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# glow

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**Effect of Kitchen Emissions on The  
Health of Rural Women**

**Technical Issues in Kitchen Improved Design**

**Indonesia's Experience in Introducing  
Healthy Kitchen: Take The Right Moment**

**Case Study of Kitchen Improvement  
Activities in Weeraketiya, Sri Lanka**

**Workshop Summary: Regional Workshop  
on ICS, Kitchen Improvement and  
Health**

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**ARECOP**

The Asia Regional Cookstove Program (ARECOP) is a forum for voicing the concerns of improved cookstove programs in the Asia Region. It influences and facilitates effective and efficient programs in improved cookstove issues.

## DEAR READERS

Greeting from Yogyakarta ! After the busy months of Christmas, New Year, Chinese New Year, and Moslem's feast of the sacrifice day, GLOW is on your desk again.

The current topic is made to meet with the last ARECOP Workshop on Kitchen Improvement and Health, which was held last year in Sri Lanka. Like in the previous edition of GLOW, we have asked Mr. SK Sharma from The Energy Research Centre, PU, Chandigarh, India to become our guest editor in this edition. We would like to present the summary of the workshop as the part of the current issue. However, some other things were also presented here and were chosen as a complimentary to each other that hopefully will give a variety of perspectives on the issue.

We also summarized articles written by Mr. Le Van Tong, HAU, Vietnam and Mr. Hari Khoju, RUCODES, Nepal for technical issue. Some parameters for healthy kitchen such as the size of ventilation, the lay-out of the improved kitchen, wind direction, cooking position, chimneyhood, etc. are discussed.

Mr. SK Sharma is discussing the health aspect of indoor air pollution in this edition. He focuses on the negative impacts on health resulting from polluted kitchen, how to create a healthy kitchen, etc. He also presents the results of his research in two villages in Haryana State, India.

IDEA's interesting experience on its attempt to introduce and implement healthy kitchen in Kudagampaha village, Hambantota district, Sri Lanka is also presented here together with JKTI-Indonesia which has similar project in Lempuyang village, Central Java.

We hope this issue will provide readers with as overview of the various causes and impacts of indoor air pollution released from inefficient biomass burning cookstoves. We also hope that this issue will help those working on ICS dissemination programs to develop sustainable and realistic approaches to stove development. [GLOW](#)

## GUEST EDITOR



Prof. S.K. Sharma is the Director of Energy Research Centre, Punjab University, Chandigarh, India, 160014. He has done extensive work in the area of indoor air quality with respect to kitchen design, air exchange rates, emission factors, wind flow and health related areas. He has also been a productive writer as he has published more than 25 papers on improved cookstoves technologies in national and international journals and he has also written a Technical Manual on Improved Cookstove in which one chapter discussed on kitchen design that was jointly funded by ARECOP and RWEDP.

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# EFFECT OF KITCHEN EMISSIONS ON THE HEALTH OF RURAL WOMEN

*Cooking is a very important and essential chore in every household; unfortunately, this activity is also a major cause of ill health, drudgery, unhygienic conditions and burn accidents amongst the rural women in developing countries. This has been attributed to the large emission of the pollutants in the kitchen, due to the use of traditional biomass fuels such as wood, cow dung and agricultural residues in inefficient and improperly designed cookstoves. As a result, large-scale use of biomass based fuel for cooking has emerged as one of the major causes of mortality and morbidity in rural area due to harmful effect of the pollutants emitted from the traditional stoves. The problems are compounded due to small size and poor ventilation of rural kitchen. On an average woman spend about 4-6 hours in the kitchen daily for cooking food and other purposes. They started toget exposed to the smoke at an early age of about 15 years. 30-40 years of exposure to smoke of biomass fuels for their lifetime is equivalent to about 60,000 hours*

Prof. S.K. Sharma and Asif Ali Khan  
Energy Research Centre  
Panjab University  
Chandigarh, India

Emission from cookstoves as a result of incomplete combustion can be distinguished as: TSP, hydrocarbons, and carbon monoxide mixture of soot. It has been estimated that there are 180 polar, 75 aliphatic and 225 aromatic hydrocarbon compounds in the smoke of biomass. Of these, 14 are known as carcinogenics, 5 are cancer producing, and 6 are toxic or very irritating for eyes, respiratory organs, and/or mucus membranes. Cooking in traditional kitchens has resulted in a number of health related implications as described below.

Major impact of indoor air pollution on health is due to diseases related to respiratory defense system such as Chronic Obstructive Pulmonary

Disease(COPD)

- COPD is a disease state characterized by air flow limitations that is not fully reversible. Air flow limitations is usually both progressive and associated with an abnormal inflammatory response of lungs to noxious particles or gases.
- COPD is the 4th leading cause of death in the world (after heart disease, cancer, and cerebrovascular disease).
- In 2000, the WHO estimated 2.74 million deaths worldwide from COPD.
- In 1990, COPD was ranked 12th. As a burden of disease; by 2020 it is projected to rank 5th.

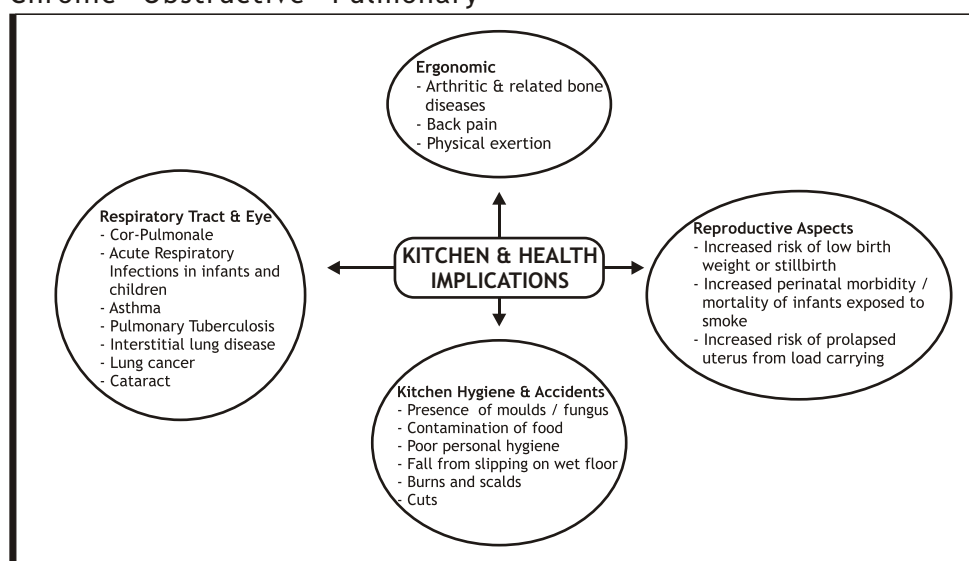


Figure 1. Kitchen and health implications

It has been estimated in a study conducted in Srilanka that the percentage of change in age-adjusted death rates (1965-2000) are decreasing in

Stillbirth and perinatal mortality, Cataract etc.

There is an urgent need for inter-

A study on the effect of introduction of improved cookstoves with chimney was conducted in two villages of Haryana State in India. Villages were selected on the basis of agroclimatic parameters. Village Kirdhan was situated in central plains, while village Mukhosarani was situated in Arid Sandy plains. 90 percent of the population in these villages was using traditional stoves for cooking. All the households having traditional cookstoves were using agricultural residues, cow dung and wood as fuel for cooking. Spirometry studies were undertaken in these villages to collect base line data on the lung function of the women working in the kitchen. Subsequently, Abhinav, a two pot improved cookstove with chimney was installed in the kitchens in the two villages. Spirometry studies were again conducted after six months in these villages.

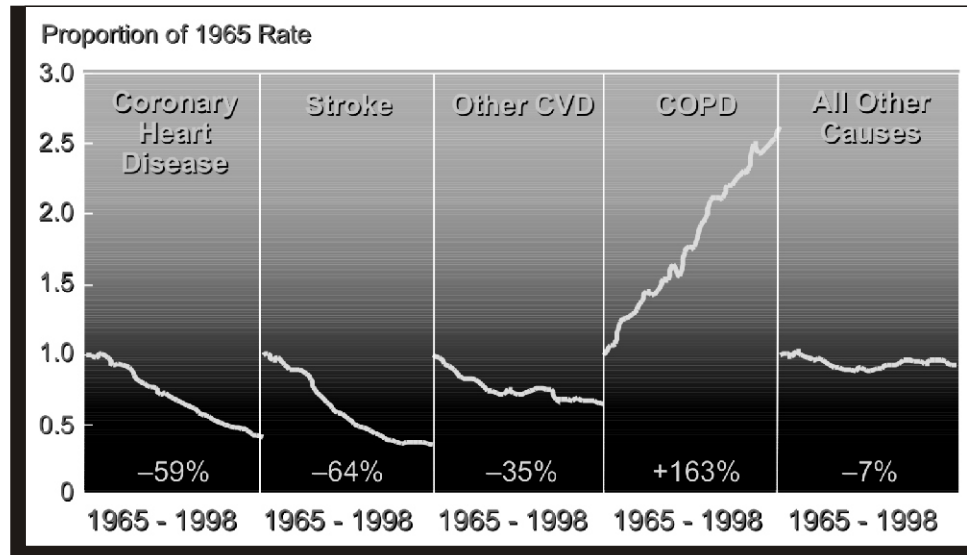


Figure 2. Percent change in age-adjusted death rates 1965-2000

the case of coronary heart disease, stroke and other CVD diseases. However, COPD has emerged as the major cause of mortality.

Thus, it can be concluded that the Indoor Air Pollution(IAP) appears to be a major environmental and public

ventions to improve kitchen such as:

- Improving kitchen design
- Improving cookstove
- Improving fuel
- Improving ventilation
- Smoke removal through chimney /hood

Figure 3 shows that percentage of women in villages Kirdhan and Makhusarani, suffering from Obstructive pulmonary disease decreased from 53% to nearly 34% after installation of improved cook stoves. This may be attributed to the reduction of pollution level in the kitchen and the lesser amount of time spent in the kitchen as a result of the use of the improved cookstove

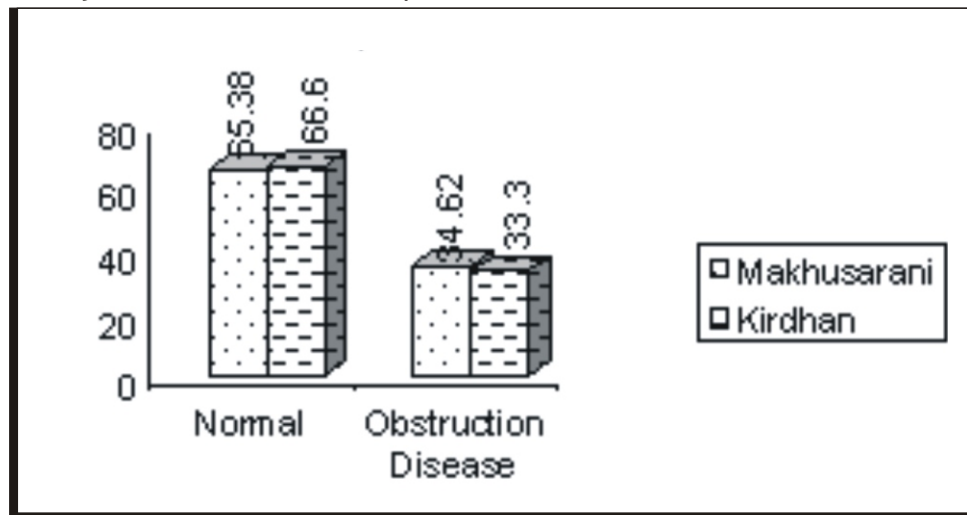


Figure 3. Result of spirometry after installation improved cookstove

health hazard as there is a strong evidence that IAP is responsible for Chronic Bronchitis, Chronic Obstructive Lung Diseases (COLD) in adults, Acute Respiratory Infections in children, Pulmonary Tuberculosis Asthma, Cancers, Low Birth Weight,

In a study conducted in India by Sharma et.al, it was observed that the introduction of improved cookstoves in the rural kitchen has shown an extremely positive effect in reducing the ARI diseases in the rural areas.

Studies conducted on the effect of opening for the smoke showed that by providing a ventilation hole of about 1.5 m<sup>2</sup>, the air exchange rate increased from 4.5 hr<sup>-1</sup> to 64 hr<sup>-1</sup> and the concentration of CO was reduced from 300 to 100 ppm. Studies conducted on the emissions from different fuels show that as we move above the fuel ladder, the emissions, cleanliness, and efficiency increases. LPG is at the top of the ladder and cow dung is at the bottom of the ladder.

Results show (Figure 4) that the behavior of smoke being emitted from a cookstove in a kitchen is just like a plume from the chimney. Concentration of the TSP at the ground level is minimum in the middle

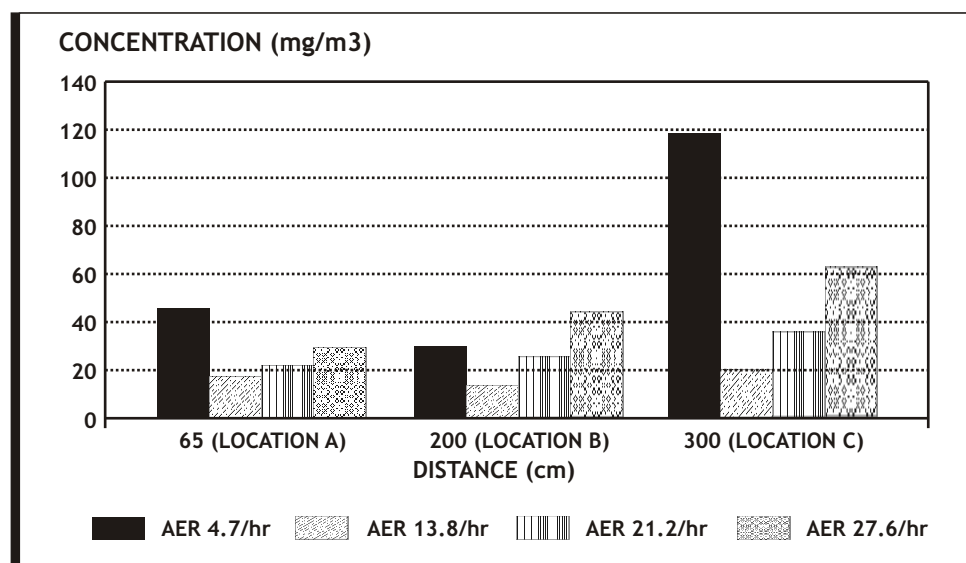


Figure 4. Concentration level of TSP at different distances

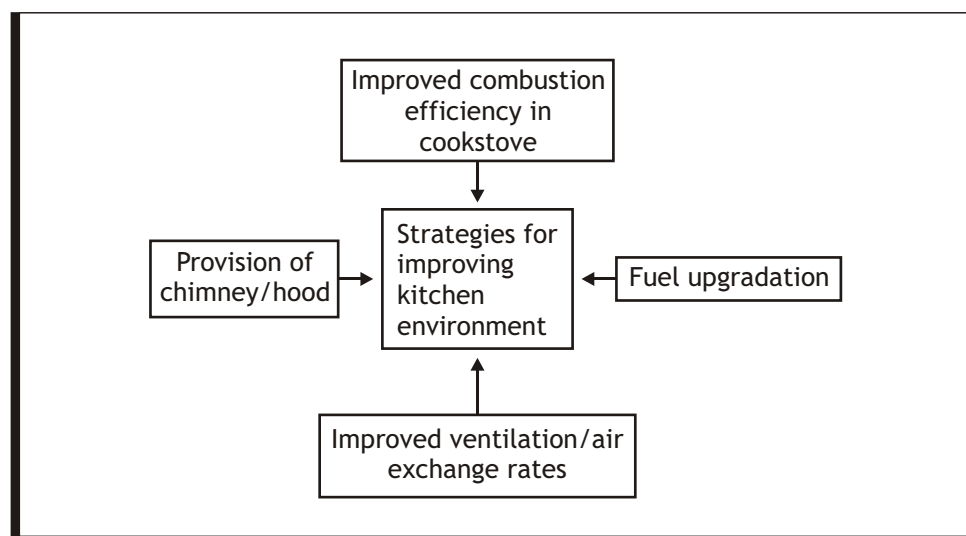
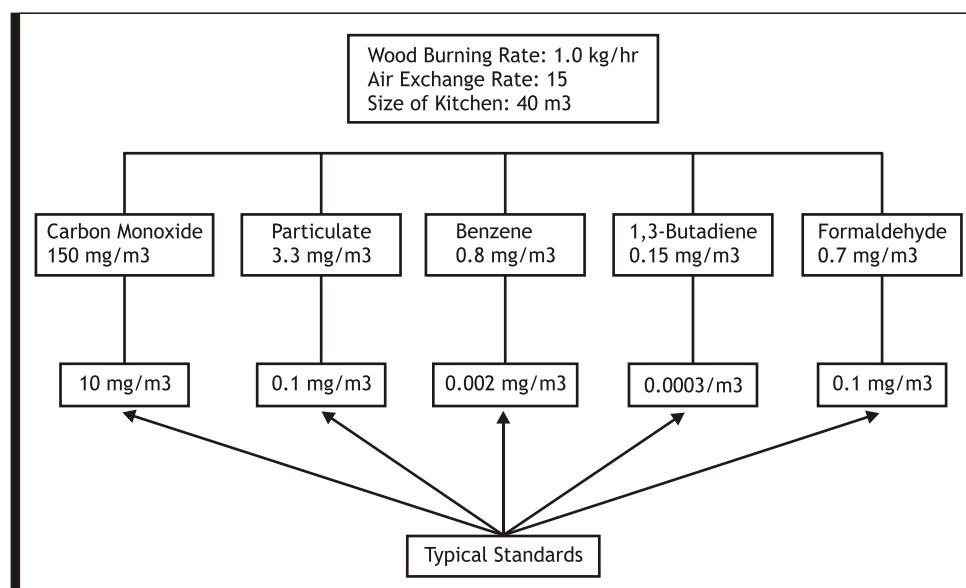


Figure 5. Pollutant concentrations from woodfired cookstoves In a rural kitchen (\*KirkSmith)

of the kitchen and maximum on the far end in the direction of the wind flow, irrespective of the Air Exchange Rates. These observations have an important bearing on the design of an improved kitchen. It can be concluded from the study that the kitchen should be constructed in a direction perpendicular to the wind flow. The wind should enter from the door and should leave by the window. The stove should be placed across the window so that the smoke may go out from window. However, in the kitchen with reverse direction of wind flow, working section should be located adjoining the cookstove. Middle section of the kitchen should be used for serving food and cleaning purposes.

#### Why Emphasis on Improved Kitchens:

Level of pollutants in traditional unventilated kitchens is many times more than the permissible limits due to use of biomass based fuels in inefficient stoves for cooking

- Women and small children spend more than 70-80% of their working time in the polluted kitchens during cooking and doing other chores
- Polluted kitchens are a major cause of mortality, morbidity and drudgery of rural women in the developing countries
- Polluted kitchens are a major cause of mortality, morbidity and drudgery of rural women in the developing countries. *glow*

# TECHNICAL ISSUES IN IMPROVED KITCHEN DESIGN

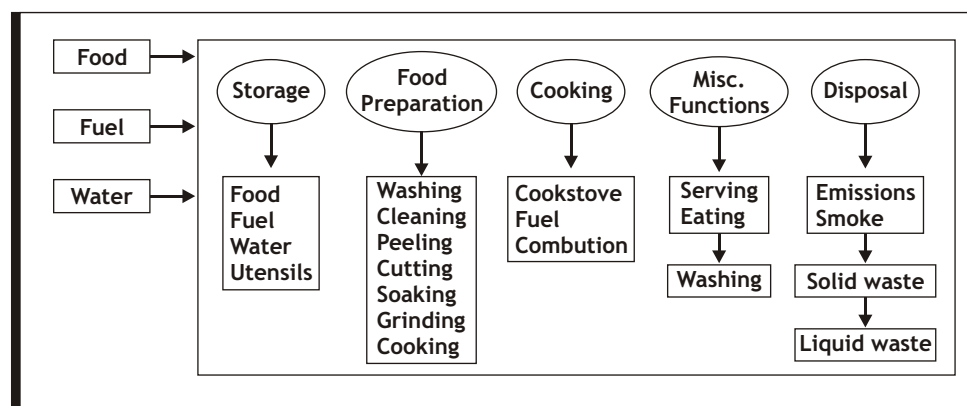
Abstracted from papers presented by  
ARC. Lee Van Tong and Mr. Hari B. Khoju  
at the workshop on Kitchen Improvement & Health, Galle, Srilanka, August 2003

Cooking is one of the most important chore in a household. As a result, kitchen plays a most crucial role in daily life in any household. Cooking involves a number of functions such as: preparation and cleaning of food ingredients, fuel preparation and firing of stoves, cooking of dishes according to family size, custom and economic conditions, serving food, washing utensils during and after eating, cleaning kitchen. Apart from its main function of cooking, a number of other diverse functions are associated with the kitchen depending on the socio-economic and cultural factors. It may be used for dining, chatting, working shed, resting place for animals, storage of food and many more. During winter season, all family members and visitors use kitchen for warming up and catching up with day's events. It is a place where women and children spend 4-5 hours every day. Unfortunately, despite its multifunctional crucial role, it is the most neglected component of the household.

Majority of kitchens are temporary small structures having poor lighting, ventilation and provisions for the disposal of waste. Studies conducted in the India (Sharma) showed that 85% of rural kitchens in Haryana state have volume up to 20 cubic meters. 97% of the rural kitchens have a ventilation area of up to 3 sq.meters. As a result, the indoor air quality is extremely bad and these are filthy, filled with smoke, soot and dust. High humidity, temperature and odour make life miserable for the women who spend major part of their life in the kitchen. Therefore there is an urgent need to improve the kitchen, so as to reduce

the drudgery of rural women and children. Most of the efforts in this direction till recently were aimed at improving the cookstoves. No holistic approach was made to improve the kitchen system as a whole. In fact, due to shortage of understanding and information, the rural inhabitants do not pay much attention to the convenience, safety, comfort of a well-organized kitchen. For example, they put cook stove, fuel and cupboard in disordered and unfunctional places. Studies show that energy consumed is in proportion to the height of reach and to the depth of bend of body of the given

A representative kitchen system is described below:



type. Depending upon the are socio-cultural and economic factors many or all of following functions are performed by the kitchen.

**Functions**

Preparation for cooking

- Cooking, dishing out and eating
- Social center for gossip
- Sleeping
- Drying of crops and clothes
- Storage for:
  - Food
  - Drinking water
  - Small live stock
  - Grains
  - Animal feed and fodder

**Kitchen placement**

Placement of the kitchen vis-à-vis the rest of the building can have a profound impact on the quality of the indoor micro-climate due to the transmission of smoke, food odour, and heat produced during cooking, to the rest of the dwelling. Kitchen may be separate or integrated with the building. Integrated kitchens are suitable only if there are for the exhaust of smoke with chimney or hood. Kitchens separated from main

house have the advantage that the smoke and odour does not affect the rest of the dwelling. However, the separate kitchen should be so located that it is easy to go in and out towards the main house. There is a hall or lane with roof between the main house and the kitchen, and it should be easy to observe the whole main house from the kitchen.

**General Guidelines for kitchen placement**

- The kitchen should be located at a place that is out of the main wind way to prevent fire and air pollution
- It should be oriented to catch cool winds in summer and avoid cold winds in winters
- It should be close to the water resource ( well, water tank or water tap)
- It should be close to sewage discharge drain

**Solutions to kitchen improvements in rural areas**

The number and type of various utilities such as cookstove, work bench, storage cupboard, washing

and waste disposal should be located in such a manner that they cause least drudgery and ensure better hygienic conditions. Natural lighting and ventilation are the primary factors in assigning space for various functions. Layout and design are the integral in the management of the kitchen. The features of a good plan are unity, continuity, flexibility and precision. Socio-psychological factors of the family must be included.

**Size of kitchen**

The size of the kitchen depends on the availability of space in the house plan, size of the family and its social economic status, activities other than preparation of food and kind of fixtures desired as per functions to be performed in the kitchen. It should be large enough to permit the cook to facilitate circulation while working. It should be designed in such a fashion that various operations could be carried to completion in its own place, operations proceeding in orderly sequence.

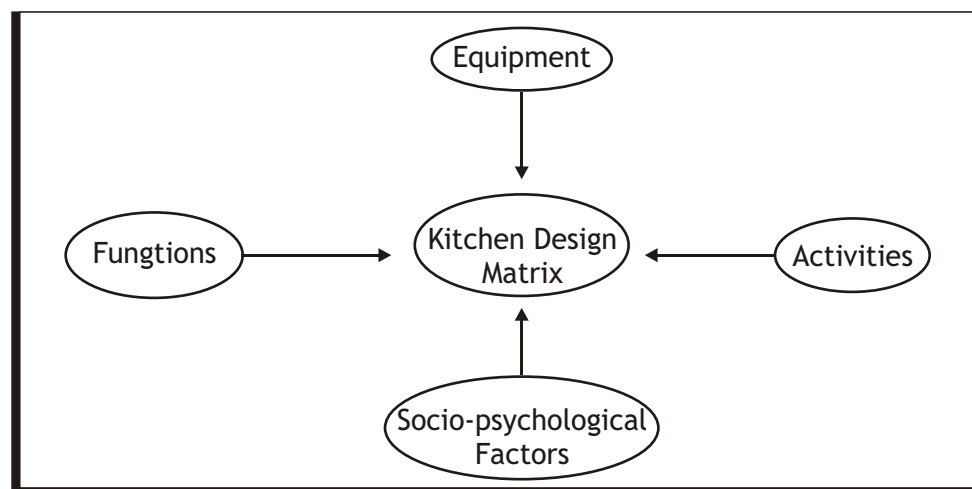
**Cooking spot/position**

Cooking spot is seen as the most important factor in relation with the rest parts of kitchen.

- It should be in the front and below the vent (Cooking Window) as it has observed that the smoke vents are better method for the better control of indoor air quality and provide sufficient light
- It should on the leeward side of the windflow so as to remove smoke away from the kitchen.

**Cook's posture**

Squatting or standing, depends a lot on local customs, lifestyles and habits. The cook either squats on floor



Optimum design of a kitchen should take into consideration the interplay between activities, equipments and the use of kitchen space for various functions

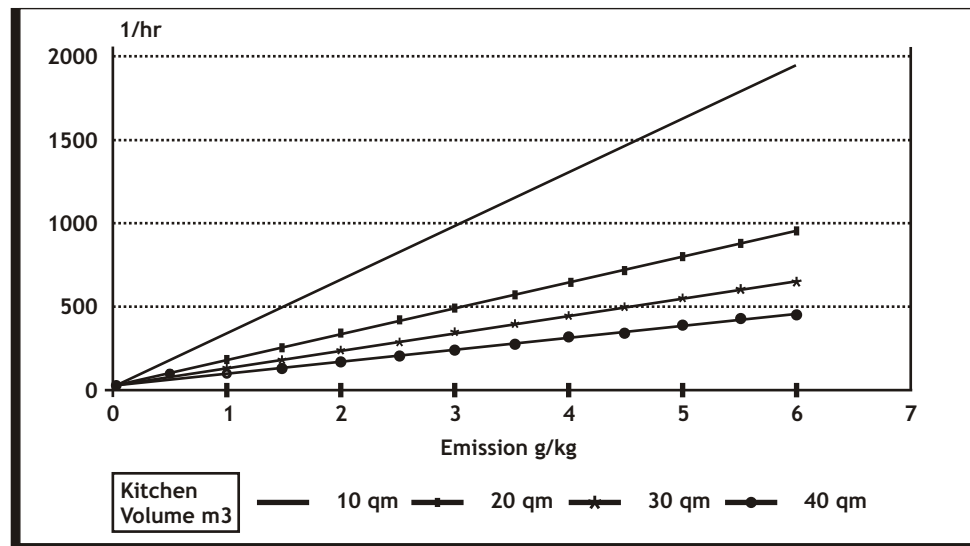
or sit on a small seat of 5 -10 cm. Women in rural areas prefer sitting position as it gives them rest after working hours in the fields. However,

**Fuelstore**

Regarding the fuel store: the most safe distance from fuel store to the cook stove is 1-1.5 m. It should be

**Location of cupboard and food containers**

In the kitchens where cooking is done in the standing position, the cupboards and food containers should be placed on the side wall of the cooking platform. Cupboard and food case should be placed on the dense walls.



Theoretical Air Exchange Rate (1/hr) required to maintain TSP Limit of 0.125 mg/Cubic meter, for kitchens of different sizes with cookstoves having different emission factors

in this posture it is harder for the cook to stir and check food. Kitchens with stoves without chimney or hood exposes the cook to smoke and other gases in standing position vis-à-vis sitting position. The danger from burn injuries and fire are less and cooking is less messy.

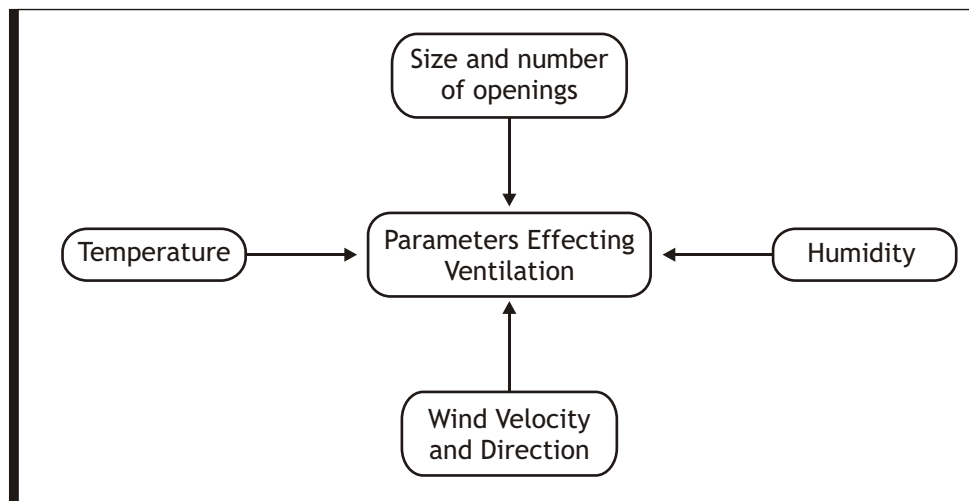
located next to walls or a little oblique to the right hand side or at the back of the cook. Fuels should be bordered by two or three brick lines so as not to spill out or catch fire.

Food stuff should be put far away from the cook stove especially for kitchens that are narrow and have poor ventilation. They may be put in the antechamber/ vestibule. It may take time to collect food stuff for cooking. However it is possible to make them ready before starting to cook. With such a location the cupboard and food containers will be far from being contaminated by dust and smoke in the kitchen.

Some of the dimensions recommended are:

- Maximum height of storage: 180 cm
- Maximum side to side reach: 120 cm
- Maximum depth from front to back:

Ergonomic studies also show that the open fire or cooking on wood burning stoves is more conducive to cooking in squatting position, while the standing position is preferred with kerosene and LPG or compact fuel stoves. Improved cook stoves which are made of bricks, sand and cement, should have standard height of 20-25 cm. The height of the seat for such stove should be 15 cm.



Results show that as the size of the kitchen decreases the air exchange rates requirement to ensure good indoor air quality increases substantially.

In the standing cooking, the recommended height of the preparation, cutting and grinding and cooking platform is 80 cm.



40cm

- Shelves for most used items: within 60 cm radius from elbow

Storage on shelf above the work surface requires less energy than storage in base cabinets or shelves.

#### Sizes and location of windows

Windows play a pretty important role in the kitchen because they are gates for light air and smoke to come in and out. If the kitchen average area is about 12-15m<sup>2</sup> there should be 2-3 windows installed with the width of 0.5m and the height of 0.8m. Windows should be placed so as to fit with functions of other parts of the kitchens as well as kitchen utensils. For instance, cook stove should be placed at a airtight spot. Whereas the counter and dining table should be located at a spot with more light and winds.

Doors should be installed for all windows to prevent rain and sun and draughts. Window doors may be opened or closed following at the weather conditions.

#### Size and location of kitchen doors

Door is a gate for light, air and human to come in and out. A kitchen may

have one or two doors, one links to the main house and the other links to the washing spot. The good size of doors is calculated at 0.7m wide and 2.1m high.

#### Trees and their refreshment

Each family in rural areas usually has a garden of many fruit trees which may bring some extra incomes and beautify the living surroundings.

Kitchens with trees shading outside would get lots of fresh air and avoid winter or rising winds. Trees would help to observe toxic gases, smoke from the kitchen reducing air pollution and heat radiation from sun and making the atmosphere more clean and fresh. This may be well tested in the hottest days in summer time.

#### Location of water tank

Following suggestions may be taken as consideration when placing the water tank: Water tank can be placed inside or outside the kitchen, depending upon availability of space in the kitchen. When space in the kitchen is small, it will be better if the water tank is placed near the kitchen. A door is suggested to be available from the kitchen to the cleaning spot where the

water tank is located. The maximum distance between the cooking place and the water tank should not be more than 5m. Water taps should be installed inside the kitchen if there are pipe water and hanging water tanks. This would help to reduce in- and -out movements of the cook.

#### Hygiene conditions and environmental pollution reduction.

Since fuels used for cooking in rural kitchens are mass kinds which create big amount of smoke and dust when burning kitchen should be frequently tidied so that kitchen utensils may not get filthy. Kitchen floor should be swept several times a day. It is better to sweep the kitchen floor before and after cooking time. A garbage bin should be placed inside the kitchen. Domestic wastes should be sorted at their resources (at each household) if possible. To sorting wastes there should be 2-3 garbage bins for specific sorted wastes. Waste sorting in this way will make it easier for waste treatment and waste recycling. Wastes should be dumped and garbage bins should be cleaned everyday. Kitchen walls should be painted once a year to strengthen the light and to make the kitchen better and look cleaner. *glow*

# INDONESIA'S EXPERIENCE IN INTRODUCING HEALTHY KITCHEN:

# TAKE THE RIGHT MOMENT

*Preparing food in a kitchen is certainly a very different process from production process of a manufacture where things can be arranged such as to the most favorable condition. It is not easy to introduce healthy and most favorable kitchen condition though it will bring them good results, as it relates closely to tradition, culture, habit and also belief of the local community.*

Lempuyang is a village located in Central Java. If we go around the village, we will find that most houses have used improved cookstove with chimney and the kitchen condition is quite healthy as the kitchen is well ventilated through windows and ventilation holes. Some others have



Typical of Candirotto kitchen

## Prianti Utami (JKTI) & ARECOP Team

even fixed roof door to provide better as well as lighting in the kitchen. The kitchen also has the necessary supporting facilities such as water jar, fuel storage, and shelf for spices, shelf or cupboard to keep the pan and pots as well as place to dishing up. If the kitchen is large, the facilities are usually in one room while if the kitchen is small the facilities are located at the adjacent space closest to the kitchen. The kitchen layout is arranged ergonomically and hygiene is also well attended such as the drainage.

Such condition however was not possible ten years ago due to the needs of the community. Approximately ten years ago there had been an effort to

introduce improved cookstove with chimney in order to promote healthy kitchen, a kitchen free of smoke. At that time the community refused the program as their main harvest then was corn and during harvest time they need to dry their corn by using the smoke from the stove they used for cooking. They even put fuel even when they were not cooking just for the sake of drying the corn so that it would not become rotten. Thus, when they learned that they would not have the smoke in their kitchen they instantly refused the improved cookstove, and they did not mind having dirty kitchen as according to them their stomach was more important (in other words, their main income was corn and thus they had to do anything to keep it).

In the past few years with the installed new irrigation system, the villagers of Lempuyang village change their agriculture product from corn to rice and therefore they do not need to smoke their corn anymore. Then they started getting interested in the improved cookstove and kitchen improvement program. Since they do not need the smoke, they installed improved cookstove with chimney and they also like to rearrange their kitchen as it will be clean and not dirty from the smoke and soot produced from the stove. The kitchen improvement program then started and that is why they have clean and healthy kitchen now. *glow*



# Case Study of KITCHEN IMPROVEMENT ACTIVITIES IN WEERAKETIYA, SRI LANKA

Mr. R.M. Amaresekara-IDEA

Many kitchen improvement programs are implemented in Sri Lanka. It is an important activity in many of the agendas of NGOs and GOs. The primary objective of these programs are to maintain a clean and an ergonomically efficient kitchen. Smoke pollution and ventilation improvements are not addressed properly probably due to high cost and lack of technical know how. The author is not aware of any serious study done in Sri Lanka to monitor or assess smoke pollution levels in kitchen or personal exposure levels. However the following studies in Sri Lanka give indication of high smoke levels in kitchens and related impact on health which warrants serious focus on the need for interventions.

The IDEA/ITDG study ( 1994)  
in 16 plantation houses in the Waltrim Estate

Tests	Average CO Level ppm	Average RSP Micro grams <sup>3</sup> m
Cooking tests (12 Nos)	28. 6 ( 1 Hr)	1192 ( 1 Hr)
All day monitoring	111.7 ( 6 Hrs)	989 ( 12 Hrs)

Range of average CO levels 8.3 - 47.5; Range of RSP levels 56 to 1450  
Source : Peter Young *et al*

The Department of Community Medicine of the University of Colombo has carried out a survey to find the prevalence of recurrent respiratory symptoms and its association with environmental factors. The survey report prepared by K.N. Lankatilake *et al* states: "In 187 households ( 48.7%) there was at least one sick person (a child or a woman) with a history of recurrent respiratory

*symptoms during the past six months. Such households associated significantly with firewood as cooking fuel and inadequately ventilated sleeping area. Cooking with firewood showed a 1.61 fold increase compared to other fuels (OR 1.61 ( 0.3 - 2.53)) and sleeping in inadequately ventilated rooms OR 2.8 (1.01 - 8.7)."*

### The need for holistic approaches to kitchen improvement.

The kitchen performs many functions, some of which contributes positively, and some negatively to the development of society. Therefore a deep understanding of the factors which influence the multifunctional role of the kitchen and the interactions of these factors are

necessary to enhance the positive impacts and mitigate the negative impacts. These factors cover a range of development issues and the complexity of interactions requires a holistic approach to avoid contradictions and maximize the beneficial impacts. Therefore, any project interventions should necessarily address gender, energy, health and other socio economic

concerns.

The first effort in proper kitchen improvement was made by IDEA in establishing a demonstration kitchen in Kudagampaha village in Hambantota District following a training conducted in Nepal by ARECOP in 1996 for which a staff member of IDEA participated. However, this program did not continue until a program of ARECOP Phase II was implemented when IDEA again concentrated on this aspect.

After creating awareness on kitchen improvement, IDEA, in association with the Ruhunu Rural Ladies Society, which is the District Focal Point of the ICS National Network for Hambantota District, launched a pilot project targeting low-income households in two villages namely Katuwewa and Kumbukmulla in the Weeraketiya District Secretaries Division. The social mobilization program conducted at an earlier stage in relation to the introduction of Anagi Stoves had created a conducive atmosphere to initiate this program. The target group consisted of low-income 13 households.

### Characteristics of the households

- Education level: majority O/L
- Average monthly income : Rs 2500 (USD 25)
- 8 male and 5 female headed households
- All government welfare beneficiaries.
- Average kitchen floor area 100 sq ft

(64 - 140 sqft)

- All families use biomass only for cooking

**Project interventions.**

The initial activity was awareness creation and social mobilisation to secure community participation. These activities created considerable interest among the women to improve their kitchens. At the beginning men did not participate in the activity but after few kitchens were improved men took a leading role in construction activities. Every effort was taken to secure the participation of all the family members. Cooking was done in a small enclosure separated from the main house or under an eave.

**Characteristics of the kitchens.**

Walls		Roofs		Floor	
Mud Clay	2	Thatched cadjan	10	Mud	10
Fired bricks	3	Tiles	1	Cement	2
Unfired bricks	5	Cdjan and GI sheets	1	Bricks	1
Mud and bricks	2	Cadjan & Tiles	1		
Wattle and Daub	1				

- 4 kitchens were already exist
- 6 kitchens modified to provide improvements
- 3 kitchens were newly constructed.

The kitchen design was left to be decided by the beneficiaries depending on their socio economic and cultural needs. The project interventions consisted of:

- Construction of a chimney hood.
- Providing an improved stove either Anagi clay stove or Anagi Mud stove
- Ventilation improvements
- Providing shelves to store bottles and plates
- Shelves for vegetables
- Storage of firewood and water
- Lighting improvement
- Waste disposal
- Platform to place pots and pans and for working
- Platform to place the grinding stone

The major challenge was to improvise low cost technical interventions to evacuate smoke and improve ventilation. With the long years of experience in stove activities, IDEA has an opinion that providing chimney hoods were more effective than providing chimney stoves. In most cases chimney stoves were found to be poorly maintained due to practical reasons leading to poor performance, thus making it worse than traditional stoves. Many houses use the smoke to dry food. Therefore the chimney hoods were found to be more practical and acceptable to many households.

**Strategies adopted in disseminating kitchen improvement**

Strategies adopted in disseminating the technology were creating

awareness, training, monitoring and evaluation. These were conducted at organizational level as well as rural levels. In extending these programmes at organizational level in other districts, IDEA used the national network member organizations. In imple-menting kitchen improvement programs at rural level, IDEA had to intervene in providing technical support at the beginning although training was provided to network NGOs. However the network NGOs provided their fullest assistance in implementing these programs and are very keen to continue their capacity building. Since kitchen improvement is a more social act than a technical act and where community is concerned, they have to be motivated and awareness should be created from time to time and also should be conducted through local organizations. Kitchen improvement should be treated as a social mobilization program rather than a technical program as the effect of

kitchen improvement has reflected on the improvement of the whole house resulting in enhancing the beneficiarie’s quality of life.

**Lessons learned**

There were many experiences encountered when implementing the program and they were:

- Awareness programs should be followed by practical exercises for the same group.
- Demonstration kitchens should be established within the areas of the target groups.
- It is desirable to take target groups to visit field activities to create awareness.
- The motivation of the families can be developed by the visits of external groups and persons to their houses and sharing experiences.
- Implementation would be successful if participation of all family members is obtained.
- When making each component in the kitchen, it should be done with the consultation and participation of the housewife and family members according to their wishes.
- Improvements should carried out gradually by giving priority to activities which provide immediate benefits.
- The field officers implementing the programs should have a practical and theoretical knowledge about activities of a kitchen.
- The field staff implementing programs should always act as social mobilizers.

**Outputs of the Programme**

After implementation of the program it was observed that unexpected direct outputs had been obtained. Previously, it was expected that an efficient kitchen with healthy environment was the only output, but it was realized then that there were additional outputs expected. These outputs could be categorized into two and they are:

- Family unit wise.

- Community development wise.

**The family wise outputs were:**

- Through a healthy kitchen with proper ventilation, there was an increase in the participation of other family members in activities which were earlier limited to the housewife.
- Family unity increased.
- Because of the increasing of the cleanliness of the kitchen, other sections such as inside the house, outside the house, and even family member's cleanliness also increased.
- Coordination between families of the village increased.

**Community wise outputs were:**

- It made easier for the local organization to obtain participation of the community in group activities and other gatherings due to trust established after benefits of kitchen

improvement.

- This program has become an entry point for new programs.
- The capability of working with other organizations within the local area or the district has increased.
- It can be easily introduced to the community as the program gives direct benefits.
- Motivation of the field officers of the organizations increased.

**Problems encountered during implementation**

- Adequate participation of men was not satisfactory during the inception of the program.
- The housewives were too busy to find time to participate in the program.
- Lack of expertise among field officers within organizations.
- Lack of staff within organizations.
- Lack of financial resources within rural communities and

organizations.

**Some strategies adopted to encounter above problems**

- Kitchen improvement was conducted in one place with participation of every body during community group meetings and other meetings.
- While improving kitchens, the activities to be done by women should be completed first in order to obtain the participation of men.
- Obtain participation of other societies in the village.
- Motivating family members by implementing kitchen improvement activities in their presence.
- Creating awareness of men should be done gradually to obtain their participation in activities which women are not capable to do.
- Establish micro credit schemes to meet small financial needs. glow

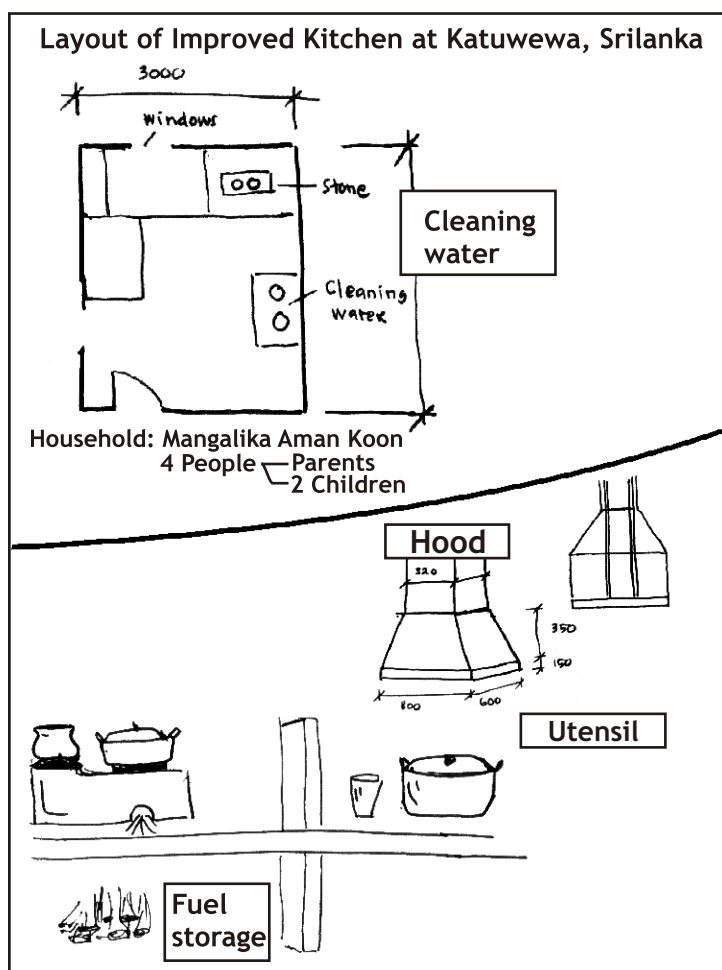
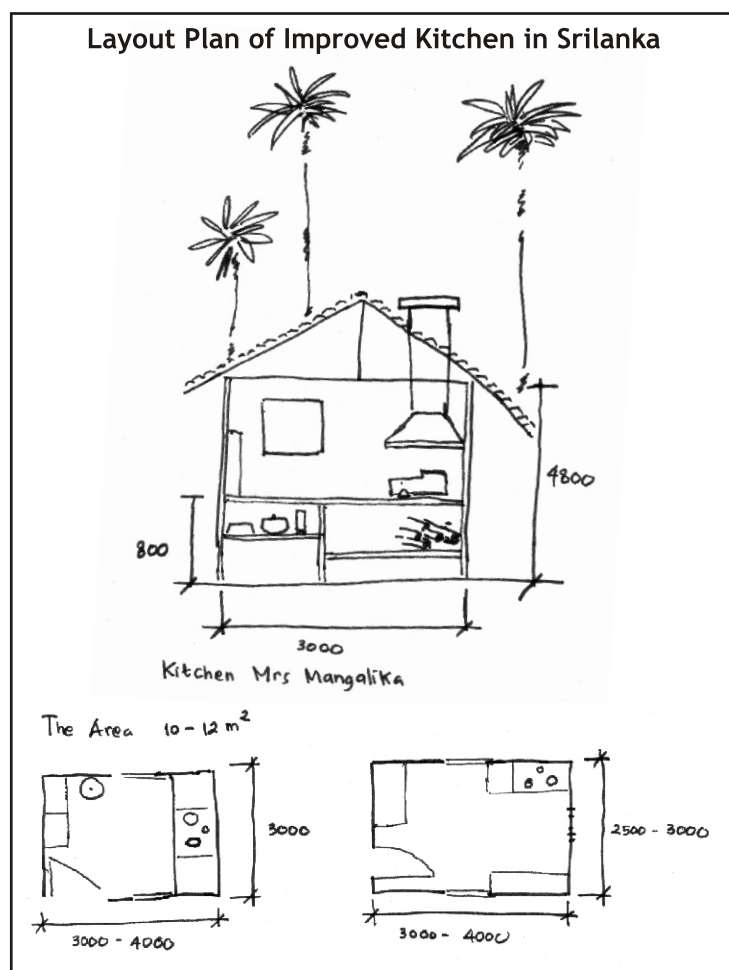


Illustration by Prof. S.K. Sharma

# REGIONAL WORKSHOP ON ICS, KITCHEN IMPROVEMENT AND HEALTH

19 - 22 August 2003, Galle, Sri Lanka

The objectives of the workshop were:

1. To provide a forum to share knowledge, experiences and new strategies surrounding kitchen improvement programs
2. To identify key success/failure factors in existing or past Kitchen Improvement programs.
3. To explore in-depth how ICS and Kitchen Improvement programs can eliminate or reduce health problems associated with the unhealthy kitchen environment.
4. To generate recommendations and a program approach to Kitchen Improvement.

The four-day workshop provided an exchange forum through paper presentations, group discussions and a field trip. Participants came from various Asian countries (Bangladesh, Cambodia, India, Indonesia, Nepal, Philippine, Sri Lanka, Thailand and Vietnam) and from different sectors including NGOs, academia, and government (though mostly were from NGOs which have been working on improved cookstove programs).

#### WORKSHOP INAUGURATION

The workshop was opened with the lighting of Sri Lankan Traditional

Light, followed by addresses from the host and organizers (Mr. Abayawardhana and Mr R.M. Amaresekera of IDEA and Ms. Christina Aristanti of ARECOP Secretariat) and by the resource person (Dr. R.M. Pandey of MSMT, Nepal). Later, this was followed by an introduction of the workshop objectives and framework by Ms. Aristanti.

#### WHAT IS AN IMPROVED KITCHEN?

In order that participants grasped the same perspective before embarking on a discussion on kitchen improvement, there was a



The Regional Workshop was jointly organized by ARECOP Secretariat and Integrated Development Association, Sri Lanka.

brainstorming session to define the concept of "kitchen improvement". In this, participants were invited to share opinion on what they perceive as an improved kitchen.



Above: An opening of the workshop  
Below: Presentation by the participant

#### DAY 1

On Day 1, presentations and discussions were on the theme "Indoor Air Pollution, Kitchen & Health". Three presentations were made on the theme, which are:

1. **The stove and kitchen smoke**, C.V. Krishna (CREAT, India)
2. **Effect of kitchen Emissions on the Health of Rural Women**, Prof. S.K. Sharma\* and Asif Ali Khan (Energy Research Centre, Panjab University, Chandigarh, India)
3. **Indoor air pollution a possible contributory factor for chronic obstructive lung disease in women of Sri Lanka**, Dr. Anoma Siribaddana (Chest Clinic/Teaching Hospital, Kandy, Sri Lanka)
4. **Indoor air pollution and health**, Prof. Dr. M. R. Pandey (MSMT, Nepal)

During the group discussions on day 1, participants discussed the extent of current intervention in addressing

#### WHAT IS AN IMPROVED KITCHEN? (A summary of brainstorming result)

1. **Functional aspects:**
  - Sufficient working and storage space
  - Orderly with regards to stove placement, cooking position, utensils, storage, safe placement of sharp instruments, water supply)
  - Ergonomic setting (cooking position, storage of various articles and materials)
  - Protection from rain and wind
  - Sufficient lighting
2. **Health aspects:**
  - Measures to reduce smoke (enough ventilation, improved cookstove)
  - Clean water supply
  - Keep out animal disturbances (e.g. Rat)
  - Good garbage disposal system
  - Hygienic environment (food preparation place, washing place, etc)
3. **Social aspects:**
  - Women and children involvement with regards to kitchen

#### WHAT HAVE BEEN ADDRESSED BY ICS AND KI PROGRAMS WITH REGARDS TO INDOOR AIR POLLUTION?

(An overview of group discussion results)

1. **Improved Cookstove Program**  
The general perspective of the participants indicated that improved cookstove programs have been to a different degree addressed the issue of indoor air pollution. Stoves/chimney stoves have been promoted, demonstrated and installed. There is a degree of quality assurance on improved stoves produced.  
It was mentioned that cookstove program in Thailand has been a government program and that there is not enough commercialization (which reflects low level of sustainability). There has also been ICS awareness campaign (e.g. TV and radio in Cambodia) and distribution of information and educational materials (e.g. in Cambodia and Nepal). In ICS related program, cooperation was also sought with government institutions. Specifically mentioned in Cambodian case, cooperation has been conducted with ministers related to energy, research, health and women.
2. **Kitchen Improvement Program/Activities**  
Several countries have also implemented kitchen improvement program (Indonesia, Nepal, Sri Lanka). For example in Indonesia through pilot projects (with ICS, introduction of cement floor, improved ventilation, etc) and using knock down kitchen model.  
While some other measures have been taken, including, the introduction of ventilation, although in an ad-hoc/scattered manner. It was also mentioned that indoor air pollution has been addressed in the school curriculum. There have been also exposures made on the issue of indoor air pollution through media write ups

#### WHAT ARE THE GAPS IN THE PROGRAM AND ACTIVITIES?

(An overview of group discussion results)

1. **Policy**  
Generally it was agreed upon that in the countries represented by participants, present policies related to indoor air pollution, ICS and

Kitchen Improvement have been inadequate, e.g.

- policy has not recognized cooking with biomass using inappropriate device as health hazards
- the issue of indoor air pollution has also not been addressed in housing, health, and energy agendas.
- With regards to policy, it is especially mentioned that in Nepal, the National Plan, while has recognized ICS as fuel saving device, yet has not recognized it as a health improvement device.

## 2 Program/User

With regards to the present programs, there are expressions about inadequacy of training, awareness and information and education materials. While public awareness about IAP has also not been adequate. Further it was pointed out that thus far, program have put more focus on fuel efficient stove and paying less attention to smoke. There was also no existing kitchen improvement program in Thailand, Sri Lanka, Bangladesh. In relation to user, it was

mentioned that program face financial obstacle.

## 3. Donor

Lack of attention given by donor agencies on the above issues.

## 4. Research and Development

There was also an expression about the lack of Research & Development on stove emission factors, health impacts, IAP/health risk. Further, it was also mentioned that R&D should also focus in improving indoor air quality and not only ICS

kitchen indoor air pollution and identified gaps and potential ways of addressing the problems.



A group discussion session

## DAY 2

Theme for Day 2 of the workshop was "Experiences in Kitchen Improvement". The presentations were on the experiences of kitchen improvement activities in Indonesia, Nepal and Sri Lanka. The presentations were as follows:

### 1. Brief Presentation of the Kitchen Improvement Programme in the Weeraketiya District Secretary

## IMPACTS /ACHIEVEMENTS

(An overview of discussion results)

There has been a micro level impact in those places where kitchen improvement activities have been implemented (Sri Lanka, Indonesia, Nepal). Among these impacts are: smoke reduction, health improvement, mental health improvement and increased economic productivity.

## WEAKNESSES

(An overview of discussion results)

1. Little awareness of the program and activities
2. Financial support has also been lacking/Lack of support from the government for such activities
3. KIP has been treated as a welfare service rather than a commercial one.
4. Lack of integration of kitchen improvement activities (they are being isolated project)
5. Lack of information and educational materials on kitchen improvement
6. General lack of capability and skills to carry out kitchen improvement activities
7. KIP is now only at an inception stage
8. Reluctance of target user to change practices
9. Socially kitchen has also not been considered as an important part of the house - thus little attention is paid toward improving it.

## STRENGTH

(An overview of discussion results)

1. Health hazards of IAP accepted globally
2. There are organizations involved in KI and related fields
3. Research on smoke and health hazards have been conducted
4. There is a growing awareness
5. Limited research finding and data is available
6. Audio/visual aids publications are available
7. Program :
  - Proven micro-level implementation
  - Strong local participation
  - Women and children have been encouraged to participate in KI activities
  - Holistic approach to kitchen improvement has been used
  - Multi-sectoral involvement
  - Strong network through national and regional network



**Division- Sri Lanka** (implemented by IDEA with the participation of Ruhunu Ladies Development Society), Mr. R.M Amarasekera (Integrated Development Association, Sri Lanka)

2. **Urgency for Holistic Approach in Kitchen Improvement Program**, Hari Bhkata Khoju Shrestha (RUCODES, Nepal)
3. **Kitchen Improvement Program in Kokap, Kulon Progo, Yogya-karta, Indonesia**, Prianti Utami (Yayasan Dian Desa/Indonesian Stove Network)

Other presentations were made on traditional kitchens in Cambodia, by Mr. San You of Development of Alternative Technology, Cambodia, and on stove program implementation by Mr. Aminul Islam, of Village Education Resource Center, Bangladesh.

Another group discussion session followed, in which participants reflected on the experiences of kitchen improvement activities presented earlier: what have been the impacts; what have been the strengths; what have been the weaknesses; what could be the solutions.

Another discussion session follows, in which participants, grouped based on countries worked on:

1. Identifying greatest concerns in typical kitchens in their respective countries
2. Identifying specific social cultural factors if Kitchen Improvement Program (KIP) were to be implemented in their respective countries
3. Identifying potential obstacles if KIP were to be implemented in their countries

Participants were asked to complete the presentation and displayed the results of the working group on day 4. At the end of day 2, another presentation was made by Prof. S.K Sharma on his studies investigating indoor air pollution dynamics in a kitchen.

### DAY 3

The whole of day 3 was spent on a field trip to a Kitchen Improvement Program implemented at Weeraketiya, by Integrated Development Association and Ruhuna Rural Ladies Association. Participants were then divided into 3 groups and visited several houses where kitchen improvement had been implemented. Participants observed and interacted



Participants were welcomed at Ruhuna Rural Lady Association



Chimney hood (wood and mud) installation and introduction of racks, as part of household kitchen

#### SUGGESTED SOLUTIONS

1. Create awareness/ awareness promotion on kitchen smoke health hazards (seminar, workshop)
2. Education/inclusion in school curricula
3. Information and Education materials
4. Simple local language IEC on operations and maintenance

#### PROGRAM APPROACH/ DISSEMINATION APPROACH

1. Integrated mechanism
2. Capacity building and mobilization on kitchen improvement activities
3. Demonstrations
4. Subsidy for KIP initiative
5. Commercialization
6. Forge multilateral relationship
7. User to user campaign
8. Appropriate/affordable technology

#### DONOR SUPPORT POLICY/ADVOCACY

1. Inclusion in policy document
2. Lobby
3. Highlight health hazards of IAP for advocacy
4. Formation of pressure groups (local, national)
5. National coordinating body (regional, international network)

with householders.

**DAY 4**

Day 4 was started with a discussion on the field visit to Kitchen Improvement at Weeraketiya . Participant reflected and wrote down their impressions on the field visit. This was followed by a

gallery presentation on the results of group work on day 2. Participants examined the presentations and exchanged ideas.

Another group discussion on Guidelines for Kitchen Improvement implementation was conducted, followed by conclusions and

recommendations of the workshop. The workshop was closed with remarks by Mr.R.M. Amarasekera, Mr. Marikar (IDEA) and Christina Aristanti (ARECOP). *glow*

<p><b>COMMENTS ON FIELD VISIT</b> <i>(A Summary)</i></p> <p>The visit resulted in various comments from participants. Some commented that the program has been good, inspiring and should be supported:</p> <ol style="list-style-type: none"> <li>1 Good program and implementation :             <ul style="list-style-type: none"> <li>- Community participation</li> <li>- Physical implementation were good : using hood is a leap forward to tackle smoke problems replacing chimney and its problems; ventilation; storage and waste disposal; healthy and safe kitchen, use local resources/low cost</li> </ul> </li> <li>2. Good eye opener for a KIP</li> <li>3. Should be disseminated and promoted to other places</li> <li>4. Impacts on users : Users' wishes of retention of smoke psychologically satisfied and that and the implementation make people happy</li> <li>5. Credit scheme initiated by IDEA on the kitchen improvement has been helpful</li> </ol> <p>Further there were also suggestions with regards to the following:</p> <ol style="list-style-type: none"> <li>1. Improvement of natural lighting to alleviate darkness</li> <li>2. While addressing still poorer houses, and smaller kitchens, we have to take cautious care in choice of ICS and the kitchen improvement steps on site/in situ</li> <li>3. The layout of the furniture should be stressed even if it is in small kitchen</li> <li>4. Permanent board should be displayed at the entrance of the</li> </ol>	<p>village mentioning KIP details to create awareness to other villagers and outsiders</p> <p><b>GUIDELINES FOR IMPLEMENTATION OF KITCHEN IMPROVEMENT PROGRAM</b> <i>(An overview of group discussion results)</i></p> <p>General approach and principles :</p> <ol style="list-style-type: none"> <li>1. Integrated/holistic approach</li> <li>2. Provide choice on the concepts of building new, improving existing OR to modifying internal components of kitchens</li> <li>3. Standardize components and solutions</li> <li>4. Simple manual on how to do and what to think about</li> <li>5. Optimal use of illustrations and pictures</li> </ol> <p>General contents</p> <ol style="list-style-type: none"> <li>1. Kitchen survey /Study on existing kitchen</li> <li>2. Architectural and construction aspects             <ul style="list-style-type: none"> <li>- kitchen measuring</li> <li>- location</li> <li>- Plan</li> </ul> </li> <li>3. Kitchen components             <ul style="list-style-type: none"> <li>- ICS</li> <li>- water supply</li> <li>- washing place</li> <li>- etc</li> </ul> </li> <li>4. Social and cultural practices</li> <li>5. Implementing KI program /activities             <ul style="list-style-type: none"> <li>- Integrate KIP to ICP or other programs e.g. Sanitation</li> <li>- Institutionalization of KIP</li> <li>- Information, Education and communication</li> </ul> </li> </ol>	<p><b>CONCLUSIONS</b> <i>(An overview of group discussion results)</i></p> <p>The extent of indoor air pollution:</p> <ul style="list-style-type: none"> <li>- Indoor air pollution is a health hazard, which needs immediate attention.</li> <li>- Research results show an alarming scenario on IAP in the kitchen</li> </ul> <p>Gaps:</p> <ol style="list-style-type: none"> <li>1. Lack of awareness among stakeholders</li> <li>2. Lack of appropriate technical intervention, Information, Education and Communication (IEC) and policies</li> <li>3. There is little investment by the government and funding agencies</li> <li>4. Efforts to address the issue on IAP have just started and awfully inadequate</li> <li>5. Insufficient institutional linkages</li> <li>6. Insufficient facilities for R&amp;D</li> </ol> <p>Impacts of kitchen improvement:</p> <ol style="list-style-type: none"> <li>1. Saves energy and cooking time</li> </ol> <p>Lessons learnt from experience:</p> <ol style="list-style-type: none"> <li>1. Beneficiaries' participation can lead to a successful result</li> <li>2. It is important to share information, experiences and knowledge from each other</li> </ol> <p><b>RECOMMENDATIONS</b> <i>(An overview of group discussion results)</i></p> <p>On popularization of Kitchen Improvement:</p> <ol style="list-style-type: none"> <li>1. Kitchen Improvement Program (KIP) should be</li> </ol>
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- integrated with other programs
- Increase mass awareness on risks and benefits of KIP to attract interest of all stakeholders
  - Promotion of info, education, communication with regards to improved kitchen
  - Information exchange (Data on IAP; success stories of KIP pilot projects; International experience sharing)

On implementation initiatives and efforts

- Development of guidelines and or manual
  - guidelines and manuals on KIP implementation;
  - Technical manual; modular design to meet diverse needs of target group in different countries
- Kitchen improvement should

emphasize on the use of low cost and local materials

- Capacity building
  - Continuation of trainings /workshops
  - Training program on monitoring IAQ should be organized for member countries
- On national level initiatives and efforts
  - Formation of national focal point for institutionalization of KIP, coordinate activities of different members and agencies
  - Formation of working group in each member country coordinated by ARECOP
  - Country working group should create awareness, media, seminar and workshops
  - Each working group should prepare country specific concept paper for kitchen improvement implemen-

tation

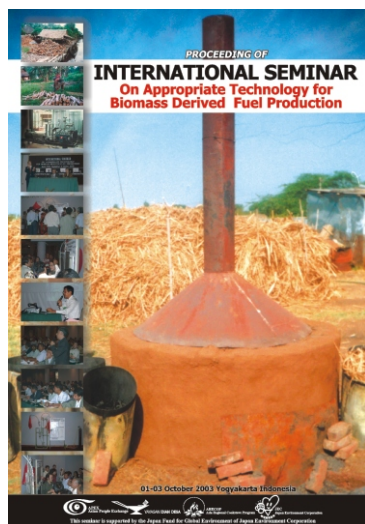
On Research and Development and studies

- Rigorous R&D (quantitative and qualitative) should be initiated in the area of IAQ and improved kitchen design.
- Baseline studies IAQ and kitchen planning should be undertaken in different agro-climatic region having different socio-cultural

On Policy and related issues

- Lobby / advocacy with government and donors
- Government and donors must take this issue as a priority in policies
- Donor agencies should be approached in undertaking pilot studies in each country

## PROCEEDING OF INTERNATIONAL SEMINAR ON APPROPRIATE TECHNOLOGY FOR BIOMASS DERIVED FUEL PRODUCTION



Available on Request at the  
**ARECOP Secretariat**  
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[secretariat@arecop.org](mailto:secretariat@arecop.org)

### Part 1

The first part of the seminar was overview on biomass energy and its potential in Asia and in Indonesia which is intended to give the participants a good understanding of the biomass energy situation and also its potential for development and utilization both in the Asia region and especially in Indonesia.

### Part 2

The second part of the seminar was paper presentations on the topic of the production of biomass liquid fuel. In this part there were 3 papers presented.

- Biofuel for Diesel Engine from Esterified Palm Oil Distillate- Dr. Ir. Supranto M. Sc.
- Biodiesel from Vegetable Oil: Its Impacts on Technology, Environment and Economy- Prof. Dr. Tatang Hernas Soerawidjaja
- High-Calorie Gasification from Biomass, and the Transition to Gas Fuel, Liquid Fuel and Power Generation- Prof. Masayasu Sakai, Dr. Eng.

### Part 3

In part 3, the paper presentations and discussion was on the production of cleaner fuel from biomass focusing on various gasification technologies. There were 6 papers presented by

resource persons from Indonesia, India, Japan and Thailand. In addition, there was one demonstration on the technology developed by the Japan expert on the Fluidized Bed Biomass Gasification Technology.

- Bio-fuel from Cellulosic Materials: Gasification and Pyrolytic liquefaction- Prof. Dr. Robert Manurung
- Biomass Gasification Technology A Summary on the Experience, Development Fabrication and Application- Ir. Chayun Budiono M.Sc
- Clean Biomass Based Energy Technologies- Prof. H.S. Mukunda
- Biomass Gasification - Diesel Engine Combined Cycle (bioner) as Rural Electricity Supply- Ir. Safriadi, Ir. Bambang Suwondo Rahardjo, Ir. I Putu Sutrisna
- Prospect of Fluidized Bed Biomass Gasification Technology- Prof. Masayuki Horio & Reiji Noda

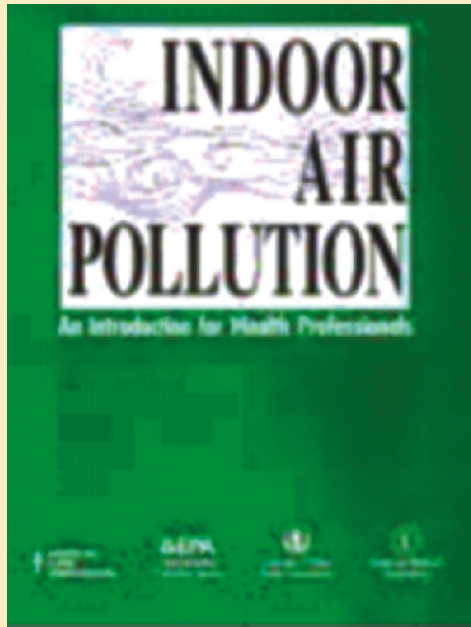
### Part 4

The last part of the seminar presented and discussed thoroughly on technologies on upgraded solid biomass and its technologies such as charcoal making and briquetting from light agro waste. In this part, a small gasification technology was also presented.

- Charcoal as an Alternative Fuel- Donatus Rantan & Rudyanta Utama
- The Blue Flame Revolution- Dr.A.D.Karve
- Charcoal From Light Agro Waste- Dr.A.D.Karve
- Development of Carbonization Technology for Community-Based Char-briquetting Industry- Ir. Bambang Suchayo, M. Eng. *glow*

# R E S O U R C E S

## INDOOR AIR POLLUTION: INTRODUCTION FOR HEALTH PROFESSIONALS



Consumer Product Safety  
Commission, American Medical  
Association, Environmental  
Protection Agency and the American  
Lung Association

This book can be used by health professional as a tool in diagnosing an individual's signs and symptoms that could be related to an indoor air pollution problem. The document is organized according to pollutant or pollutant group. Key signs and symptoms from exposure to the pollutant(s) are listed, with diagnostic leads to help determine the cause of the health problem. A quick reference summary of this information is included in this booklet. Remedial action is suggested, with comment providing more detailed information in each section. References for information included in each section are listed at the end of this document.

## WHAT YOU SHOULD KNOW ABOUT COMBUSTION APPLIANCES AND INDOOR AIR POLLUTION

Consumer Product Safety Commission

Hazards may be associated with almost all types of appliances. The purpose of this booklet is to answer some common questions you may have about the potential for one specific type of hazard- indoor air pollution- associated with one class of appliances- combustion appliances.

Combustion appliances are those which burn fuels for warmth, cooking, or decorative purposes. Typical fuels are gas, both natural and liquefied petroleum (LP); kerosene; oil; coal; and wood. Examples of the appliances are space heaters, ranges, ovens, stoves, furnaces, fireplaces, water heaters, and clothes dryers. These appliances are usually safe. However, under certain conditions, these appliances can produce combustion pollutants that can damage your health, or even kill you.

POSSIBLE HEALTH EFFECTS range from headaches, dizziness, sleepiness, and watery eyes to breathing difficulties or even death. Similar effects may also occur because of common medical problems or other indoor air pollutants.

This booklet was written:

1. to encourage the proper use, maintenance, and installation of combustion appliances;
2. to discuss the pollutants produced by these appliances;
3. to describe how these pollutants can affect your health; and,
4. to tell you how you can reduce your exposure to them.