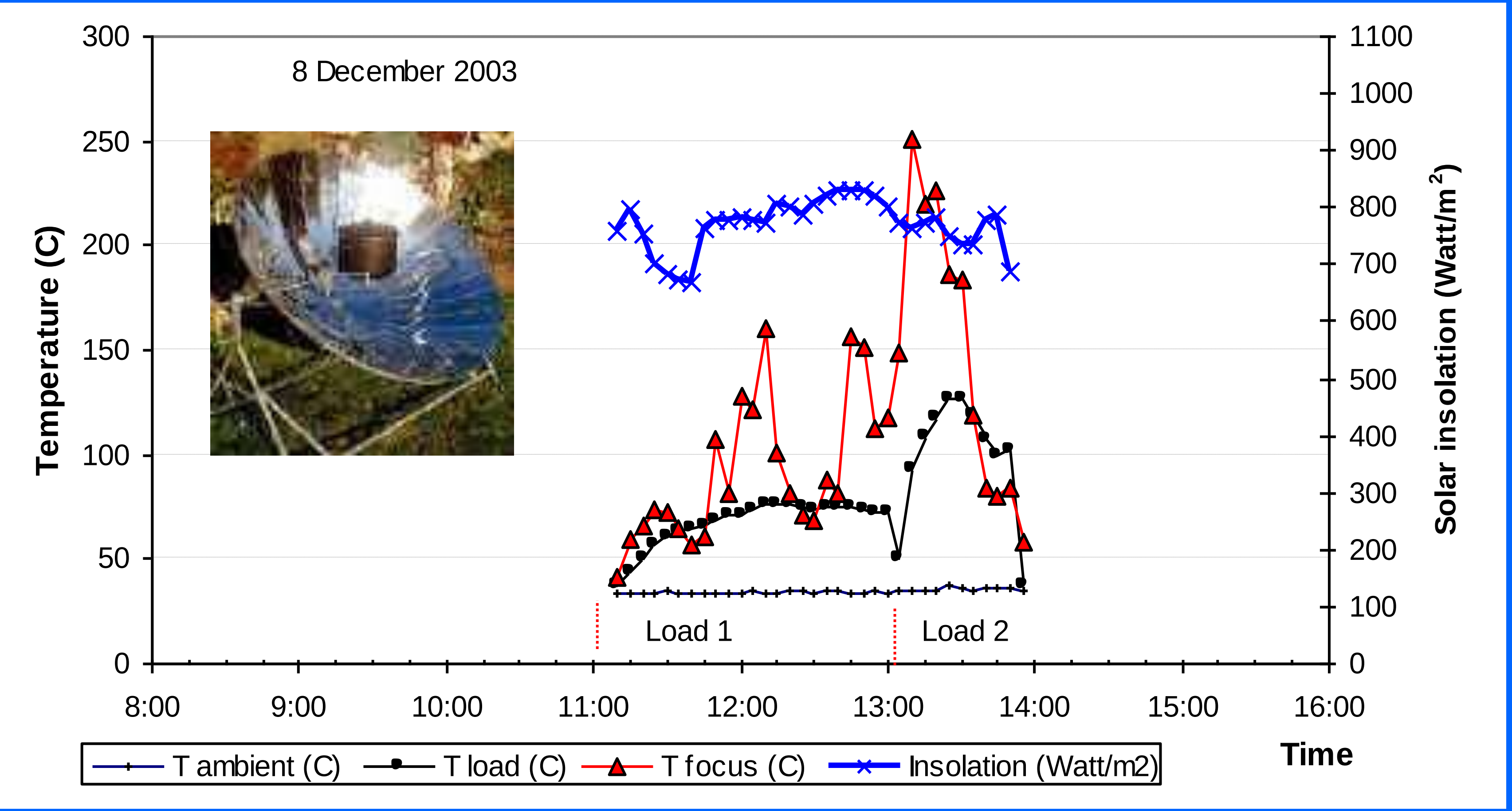


Fig. 4* The performance of concentrator cooker K10 tested on 8 December 2003 at UPT LSDE, Serpong, Java. The cooker was start exposed to the sun at 11:05.

Load 1 : 2 liters water in a black painted pan (having a hump at the center) was start loaded at 11:05. A space under the hump reduces T $_{load}$ sensitivity to follow the profilr of temperature at focus point
Load 2 : 150 ml coconut oil in a flat frying pan (having shinny aluminium colour at the bottom) was start loaded at 13:03. When T $_{load}$ = 106C there are small bubbles come out from a shrimp crisp, which was frying . Temperature oil of 156C was not enough to fry a single shrimp crisp. Need to focus the reflector all the time or the temperature at focus decrease, see T $_{load}$ between 12:10 and 12:45.

For simple concentrator (non-imaging concentrator), the rate for solar energy input to the receiver is (see Donald Rapp, 1981) : $\mathbf{Q_{input} = I\ C_e\ \eta_{optical}}$

I is the total insolation on horizontal surface in watt/m^2, C_e is the effective concentration ratio. $\eta_{optical}$ is the overall optical efficiency, which is the product of τ,α and ρ for light interacting with all surfaces between the entrance aperture and receiver.

The efficiency is: $\eta = [\ I\ C_e\ \eta_{optical} - U\ (T_{abs\ plate} - T_{amb})\ ] / IC_e$ **(1)**

U is the heat transfer coefficient per unit area of the receiver.
He assumed that for flat plate collector having a very good insulator, $C_e = 1$.

$$\eta = \eta_{optical} - U\ (T_{abs\ plate} - T_{amb}) / I \qquad (2)$$

The solar box cooker type HS can be classified as *non-imaging concentrator*
Solar irradiation entering its aperture, its plane receiver distribute radiation onto all parts of the absorber. It has a good insulator. The efficiency is:

$$\eta = (\tau\alpha)_{av}\ (1 + \rho_m\ f_R\ b\ ) - (U_L)_{av}(T_{ov} - T_a\ ) / I \qquad (3)$$

Eq.(2) = eq. (3) if : $\eta_{optical} = (\tau\alpha)_{av}\ (1 + \rho_m .\ f_R .\ b)$**.**
But many scientists state $\eta_{optical} = (\tau^*\alpha)$, then we named the different as
the effective concentration ratio: $C_e = 1.01(\ 1 + \rho_m\ .\ f_R .\ b)$

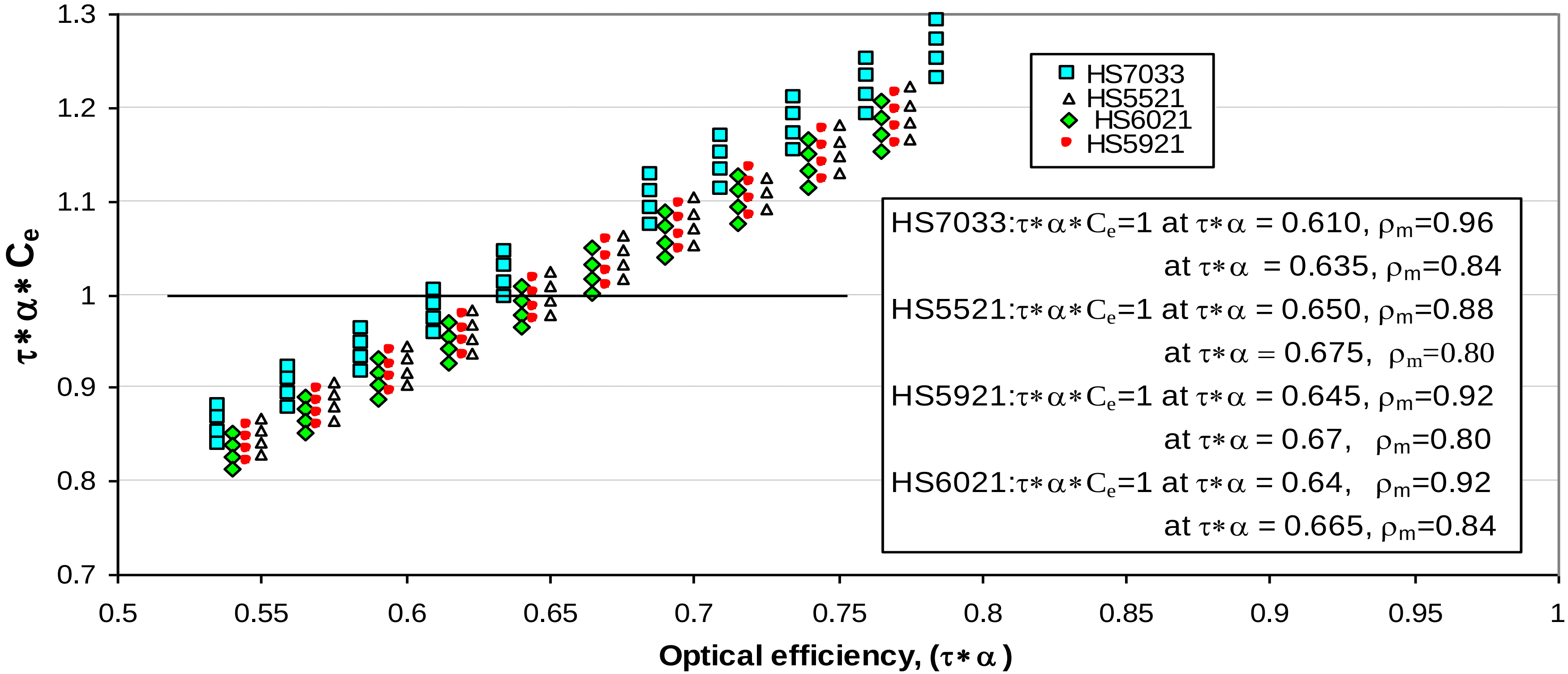


Fig. 4 The optical efficiency ($\tau*\alpha$) versus $\tau*\alpha*C_e$ at various ρ_m : 0.96, 0.92 , 0.88, 0.84 and 0.80

C_e for HS7033 varys from 1.54 to 1.65 while for HS 5521, HS5921 and Hs6021 varys from 1.48 to 1.58

At f_R of HS7033 = 0.8009, $\tau*\alpha*C_e$ =1 gives b_{max} = 0.8212

At f_R of HS5521= 0.8668, $\tau*\alpha*C_e$ =1 gives b_{max} = 0.6739

At f_R of HS5921= 0.8736, $\tau*\alpha*C_e$ =1 gives b_{max} = 0.6700

At f_R of HS6021= 0.8750, $\tau*\alpha*C_e$ =1 gives b_{max} = 0.6689

For a certain design, the value of τ, α, ρ_m and f_R are constant while the surrounding factor varies depending on the test site atmosphere. We did the simulation uses: - various ρ_m: 0.96, 0.92 , 0.88, 0.84 & 0.80; - f_R values of different designs; - various optical efficiency ($\tau*\alpha$) from 0.5 until 0.78; - various surrounding factor (b)

At certain τ, α, and ρ_m, increasing f_R lowering the value of b_{max}. This means lower requirement for a higher value of surrounding factor, so that the choice to place the cooker increase. The design having a higher f_R gives a better performance.

The assessment of theoretical and experimental results shows that *f_R* is vital as this parameter dictates the performance.

Degrading environment that support the living of

the firewood consumers

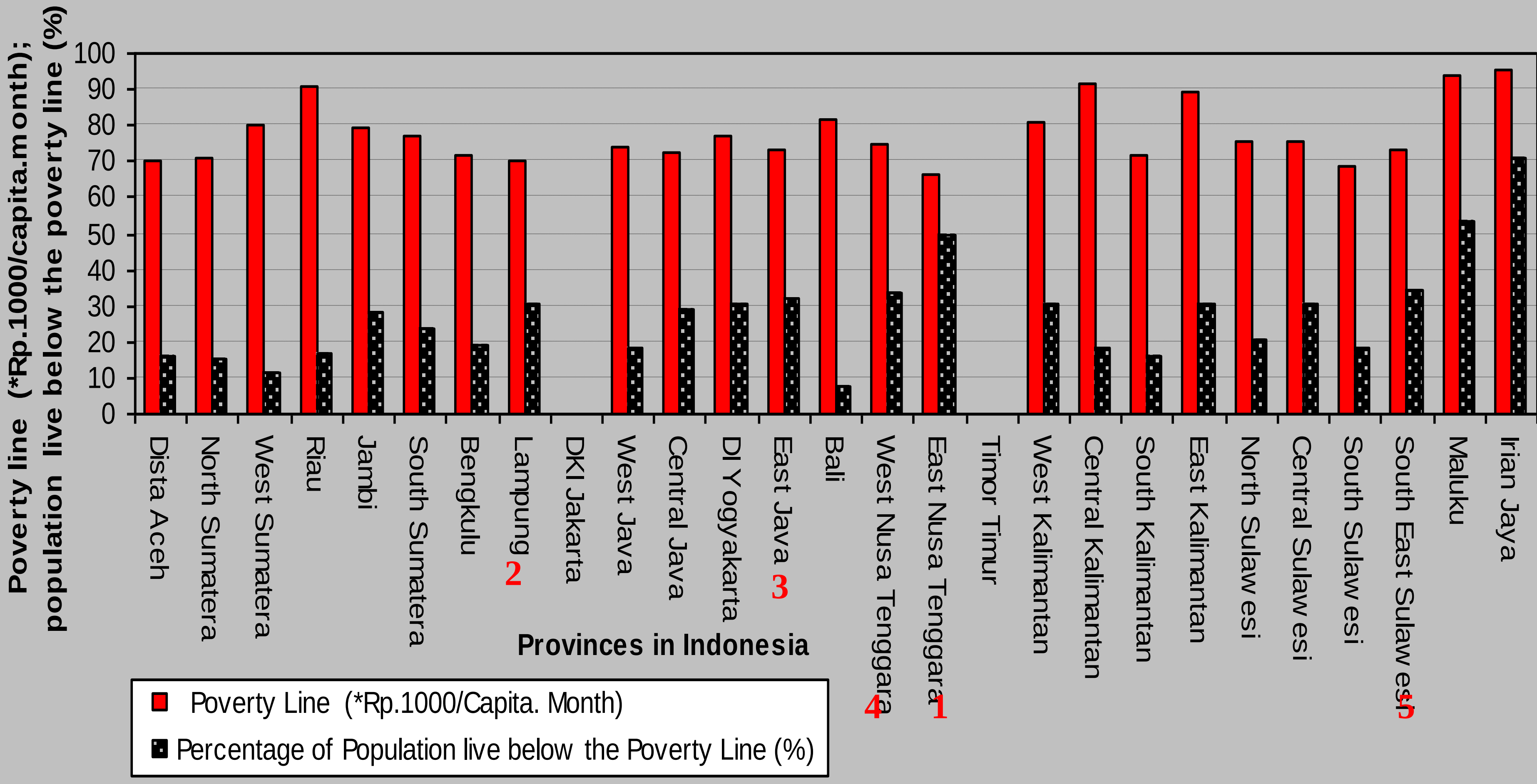


Fig. 5 Poverty line in rural areas by provinces in Indonesia, in 1999.

The poverty line in East Nusa Tenggara is the lowest, that is Rp 66,143.- and 49.39 % of population live below this poverty line, which means their incomes are below Rp. 66,143.-

Source: Statistik Indonesia 1999, BPS (2000, p597). Note: US$ 1 = Rp 8241 per 10 June 2003

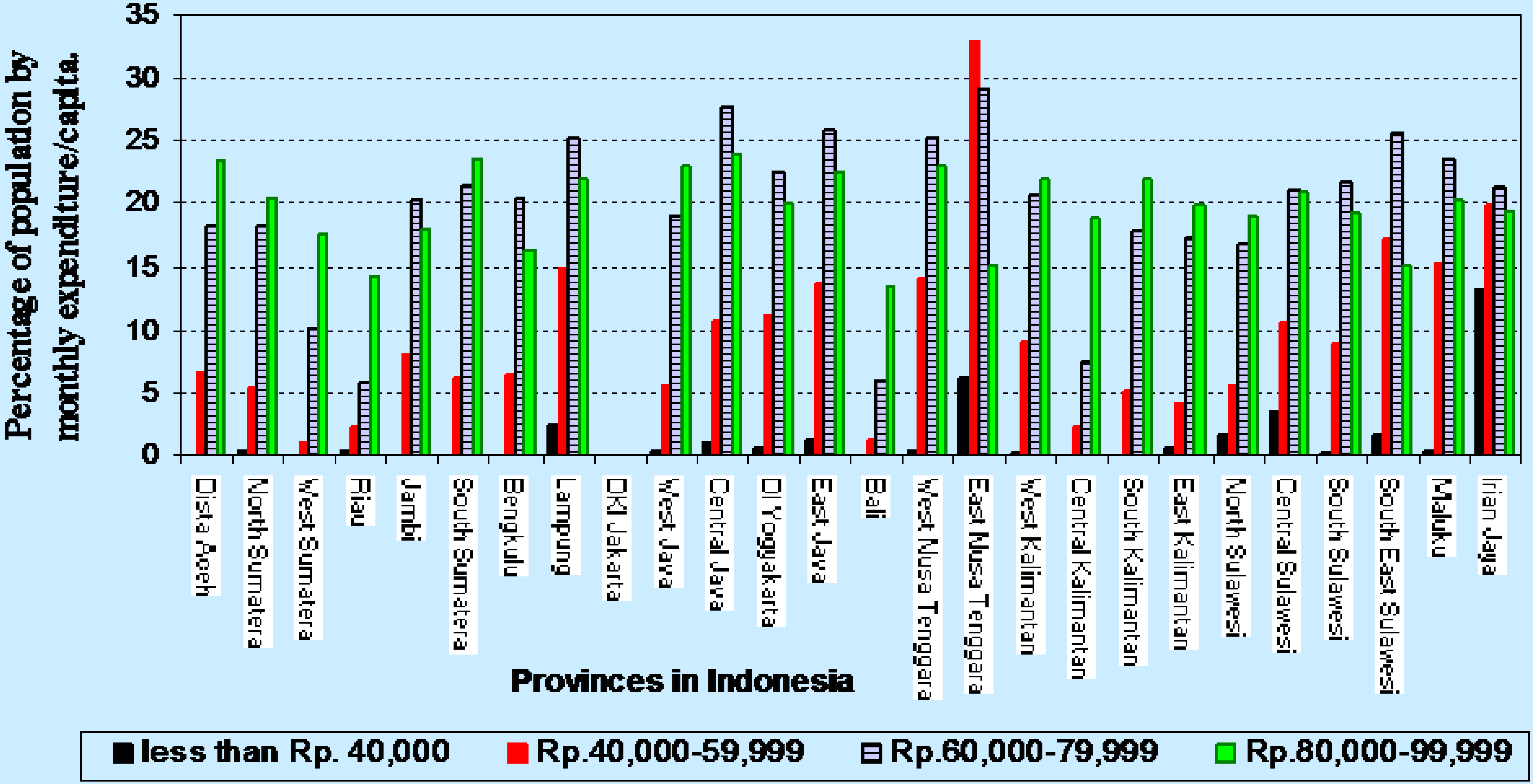


Fig. 88. Percentage distribution of population by monthly expenditure per capita, in rural areas of various provinces in Indonesia, per 1999. Only 4 expenditure classes until Rp. 99,999.- are shown.

Source: Statistik Indonesia 1999, BPS (2000: p.528).

In East Nusa Tenggara, 32.98% of the villagers spend Rp. 40,000-Rp. 59,000 in a month.

The socio economic survey in 1999 (BPS, 2000: p.504) shows:

The average of monthly expenditure per capita

in rural areas was Rp. 109,523

62.9% was spend for food.

The poverty stays and becomes chronic as they have only **38.1% for non- food**

The lowest was in East Nusa Tenggara
in the range
Rp.40,000 - Rp.59,999
(US$ 3.4 – US$ 7.4)

The firewood consumers never feel the meaning of fossil fuel subsidize.

Degraded environment make the rural women to work harder.
Inability to overcome social situation such as gender discrimination add their burden, less food, poor health and inability to provide a better education to their children.
This poverty is inherited to their malnourished baby.

The children grow then life in similar levels of education, similar well-being and similar jobs as their parent.

Seems difficult to alleviate this poverty cycle.

However, the participants in the training "technology transfer of solar oven“ do not loss their spirit to learn

In this minimum standard of living, they have proved their strong willing to improve their situation positively.

A little transport money as an appreciation for their good spirit in learning is meaningful to reduce their burden.

If the number of low-income peoples is dominant, sustainable development becomes a difficult choice to be taken. The pressures to improve standard of living push people to exploit the natural resources. THEN…………

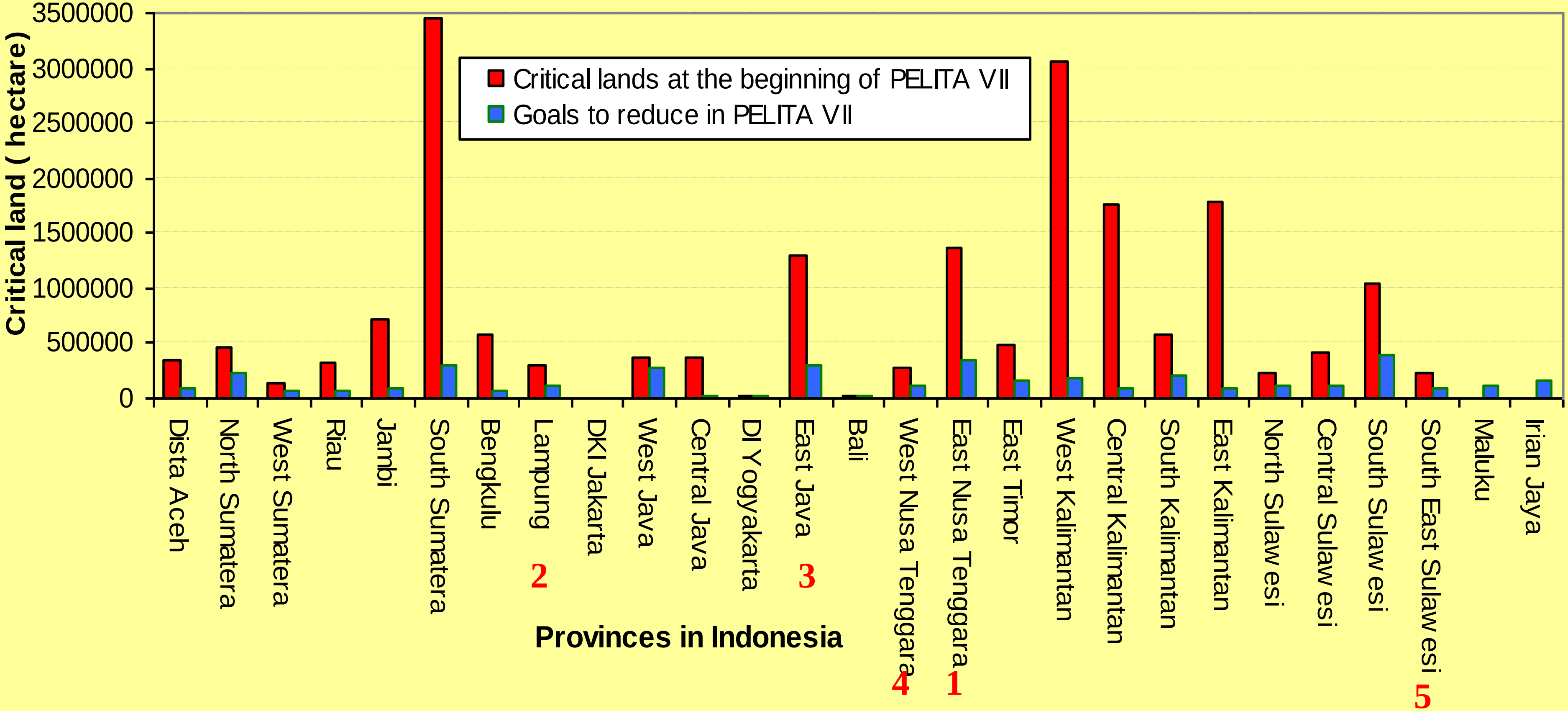


Fig. 6 The critical lands by provinces and the rehabilitation program to reduce critical lands of Indonesia in the 5-years development period: 1999 - 2003 **(PELITA VII)**

Critical lands in Kalimantan is 7.179 million hectares in total.

Source: Statistik Indonesia 1999, BPS (2000, p 217).

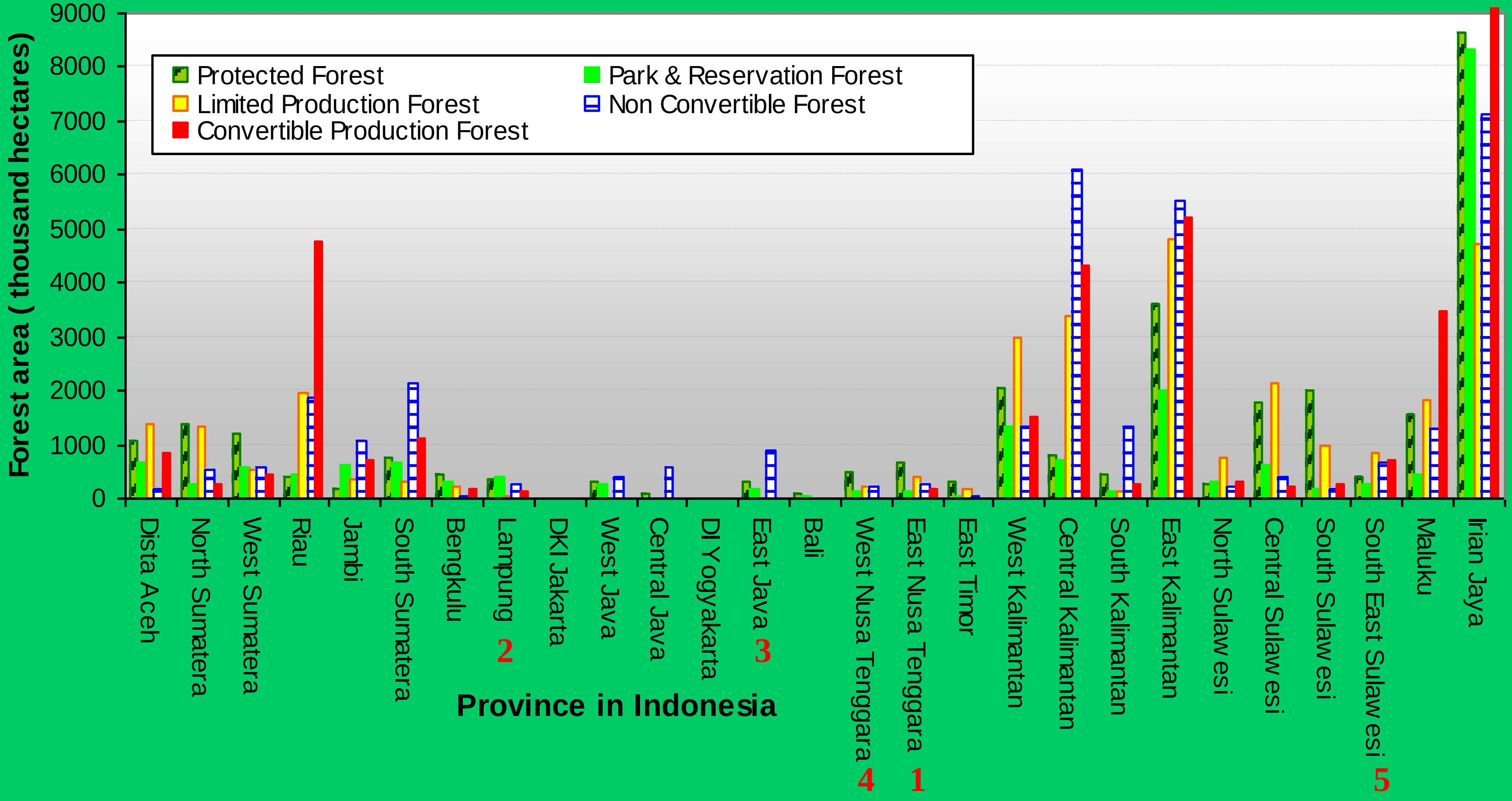


Fig. 7 Forest area in each province based on agreed forest land use, per March 1998.

Convertible production forest in Irian Jaya is 11775000 hectares.

Source: Statistik Indonesia 1999, BPS (2000, p 214).

Getting funding flows
to these destitute peoples is very tough.
These peoples have a low level of education,
have no network as a guarantee therefore
they need a concealing.

However, the concealing mechanism should be designed in effective way to drive a greater percentage of funding flows to the poor.

Volunteering system might improve this.
It is a need to bring every finding into the attention of international policy makers in order to break the funding scarcity in helping the poor live in barren areas of the world.

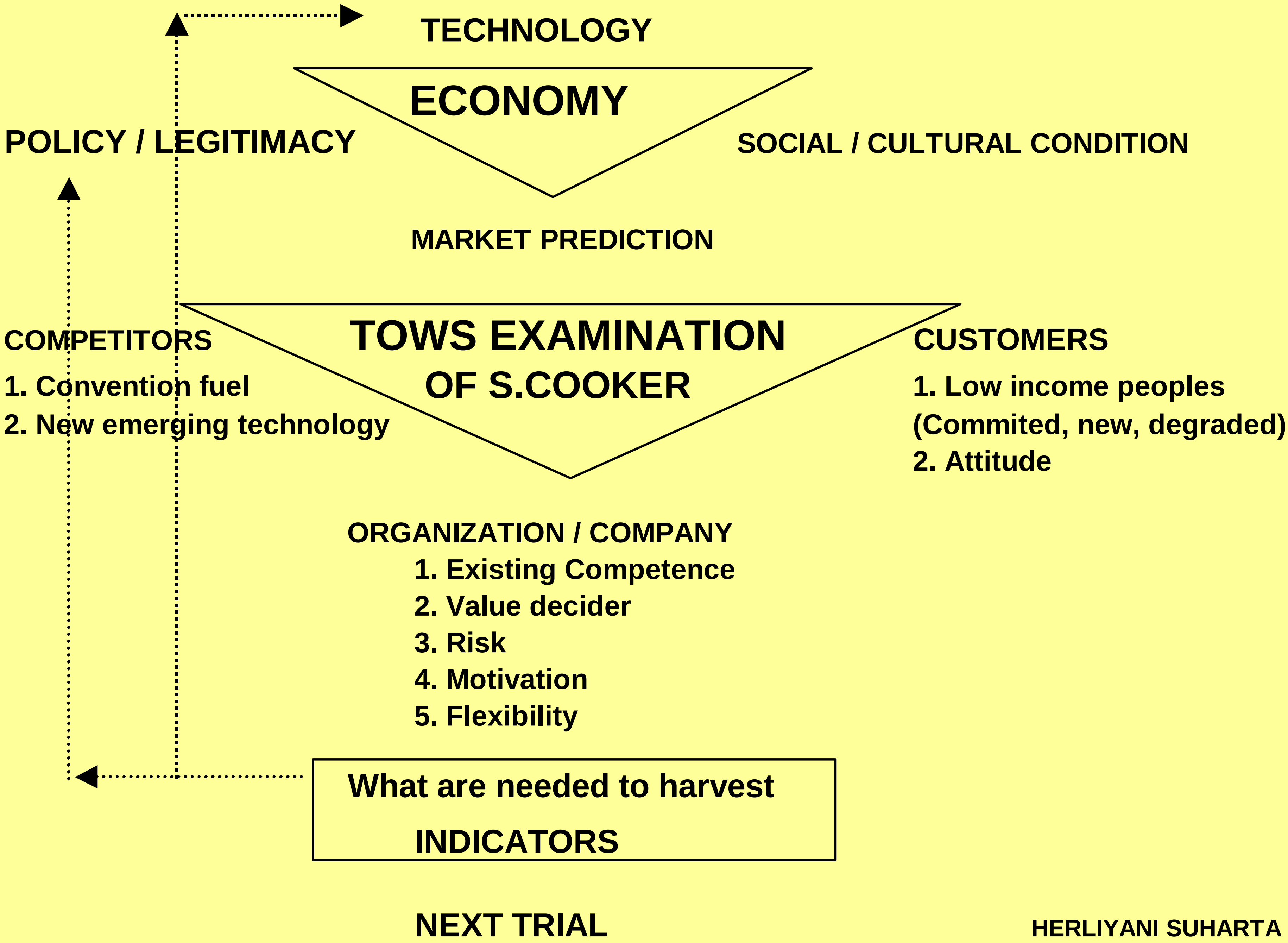
The involvement of the government is urgent. Create a huge program for solar cooker dissemination, as the choices are:

* to revamp the policy framework to be easily work in practice and to allocate a partial funding of support,

or

* the environment will be depredated severely lead to a more chronic poverty in the country.

BIRD EYE
for Social Acceptance



HERLIYANI SUHARTA
Nairobi, 22 February 2005

SOLAR COOKER — CUSTOMIZATION

↓

DELIVERY SERVICES — CUSTOMIZATION

↓

EXPERIENCES

↓ — CUSTOMIZATION

TRANSFORMATION EXPECTED FOR CHANGE

↓ — CUSTOMIZATION

COMERCIALITATION

Need to explore

STRATEGY

1. Mapping & segmentation
2. Fitting and targeting
3. Positioning

TACTIC APPLIED

1. Tactic derivation
2. Marketing Mix
3. Selling

VALUE EXECUTED

1. Brand as indicator
2. Service to aim change

BE AWARE

SLOW ACCEPTANCE IS NOT A FAILURE, so encourage all the existing efforts of change. Whatever amount of progress is a good achievement.

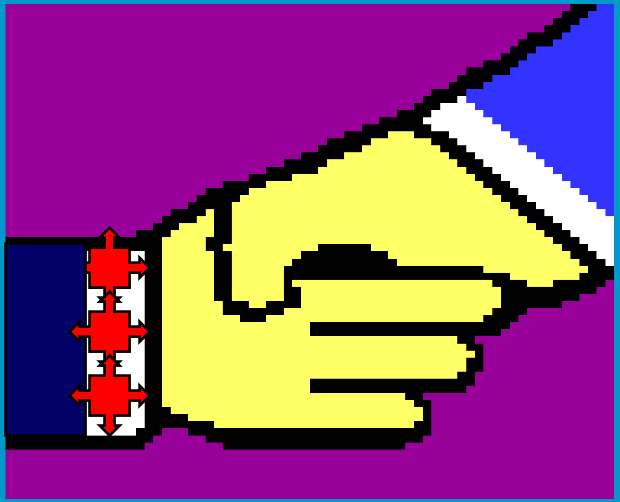
IF GOOD ACTION IS EFFORTED AS CHILDREN WATCH THE PARENT USING SOLAR COOKER.

They will grow up and might be the good seeds for a new vision.

Therefore we must enthusiastically push every effort, plea the effort, give courage to raise optimism in delaying the growing environmental problems: GLOBAL WARMING AND CLIMATE CHANGE.

* In the longer term, greater understanding might arise from multiple sites and could help to shape a fundamental framing of policy problems.

* The field research findings into the broader impacts within the policy elite might help shift the policy debates in providing facilities and funding for this type of community education in gender equity basis.



No technology will spread by itself

It needs: -Your thought, - Your hand, - Your help - Your support

Effort in Renewable Energy dissemination involves:
- Central Government Initiatives
- Local Government Initiatives
- Private Initiatives.

- GLOBAL FUNDING

The future of our country is in your hands

NEED HELP FOR

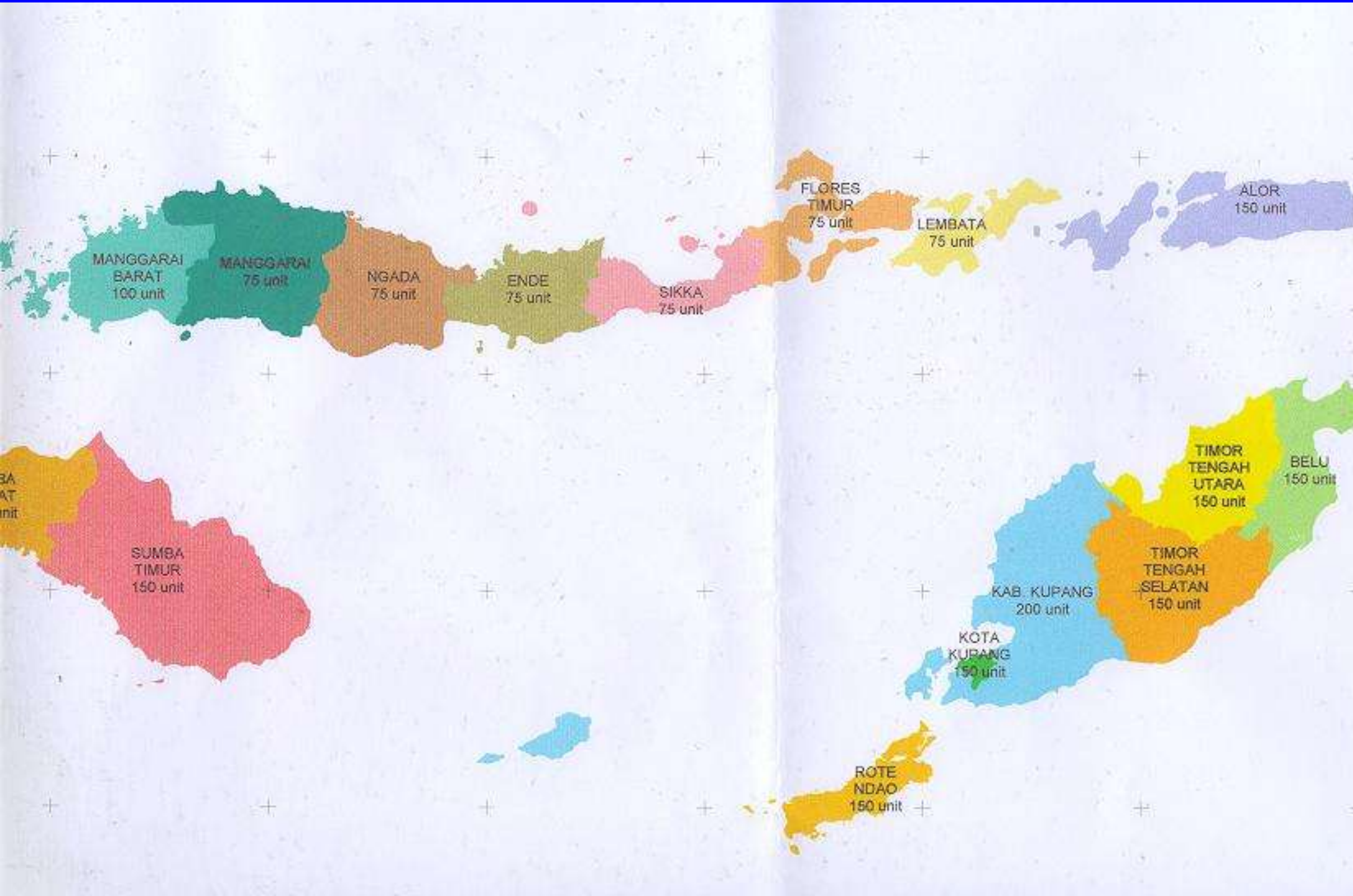
Mass Dissemination

NEXT PROGRAM

* EAST NUSA TENGGARA

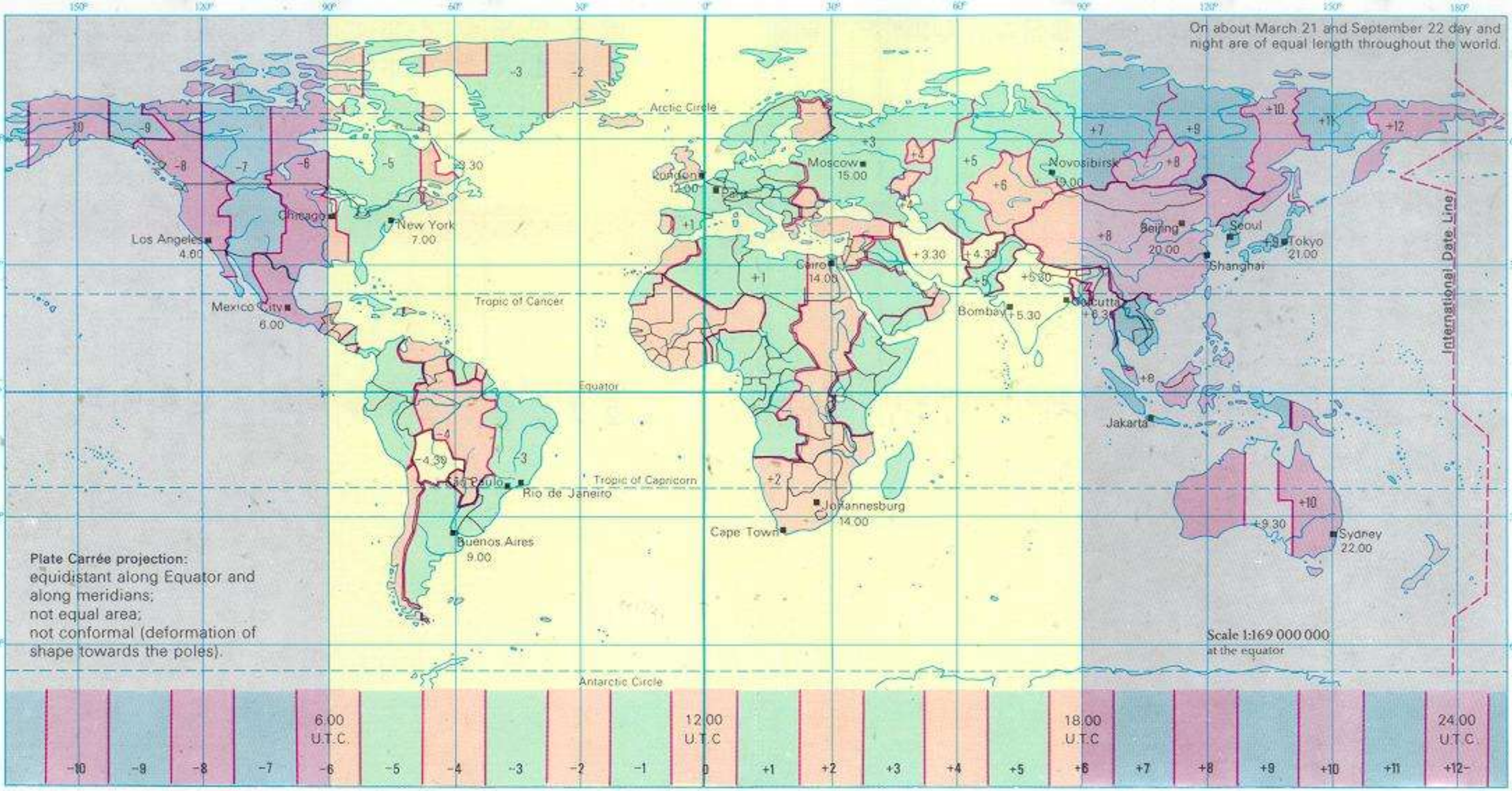
* South Sulawesi

16 Regencies in East Nusa Tenggara require 1950 solar cooker.



South Sulawesi

/////// year 2005
xxxx year 2006



About December 22 at 12.00 U.T.C.

Daylight:
north of Arctic Circle: 0 h.
London (51°30'N.): 8 h.
at the Equator 12 h.

About June 21 at 12.00 U.T.C.

Daylight:
north of Arctic Circle: 24 h.
London (51°30'N.): 17 h.
at the Equator 12 h.

Direction of Earth's rotation. The Earth rotates on its axis from west to east and completes one rotation in about 24 hours. The Earth has been divided into 24 Standard Time Zones. The lines separating these Zones on land mostly follow country or province boundaries. Many countries however use a different standard, eg. British Summer Time.

ENVIRONMENTAL IMPACT

1.Energy harnesses from the sun

Each cooker can give 2-3 $KW_{thermal}$ in a day

(6 hours from 9:00 to15:00)

Assume that the cooker is used only 146 days a year (40%), 500 cookers will provide thermal energy as much as

(500 x 3 x 146 x 6 x 3600=)

4730 Giga Joules/second in a year.

This equal to 1.314 GWh_e

ENVIRONMENTAL IMPACT (continu)
2. Carbon credit

- A coal fired power plant might produces 1000 tonnes CO_2/ GWh_e .
  If we compare this to the energy harnesses from **500** solar box cookers, these cookers will have saved pollution of 1314 tonnes CO_2 eq. / year

- Assume that the abatement cost is 10 US$ per ton CO_2 eq. , the use of 500 solar cooker will collect yearly carbon credit of 13140 US$
  This equals to the prize of **438** solar cookers (if the cooker price is about 30 US$).

ENVIRONMENTAL IMPACT (continu)
3. Re-forestation impact

- The use of 500 cookers is assumed will archive 40% fuelwood used by 500 families which is equal to 27000 kg wood / month (each families uses 135-180 kg wood / month).

  This wood saving is equal to save 42 trees of 4-years old from cutting per month or 500 trees per year.
- The use of solar cooker contributes aforestation in barren area and give an additional facilities for terrestrial carbon sink. This aforestation cost is assumed equal to the price of **218** cookers

ENVIRONMENTAL IMPACT (continu)
4. Community education beneficial.

- Community education approach to make 500 cookers involving 1000 participants. This approach is rated as benefit in the form of:
  - Local abilities in making another 500 cookers in the future.
  - Raise the awareness of the locals on gender equity, health issues and on the environment al issues: DEFORESTATION, GLOBAL WARMING AND CLIMATE CHANGE.

These impacts are rated as the price of **750** cookers.

ENVIRONMENTAL IMPACT (continu)

5. Value of SUN COOKING program via community education

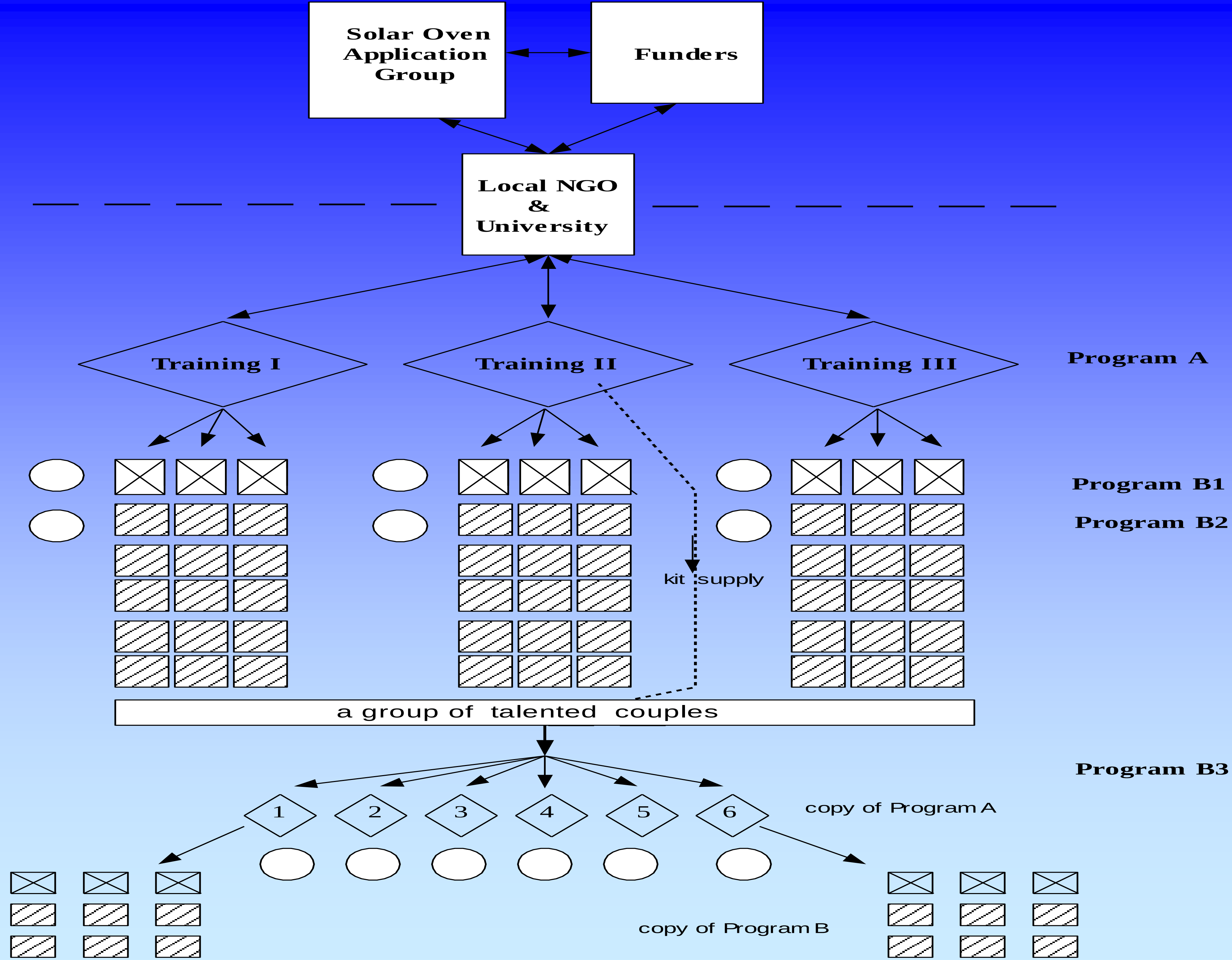
This SUN COOKING program will have the multiplication factor of {(438+218+500+750)/500 =} 3.8

or equal to

(3.8 x 500 x 30 $ =) US$ 57000

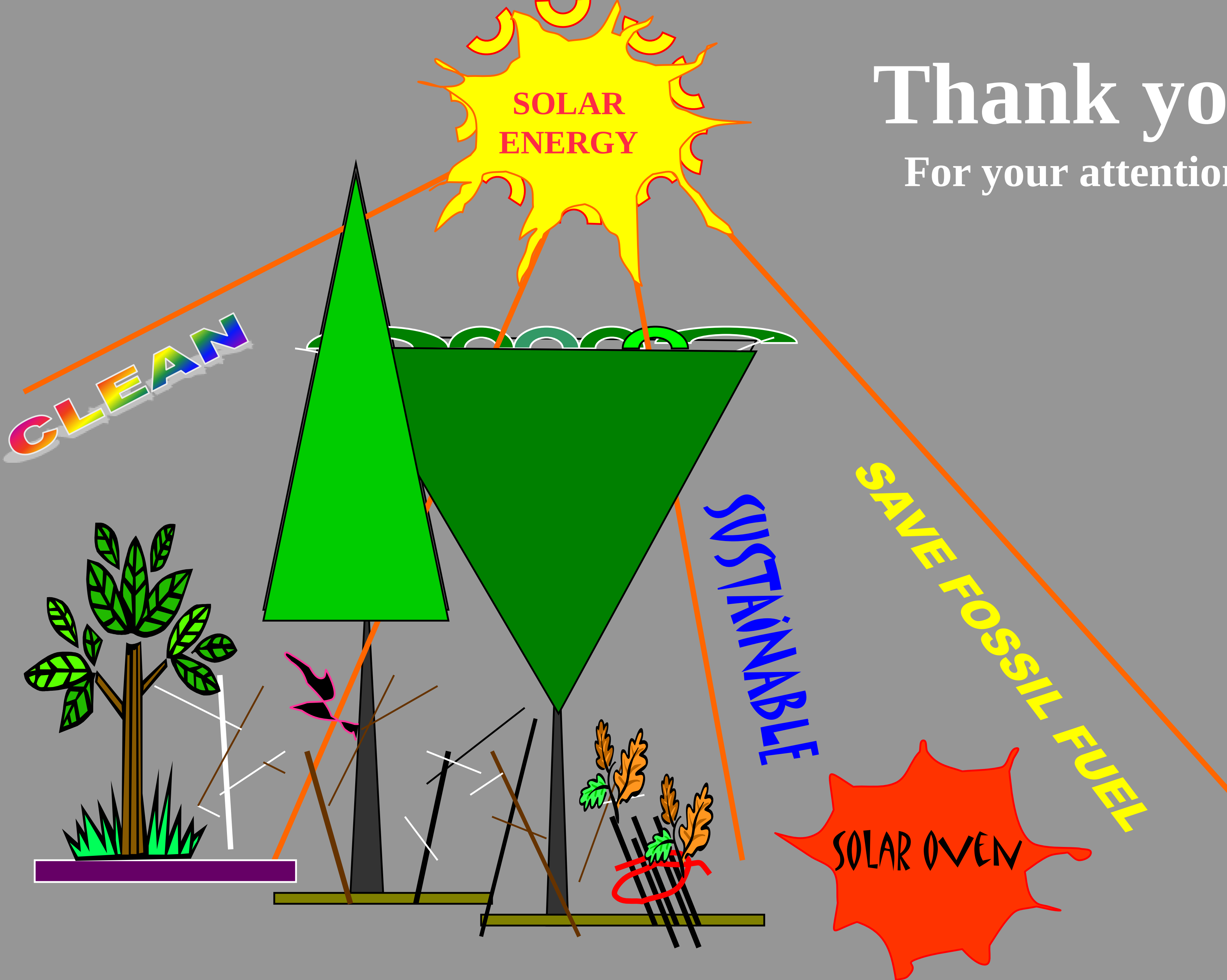
This offer a good reason to finance Sun Cooking Program in barren area where wood is limited, especially if the CO_2 mitigation cost will not going cheaper as the concentration of CO_2 in the atmosphere raise steeply while the world's carbon sink quality degraded.

When people become use to sun cooking and no need to do a community education then pure business can be run


Solar Oven Application Group
Funders
Local NGO & University
Training I
Training II
Training III
Program A
Program B1
Program B2
kit supply
a group of talented couples
Program B3
1
2
3
4
5
6
copy of Program A
copy of Program B

Thank you

For your attention



Bambo