Renewable Energy: Indonesia

I. Improved Cook Stove

Kitchen Improvement in Small Scale Brown Sugar Production in Kulon Progo, Yogyakarta, Indonesia

The improved cook stove was identified as one of the best practices in the field of renewable energy. The project was initiated and conducted by Yayasan Dian Desa (YDD), a leading NGO in appropriate technology implementation in Yogyakarta, Central Java in cooperation with other NGOs and local government. In the case of the improved cook stove implementation in Kulon Progo, Yogyakarta, YDD also cooperated with Asia Regional Cook Stove Program (ARECOP) and local government. The project was selected as one of the best practices due to its multiple benefits for household particularly for women. The major positive impacts were related to the improvement of women's health, reducing environmental problems and increase in the productivity of the industry. Others contributing factors to the success of the project were that the project used a participatory approach in implementing their activities. Therefore, men and women were invited to make their own improved cook stove by themselves. YDD only provided technical assistance.

(1) Background / Context

Kulon Progo district is located 35 kilometers to the west of the municipality of Yogyakarta. One of the sub districts of Kulon Progo, Kokap, served as a trial area for the improved cook stove (ICS). Two villages were selected as the sample for this study, since those villages mostly used the ICS for home industry purposes. The villages were, Hargowilis and Hargotirto. The soil types in those villages are lotosol, regosol, grumusol and alluvial. Kokap is at an altitude of about 450 meters above sea level with humidity varying from 75 percent to 82 percent. It has ideal growing conditions for the coconut palm. Population density in Hargowilis is 539/km^2 and in Hargotirto 550.6/km^2. The majority of the populations in those villages are farmers and farm workers. Men are mainly rice farmers, while women mostly had made palm sugar. Many of them also consider the production of palm sugar as a secondary occupation that provides them with ready cash. The numbers of households that produce palm sugar are 293 in Hargowilis (20 percent of the total village population) and 742 in Hargotirto (50 percent of the total village population).

Most of the kitchen activities and palm sugar production in these villages are done by women and girl children. They use traditional stoves with firewood for their palm sugar production as well as for cooking their meals for the family. The stoves used for processing palm sugar and cooking their food have a very low energy efficiency (approximately 8 percent compared to improved cook stoves). The

primary collectors of firewood are women and girl children. They collect firewood from home gardens and the nearby forest.

There has been a study conducted by YDD in Yogyakarta on the impact of using traditional stoves as well as the risks faced in collecting firewood. Besides reducing time for women's other activities, such as for infant or child-care, the smoke and heat from the traditional stove also has a direct impact on the health of women and children who are the main players in the kitchen. It was identified that there was a high incidence of acute respiratory diseases in women and children caused by smoke and in a severe cases it caused lung cancer. Problems faced during the firewood collection, among others, are snake and insect bites, severe fatigue, allergic reactions, fungal infections, backache, and miscarriage.

Like many other villages in Indonesia, women in Hargowilis and Hargotirto village are responsible not only the domestic chores, such as cleaning the house, cooking and taking care of children, etc, but are also engaged in home industry activities. The women in those villages have a dual burden to bear.

Brown and palm sugar production was introduced to communities in Kokap sub-district in 1997 by a non-governmental organization called Economic Community Studies Group (*PKPEK).* Actually the Ministry of Industry had earlier in 1985 introduced brown sugar production, however, it was not readily taken up by the villagers. It was Yayasan Dian Desa (YDD) who introduced the improved cook stoves in 1987. YDD in collaboration with ARECOP organized a kitchen improvement training in palm sugar producing areas. The training was attended by staff members from PKPEK and a number of palm sugar producers. From then onwards PKPEK begun to introduce and implement kitchen improvement programs in Hargowilis and Hargotirto villages.

YDD was formed in 1972 as an NGO focused on community development, particularly in the field of appropriate technology implementation in the rural areas of Indonesia. At present, YDD implements several technologies for rural development, among others in the area of water technology and the improved cook stove (renewable energy). YDD also provides consultants and training for rural people and other NGOs as well as government institutions. In the implementation of the projects, YDD cooperates with other organizations.

(2) Description of GEST Projects, Programs and Services

Since 1997, YDD in collaboration with the Asia Regional Cook Stove Programs (ARECOP) have organized training in kitchen improvement by introducing the use of new stoves and hygienic practices to women who are involved in palm sugar production. The objectives of the training were to help rural women to increase their palm sugar production as well as reducing a number of health hazards caused by traditional stoves.

Technology introduced to the palm sugar production was the improved two holes palm sugar stoves. Previously they used only one-hole stoves or two-holes with no chimney causing heat and gases to escape around the edges of the pan. The ICS was made from local, freely available materials; mud and clay, sometimes combined with bamboo or rice straw for increasing the strength. The ICS has two holes for two pans. The stoves were built by incorporating user ideas. The main characteristics of the improved cook stove are:

- It has two holes
- There is a grate under the wood burning area so that the ash could be removed and air could pass through the charcoal
- A chimney to draw air into the combustion space and to overcome flow resistance under the pan. The chimney makes the stove smokeless.

The performance of the stove deals with efficiency, evaporating time, specific consumption of wood and power output. Therefore the advantages of using the improved cook stoves are it reduces fuel consumption up to 50 percent, thus reducing time for collecting firewood, reduces health problems due to exposure to heat and smoke as well as reducing other risks caused by firewood collection activities.

The old style stove is without chimney, it has no grate but a pot rest. The space created by the pot rest between the pot and the stove edge allows the soot and smoke to escape and fall into the palm sugar mixture which makes it dirty. The diagram of improved cook stove model for palm sugar processing is shown in Diagram-1

Role of Women

Almost all stages of palm sugar production involve women, including boiling coconut sap, molding, packaging and marketing the product. All palm sugar producers in the village level use biomass fuel and traditional stoves in their production activities. Women as the main users of the stoves, and also make the decision for the placement of the stove. Men usually repair the broken stoves. Unlike industrial activities, women involved in household activities are also responsible for collecting firewood. They spend two to three hours a day to collect firewood.

Beside the implementation of the improved cook stoves, YDD also introduced kitchen improvements in terms of lay out and convenience in order to have a clean and hygienic kitchen. At the end of the year or after completing the project, YDD evaluated the kitchen improvement and improved cook stoves project based on several criteria, which are described as follows:

Safety – This could be considered from the stove aspect. The flame was enclosed and controlled and there was no excessive heat coming from it. Furthermore the kitchen wall was made of concrete with lockable doors and windows.

Comfort – In addition to what has already been discussed above, the stove was also equipped with a chimney, which assisted in channeling the smoke.

Health and hygiene – The chimney assisted in stabilizing the flame intensity. With the chimney, soot production was also reduced and this helped to keep the brown sugar clean. It has been noted that soot could be carried by wind and would fall into the sugar mixture during the cooking process. Workers are also less exposed to smoke when they work with chimney stoves.

Efficiency – previously, production tools were not positioned according to the palm sugar production process. The dish rack needs to be positioned in between the water tank and the stoves to facilitate more efficient flow of movement or to facilitate a more efficient production process.

(3) Project Impact

ICS provide multiple benefits to households, as well as the palm sugar industry. The major impact can be seen on women health, environment problems and productivity of the industry. After implementing the ICS, production of palm sugar almost doubled. With the traditional stoves one family produced about 10 to 15 kilograms of palm sugar a day. By using the ICS they can double the production to 20 to 30 kilograms per day. The increase in production led to increased income for the family.

Both, palm sugar and brown sugar industries need to observe health and hygiene aspects during the production process. As a business enterprise, the industries are also concerned with minimizing production costs. It is therefore appropriate to acquaint users with kitchen improvement and the improved stove in the industry. Kitchen improvement and ICS are expected to improve health, save on fuel, promote more efficient production, improve the quality of the products and improve hygiene in the kitchen.

Practical Needs

Women and girl children are mainly responsible for preparing and cooking food for the whole family as well as producing palm sugar. ICS have provided direct benefits to the women and girl children in Hargowilis and Hargotirto villages by reducing the time and drudgery related to procuring firewood. It has reduced women's workload considerably. It was reported by one of the palm sugar producers that using the ICS can reduce almost four working hours per day, which mainly for collecting firewood and cooking. Smoke and heat exposure caused by traditional stoves is one of the major causes of acute respiratory infections among women, infants and children. The ICS have reduced the heat and smoke and

improved the health of women and children. Women also can double the palm sugar production, 20 to 30 kilograms per day. The increase in production has lead to improved income for the family. Development of the ICS was done mostly by men with technical assistance from YDD.

Strategic needs

The new technology has lead to a reduction in time and the workload of women. This has provided women with wider opportunities to access other economic as well as social activities that are usually dominated by men. Many women have now become managers in palm sugar production and they deal with palm sugar production planning as well as promotion and marketing. Equal participation of men and women, in decision-making has also occurred in the palm sugar production. Before the project was implemented, women were busy collecting firewood, cooking and cleaning the house and taking care of children, which occupied their day until late evening, while men did the marketing after finishing the rice field farming activities. They only met in the evenings in the verandah or in the family room. Now, members of the family can sit and meet each other and discuss the household problems as well as production problems during cooking time, because the kitchen is not so hot and is free of smoke. Women have been involved in the design of the stove, since they are the main users of the stoves. This experience has led to an improvement of their knowledge and skills in designing and using improved cook stoves.

(4) Analysis and Lessons Learned

The ICS was identified as one of the best practices in the field of renewable energy because it is widely used by communities in rural areas and also has a positive impact on the community and the environment, particularly women and children. The ICS can reduce the workload of women in terms of fuel collection and cooking activities. At the same time, the ICS also increase the production of palm sugar, improve its quality as well as reduce time spent in cooking. Thus both the practical and strategic needs of women were addressed in this project. Others contributing factors were that the project used a participatory approach in implementing its activities. All participants, men and women were invited to make their own ICS by themselves, with YDD providing technical assistance. The stoves also required little capital and were made by using local, freely available raw materials found around the house. This project has no subsidies at all for rural people. They even have to maintain their stoves by themselves. YDD provides technical assistance as well as technology information. As a result of the business expansion, many households have made a second and even a third ICS for their palm sugar production activities.

Future prospects for wider replication, especially in rural communities are very high indeed. The majority of the Indonesian populations live in rural areas and almost 90 percent of rural households use biomass fuel with traditional stoves as

their main source of cooking fuel. However, one limitation is that very poor households cannot afford the technology. Some subsidies from various agencies may be required. Other limitations are that the Palm Sugar Association is male-dominated and it was formed as a means to exchange information among palm sugar producers. There has to be an effort from government and non-governmental organization to promote women's participation in the association, since they are the main players in palm sugar productions.

(5) Recommendation for Replication

Women in rural areas have the main responsibility for cooking and others kitchen activities. Therefore, in the process of project identification and need assessment the needs of women should be considered. YDD has incorporated gender perspectives into the project, although the task of repairing the stove still remained the task of the males.

The project brings many benefits for women and the whole community in terms of reducing workload, improving health as well as their financial status. Since there is an association of palm sugar producers in the village, it requires women's participation in the discussion, as they are the main players in production of palm sugar.

Areas for improvement include the strengthening of women's capability in making palm sugar related products through increasing skills and income generating training programs. Such programs could better enhance women's status in relation to the improved cook stove program. For future prospects, the ICS needs to be evaluated and assessed further through R&D. This activity will result in the appropriate stove for the specific user in the village.

II. Solar Oven

SOLAR COOKING TECHNOLOGY (SOLAR OVEN)

Solar Cooking Technology was identified as one of the best practices in the field of renewable energy. The program was implemented by the Energy Laboratory, Agency for the Assessment and Application of Technology (UPT, LSDE, BPPT) in cooperation with local government and the Earthwatch Institute, Boston, USA.

The project was implemented in 37 districts and about 497 solar ovens were made and used by women during the training. The solar oven was invented by a woman and all four generations of the solar oven have a patent. The solar oven is a reliable alternative technology for cooking during the sunny days. Dry and barren land areas are the most suitable for the use of the solar oven. Women have taken much benefit of the solar oven, such as reducing their workload and saving time in firewood collection. Although the technology only works on sunny days, it has

brought great changes to the community, particularly women in using new technology.

(1) Background / Context

In the dry, bare land area of several poor villages of Lombok, Sumbawa and Flores islands of East Indonesia, local people use traditional stoves with charcoal, firewood and others types of bio-mass fuel to cook meals. Women are responsible for taking care of children and domestic chores, such as cooking, washing, cleaning the house, as well as fetching water and collecting firewood.

In these areas where the majority of women use firewood for cooking, women often have to spend two to three hours for collecting firewood. They collect firewood from the area surrounding their homes rather than purchasing it. This firewood is sometimes of poor quality and the conventional/traditional stoves are often made in a haphazard fashion and produce smoke which irritates the eyes, skin and lungs. Daily exposure to smoke caused of lung and eye damage. Another impact firewood collection is related to the health status of women, such as cut and bruises that could lead to tetanus, allergic reactions, fungal infections, malaria and dengue fever, snake or other insect bites and severe fatigue, backache and also miscarriage. The firewood taken from their surrounding environment often resulted in environmental degradation. Another group of women spent a large part of their income for firewood and charcoal also faced problems in budgeting for the family's daily needs.

Most of the people in these areas are farmers. The division of labor between men and women clearly exists. Husbands or men are the income earners for the whole family. Men mostly work outside the house from 6 a.m. or 7 a.m. in the morning until 4 p.m. or 5 p.m. in the afternoon. While women mostly spend their time at home starting at four o'clock in the morning until eight or nine o'clock in the evening.

The need to solve the problems of women's health as well as environmental degradation cause by firewood collection has resulted in the search for alternative methods to decrease the negative impact of the use of traditional stoves to women. One feasible possibility is to use the solar cooker, especially in arid and semi-arid zones of the country.

The Indonesian Solar Cooking Technology was promoted by UPT -LSDE –BPPT. The project was funded by the local government and the Research Center of Earthwatch Institute, Boston, USA from 1995 to 1999.
UPT LSDE-BPPT was established in 1987 based at the Research Centre for S&T in Serpong. It is located about 30 kilometer to the south of Jakarta. The main activities are related to research and application of energy. In the application of

technology for women, particularly in rural areas, the institute used the methodology of training for the trainers.

(2). Description of GEST Projects/Programs/Services

UPT-LSDE-BPPT introduced the use of Indonesian Solar Cooking technology to the women in rural areas. The project was designed to promote a well-engineered and cheap solar cooker. The Center for Field Research and Earthwatch Foundation funded the project for five years (1995 to 2000). Selection of the location was based on the geographical position and the level of sunrays in that location, preferably the bare land such as the beach or open fields. Selection of the participants was done with the help of local government. First, the participants were the firewood users focusing mainly on housewives and second, the level of education had to be higher than elementary school as a prerequisites for acquiring the knowledge, because the training dealt with some measurements and accuracy. The participants had to demonstrate interest in using new technology and be able to work in a new environment, since the solar oven needed an open field for cooking. Others considerations included poor rural areas, high workload of women and environmental degradation.

The basic concept of a solar oven is simply to trap and store solar energy inside a box. The oven was made of 8 to 9 mm thick play-wood and the size of the box is 75 by 75 by 33 cm. The oven was designed with the door on one of the walls. The upper side of the oven consisted of three layers of ordinary glass. A 0,4 mm thick aluminum sheet painted black with commercial spray paint was used as an absorber and it lined the oven's walls and base. Cotton was also used for insulation. A reflector used a 3mm thick mirror to increase the intensity of the reflected beam entering the aperture. It also functions as an outer cover when the oven is not in use. The oven is used for baking and boiling.

Cooking experiments using the solar oven shows that type of foods and length of time for cooking vary as well as the temperature reached during cooking as shown in Annex-1. The highest temperature for oven type HS-4 without load was 175^{o} C and on a cloudy day it reached 80^{o}C. Since its first implementation, the design of solar oven has been developed four times, known as four generation of solar oven, namely HS-1. HS-2, HS-3, HS-4. The primary consideration in modifying the design was to improve performance including its temperature and to reduce the cost.

The project was implemented in 37 regencies of Indonesia, funded by the local government and Earthwatch Institute, Boston, USA. The project has involved almost one thousand local participants – men and women – and among them, there were 600 couples (husband and wife) and over 100 international volunteers from 11 countries. Technology transfer of knowledge about solar cooking focused on women, the most adversely affected by environmental degradation. Participants who joined the project learned how to make and use the solar oven. About 497

solar ovens were made and disseminated to the participants. Besides the main participants, a large number of local government staff were informed about the purpose of the project, how to solve future environmental problems and the advantages of cooking with solar energy for low income people who are desperately dependent on firewood.

The duration of the training was about 10 to 14 days. The methodology used for implementing the project was as follows:

- Start with formal audio-visual presentation
- Provide guidebooks and templates for making and using solar oven
- Participants are divided into groups
- Practice in making the solar oven
- Experimental cooking
- Maintenance of the solar oven

The training given to the participants not only covered how to make and use the oven, but also introduced how to maintain a healthy environment and other health concerns, such as: ensuring cooking is free from ash and smoke, and proper cooking methods to ensure the cooked food will retains its vitamin and mineral content. The training also took into account the importance of the taste, texture, color and overall appearance of the final product and some cooking tips/techniques.

The solar oven introduced in this project was invented by a woman, Ms. Suharta. She is a senior researcher of the UPT-LSDE, BPPT. She is the designer of the oven as well as the organizer of the project and the training. She is the patent holder for all solar ovens, which were introduced in this project.

During the training, the main role of men was in the solar cooker construction, as women are less skilled for such jobs. The women assisted the men in measuring and making the pattern for the solar oven. However, both men and women participants cooperated well in making the solar oven. In the cooking part, men playing little or no part in it, while women were active, starting from the selection of the recipes, procurements of raw materials until the cooking practice.

Most of the equipment and material needed for constructing the solar oven was provided by the project organizers. They also provided technical support as well as information related to the use of solar oven. As one of the objectives of the project was to facilitate cooking activities as well as to reduce women's burden and also environmental degradation through cutting of trees in the forest, women were involved more from the beginning of the project. Besides the designer of the solar oven was woman. The opinion of the women' participants were also included in the assessment of the effectiveness and future improvement of the solar oven. There had been an assessment of gender roles during the training including women's work burden and men's awareness of women's issues in that village.

(3) Project Impact

The solar oven has demonstrated its ability to cook a variety of foods well. Although the solar oven can only be used on sunny days, still it has a positive impact on the user, in this case the women who use the oven. The benefits of using the solar oven during the sunny days among others are it reduces women's workload as well as saves time in firewood collection. The solar oven also increases the health status of women as they are protected from smoke and heat produced by the traditional stoves. It was through the training that women acquired the knowledge of a new cooking technology and also the ability to make and to use their own solar oven, broadening their knowledge, and acquiring valuable practical skills.

Practical gender needs

The solar oven provides many positive benefits for women. The oven can be used for several kinds of food as described in Annex-1. In the cooking process, the oven depends totally on the sun, therefore, this oven may not be suitable for economic activities. To some extent, the oven can save money used for buying fuel or firewood. It also helps save time and reduces women's drudgery due to firewood collection.

After acquiring new knowledge of the advantages of solar energy for cooking and also new technology, the women who joined the Solar Cooking Training felt very confident of themselves. The training had created a feeling of ownership and even fondness for the device, because they were not only taught how to make and use the solar oven, but also teach how to have a healthy kitchen environment and cook healthy food. Women have benefited from the project as they are the people most affected by the negative impact of the traditional stoves.

Strategic gender needs

The solar oven training project, which consisted of how to make and use the solar oven has provided women with access to new knowledge and technology. One of the important results of the training is the plan to form a working group of women in the village. In the village of Banyumulek in Lombok area, the women initiated the working group during the solar oven training and the group has continued until now. The activities of the women groups were not only limited to the exchange of ideas on the solar cooker and cooking matters, but also about health and environmental issues in the village. By using the solar cooker, women have saved time and some of them use their time for other activities such as formulating recipes for using the solar oven. The activities have enriched their cooking abilities as well. Other women have used their time for earning an income through making pottery.

(4) Analysis and Lessons Learned

The solar oven technology was identified as one of the best practices in the field of renewable energy, because of its gender sensitivity approach in the implementation of project. Since the beginning women were involved in the project and through the scientific contribution in making and using the solar oven, the workload of the women has been reduced. The solar oven has demonstrated great benefit in addressing women needs, both practical as well as strategic needs.

Since the solar oven can only be used on sunny days, cooking on rainy days or at night requires other cooking technology. There is pressure on women for meals to be ready and husbands expect good food regardless of whether the solar cooker works that day. Therefore, it is important to consider a combination of solar oven and local cooking stoves, and this needs to be investigated in the light of both the practical and economic impacts.

Through the funding from the Eartwatch Foundation, the project has succeeded in creating and developing solar oven technology in many poor villages of Indonesia. Men and women have benefited from this project. However, the project team has identified constraints that come from the institute in formulating and implementing the project, that gender programs are not considered part of the vision and mission of the UPT -LSDE, BPPT. Therefore, support is needed from the government to mainstream gender in all institutions, government and non-governmental organization as well as educational institutions.

Despite the success of the project in introducing the solar oven, there has been some identified weaknesses in the technology itself such as the longer cooking time, high dependence on sun rays, limited types of cooking and the need to push the cooker in and out of the house, during cooking and after cooking to store the solar cooker. Other limitations, however, have to do with the fact that changing the habits is not easy. Some women need time to adjust to the new kitchen environment, such as cooking outdoors.

(5) Recommendation for Replication

Future prospects for a wider replication of the technology that would reach a greater number of poor women, are highly depend on some improvements in the technology as well as the implementation of the project. Therefore, the sustainability of the solar oven is dependent on how the designers, engineers, researchers and users can change or modify all the identified limitations and weaknesses of the solar oven, including its high dependence on solar energy and its inability to conserve the solar energy. Modification of the oven should be directed also at reducing the size and weight.

In the institutional level, gender mainstreaming should be done in order to increase the awareness of policy formulators and decision makers that gender programs

should be an integral part of the vision and mission of the energy laboratory and other institutions concerned with women's empowerment through renewable energy.

Since the target of the solar oven is the low income people in rural areas, there is a need to develop supporting infrastructure and financial mechanisms for them, such as giving subsidies for the poor people for acquiring the materials for the solar oven. Future prospects could be related to exploring ways to develop solar cooker industries and to sell it on a credit based scheme.

Annex – 1. Cooking experiments using the second generation solar oven during the national exhibition in Gerung village on 16.17 July 1996 and during training in Sumbawa Besar city on 12, 15, 21, 22 and 23 August 1996

Name of Food	Cooking times and oven temperature (Note: 2°10' means 2 h 10 min)	No. solar oven: Date of Experiment	Food Temperature (°C) Remark
1.2 kg Chicken in coconut mik (opor ayam); [b] 1st	09:55-12:05 (2°10') 87°C-1 13°C	01/ I.1: July 16,1996	Well done / normal [c]
0.67 kg Peanut (kacang); 2 nd	12:05-13 10 (1°5) -98°C	01/ I.1	Appearance as roasted peanut
O.8 kg Peanut (kacang); 3rd	13:10-14:20(1°10') -113.5°C	01/ I.1	Appearance as roasted peanut
1.35 kg Potatoes (kentang); 1st	9:30-11:30 (2°) 80°C107°C	02/ II.1[a]: July 16,1996	Well done / normal
1.3 kg Vegetables sayur); 2nd	12:00-13:30 (1°30') 112°C-90°C	02/ II.1	Well done / normal
1.25 kg Melinjo; 1st	09:45-12:15 (2°30') 87°C- 118°C	03/ III.1: July 16,1996	Well done / normal
4 kg Banana in coconut milk and palm sugar (kolak pisang); 2nd	12:15-14:30 (2°15') -117°C	03/ III.1	Well done / normal
20 Eggs (telur); 1st	09:30–11.00 (1°30') 80°C-110°C	04/ IV.1: July 16,1996	Well done / normal
1.7 kg Bananas in coconut milk; 2nd	11:05-13:30 (2°25) -97°C	04 /IV.1	Well done / normal
1.2 kg Peanuts; 1st	09:30-11:30 (2°) 75°C-117°C	05/V.1: July 16,1996	Well done / normal
1.2 kg Cake; 2nd	11:33-13:30 (1°57') 108°C-100°C	05/V.1	Not risen well
1.1 kg Talas	10:15-12:45 (2°3')	01/ I.1: July 17,1996	Well done / normal
1 kg Fish; 1st	10:45-12:45 (2°) 88°C-101°C	02/ II.1: July 17,1996	Well done / normal
0.52 kg Chestnuts; 2nd	12:45-13:45 (1°)	02/II.1	Appearance as roasted chestnut
1.15 kg Sweet potatoes	11:00-13:45 (2°45')	03/ III.1: July 17,1996	Well done / normal
1.1 kg Crab	10:45-12:15 (1°) 82°C-100°C	04/ IV.1: July 17,1996	Well done / normal
1.2 kg Rice (included water)	10:30-12:30(2°) 90°C-110°C	05/ V.1: July 17,1996	Well done / normal
1.71 kg Eggs (25 butir telur)	10:50-12:00(1°10') 121°C-121°C	01/ III.1: August 12,1996	Well done / normal

Vegetable (sayur lodeh); 1st	11:30-13:45(2°15') 120°C-119°C	02/ IV.1: August 12,1996	97.3°C Well done / normal
1.43 kg Cob corn (jagung); 2nd	14:00-16:20(2°20') -106.1°C	02/IV.1	86.7°C Well done / normal
Rice (Nasi); 1st	10:50-12:45(1°55') 123.9°C-129°C	03/ II.1: August 12,1996	Well done / normal
1.83 kg Potatoes (kentang); 2nd	13:00-16:20(3°20') -112°C	03/ II.1	97°C Well done / normal
0.82 kg Peanut (kacang); 1St	10:503-12:15(1°57') 110.9°C-124°C	04/ V.1: August 12,1996	Appearance as roasted peanut
1.82 kg Banana in coconut milk (kolak pisang); 2nd	12:18-14:45 (2°27') 127°C-	04/ V.1	79°C Well done / normal
0.92 kg Fish (ikan); 1st	11:45-13:00 (1°15') 115.4°C-125.5°C	05/ I.1: August 12,1996	Well done / normal
1.82 Kg Banana in coconut milk (kolak pisang); 2nd	14:30-16:20 (1°50') 124.3°C-108.3°C	05/ I.1	88.4°C Well done / normal
1.7 kg Rice (nasi)	09:30-12:00 (2°30') -132°C	01/ III.1: August 15,1996	Well done / normal
1 kg Cake	10:30-12:10 (1°40') 108.3°C-125°C	03/ II.1: August 15,1996	Well done / normal
1.915 kg Sweet potatoes + egg + water	10:30-12:30(2°) 102.3°C-	09/ V.3: August 15,1996	Well done / normal
1.85 kg Banana in coconut milk (kolak pisang); 1st	10:20-12:30(2°10') 18.9°C-112.6°C	01/ III.1: August 21,1996	90°C Well done / normal
1.08 kg Fresh corn bean with egg and flour (jagung segar pipil); 2nd	12:33-14:45(2°12') 113°C-98°C	01/ III.1	95.4°C Well done / normal
25 Eggs (telur); 1st	09:55-12:15(2°20') 104.7°C-108.8°C	03/ II.1: August 21,1996	Well done / normal
0.800 kg Peanut (kacang); 2nd	12:30-14:45(2°15') 102.3°C-107°C	03/ II.1	Appearance as roasted peanut
1 kg Banana with coconut milk (kolak pisang); 1st	10:20-12:30(2°10') 02.3°C-89.4°C	05/ I.1: August 21,1996	84°C Well done / normal
1.85 kg Potatoes (kentang); 1st	12:35-14:45(2°10') 87°C-118°C	05/ I.1	Well done / normal l
1.86 kg Sweet cassava (singkong gula)	10:55-14:30(3°35') 128.8°C-	07/ I.2: August 21,1996	Well done / normal
1.12 Palm sugar cake (bolu gula merah); 1st	09:55-11:45(1°50') 112°C-117°C	01/ III.1: August 22,1996	Risen well
Cake; 2nd	12:00-13:15(1°10') 131°C-132°C	01/ III.1	Risen well
1.5 kg Cob corn; 3nd	13:18-15:30(2°15') 132.9°C-	01/ III.1	Well done / normal
Experiment sterilization (Dry system) 0.5 kg Medical equipment;	09:55-12:30(2°35') 993.4°C-142°C	03/ II.1: August 22,1996	
1.8 kg Water (air); 2nd	14:05-15:45(1°40') 125.2°C-114.7°C	03/II.1	92 °C Temperature of water 92 °C
1.55 kg Shrimp and vegetable (udang singan); 1st	10:05-12:00(1°55') 94.4°C-103.6°C	05/ I.1: August 22,1996	Well done / normal
1 kg Peanuts in water (kacang rebus); 2nd	12:30-14:30(2°) 127.3°C-117°C	05/I.1	Appearance as steamed peanut
1.9 Wingko cake; 1st	10:05-12:45(2°40') 113.1°C-97.5°C	07/ I.2: August 22,1996	Well done / normal
2.5 kg Rice (beras+ 1.2 kg water/air) after 16.00 solar oven was closed and stored in door; 2nd	14:00-16:00(2°) 129°C-	07/ I.2	Rice was taken out at 08.00 next day Normal and is not spoiled

1.7 kg Chicken meat + coconut milk 0 (opor ayam)	10:30-12:30(2^{o}) 122.9^{o}C-	01/ III.1: August 23,1996	Well done / normal
1.7 kg Chicken and vegetable (ayam + sayur kelor)	11:10-12:30(1^{o}20') 118.8^{o}C-	05/ I.1: August 22,1996	Well done / normal
1.3 kg fish in banana leaf (pepes ikan)	11:05-12:30(1^{o}25') 129.2^{o}C-	03/ II.1: August 22,1996	Well done / normal

[a] 02/ II.1 means solar oven number 2, and it was the first unit made by Group II.

[a] 1st, 2nd and 3rd mean the first, the second and the third food cooked in the same solar oven.

[c] Normal means the food and its appearance are the same as that cooked by conventional means.