Air pollution:a case study of a cashew nut factory

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Abstract

Probably the first experience of the human beings from the impact of air pollution might have taken place when they built fires in poorly ventilated caves. Since then our planet Earth has suffered much from man-made pollution. Cashew nut processing involves the hazards of both air pollution and indoor pollution; the former burns away our planet Earth and the latter affects the health of the factory workers engaged in different processes. The present study deals with only the latter: the occupational health hazards involved in cashew nut processing. This aspect is examined here by means of a case study of one cashew nut processing factory in Kanyakumari District of Tamil Nadu State in India. Cashew nut industry is important at the national level as a foreign exchange earner and is equally important at the local level as an avenue for extensive employment, especially for women. But how can that condone for the deadly sin of polluting our planet?

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Chapter 1
Introduction

> "The earth is drooping, withering... and the sky wanes with the earth; for earth has been polluted by the inhabitants thereof... Therefore a curse is crushing the earth, alighting on its guilty folk..."
>
> (Isaiah 24: 4-6)

It was a nice sunny morning; the sky was blue and spotless, except for some silver clouds. I was climbing the little hill near my house along with my parents, and I felt like standing on the top of the world. As a gentle breeze touched me, I looked around to see the land lying below me. And then I saw it: a long chimney of a building in our neighbourhood emitting dark smoke into the lungs of the sky. As I stood with a bewildered gaze, my parents told me that the building was a cashew nut processing factory. As a child, I liked crisp cashew nuts to bite and eat. But when my parents told me about air pollution and its consequent hazards on human health as well as on our very planet, I felt sad; my tongue that had tasted the cashew nuts turned sour.

Later from the text books and other books I learnt more about green house effect and climate change. When the Norwegian Nobel Committee decided to award the Nobel Peace Prize for 2007 to the Intergovernmental Panel on Climate Change (IPCC), along with Albert Arnold Gore Jr. (Al Gore), "for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change",[1] I took it as an official recognition of the international concern over climate change.

I have found while on errands that there are four cashew nut processing factories, located within a radius of less than two km. in my neighbourhood. Beyond that circle too I have seen a number of smoking chimneys. As a student, I am shocked to understand that the smoke from those chimneys contains more CO_2 than the green leaves around us are capable of absorbing for photosynthesis. That means a positive contribution to the stock of green house gases and climate change.

[1] http://nobelprize.org/nobel_prizes/peace/laureates/2007/press.html (Accessed on 3 August 2009).

1.1 Cashew Nut Processing Factories

Cashew nut processing refers to the conversion of raw cashew nuts in shell to its blanched graded kernel form. The processing units in India are mainly concentrated in the states of Kerala, Tamil Nadu, Karnataka, Goa, Andhra Pradesh, Maharashtra and Orissa. The process is highly labour intensive and the work force consists mainly of women.

Kerala has been the pioneer of cashew processing and exports, but is now slowly losing its premier position, as most of the major exporters are now getting the processing work done outside the State. There are around 150 major processor-exporters registered with the Cashew Export Promotion Council of India. Though a majority of them have offices and processing units in and around Kollam (Quilon), the "cashew town", almost all of them get over 50 per cent of the processing work done in neighbouring States. As against Kerala's 225 to 250 factories, Tamil Nadu has over 300 processing units, mainly in the Kanyakumari district, owned by the Kollam based companies.

Many processors are still using the traditional methods, which are highly polluting though a number of modern innovative systems are widely used in some parts of India and in other cashew processing countries. In addition to air pollution, this industry also causes impairment to the health of the workers, and is classified as a unit carrying on hazardous process.[2]

1.2 The Study Problem

Thus cashew nut processing involves both air pollution and indoor pollution; the former burns away our planet Earth and the latter affects the health of the factory workers engaged in the processes of roasting, shelling and peeling. Thus an ideal study should have the following objectives: (i) to analyze the association between climate change and air pollution from such cashew factories; and (ii) to examine the health issues of the cashew factory workers due to indoor pollution. However, I

[2] "As per the provisions of the Factories Act, 1948, any unit carrying on manufacturing process which has potential to cause material impairment to the health of the workers or pollution of the general environment, is termed as a unit carrying on hazardous process."
http://dgfasli.nic.in/publication/reports/kerala/chapter4.htm (Accessed on 3 August 2009).

am at present not in a position to take up the first objective as it involves scientific experiments which are beyond my capacity to assess the impact of such air pollution on climate change, though I firmly believe that there is a positive link. Hence I confine myself to the second objective only.

1.3 Objective of the Project

Thus the main objective of my project is:

> To examine the health issues of the workers engaged in cashew nut processing factory due to occupational hazards.

1.4 Methodology

The study is designed to be a case study of one cashew nut processing factory in my neighbourhood.

1.5 Organization of the Study

The present Project Report is structured in six chapters including this introductory chapter. The next chapter discusses the issues of air pollution and climate change and the third one briefly deals with occupational health hazards. Chapters four and five are the core ones presenting the case study results. The last chapter summarizes and concludes the study.

1.6 In Lieu of Conclusion

I have heard that the whole Kanyakumari District abounds with such factories; and I often look up in the sky in terror for some imminent smog as if I were in Mexico City. Of course, I know those factories are also the main sources of employment and income for a majority of the poor in my locality. I know also that cashew products are among the major exporting items of our country. But how can that condone for the deadly sin of polluting our planet?

Chapter 2
Air Pollution and Climate Change

"..... the earth has a fever. And the fever is rising. The experts have told us it is not a passing affliction that will heal by itself. We asked for a second opinion. And a third. And a fourth. And the consistent conclusion, restated with increasing alarm, is that something basic is wrong. We are what is wrong, and we must make it right."

(Al Gore, *Nobel Peace Prize Acceptance Speech*, Oslo, Norway, 10 Dec 2007)[3]

2.1 Introduction

Probably the first experience of the human beings from the impact of air pollution might have taken place when they built fires in poorly ventilated caves. Since then our planet Earth has suffered much from man-made pollution. Such problems have been local and minor until recently thanks to the Earth's own ability to absorb and purify minor quantities of pollutants. However, with the industrialization of society, introduction of motor vehicles and the population explosion, the problem of air pollution has assumed a threatening proportion.

Pollution is the contamination, *by man*, of any natural resource. Generally it is classified into: (1) air pollution, (2) land pollution and (3) water pollution. The interaction of these pollutants can also yield complex results. Air pollution is thought to largely cause global warming, creating freakish weather patterns – such as heavy rains and flooding. Such flooding can then overwhelm city waste systems and overflow sewage and other contaminants into drinking water. I consider here only air pollution.

The primary air pollutants found in most urban areas are carbon monoxide, carbon dioxide, nitrogen oxides, sulphur oxides, and particulate matter (both solid and liquid). These pollutants are dispersed throughout the world's atmosphere in concentrations high enough to gradually cause serious health problems.

[3] http://nobelprize.org/nobel_prizes/peace/laureates/2007/gore-lecture_en.html (Accessed on 13 August 2009)

2.2 Photosynthesis: the Regenerator of Oxygen

With the destruction and burning of the rain forests more and more CO_2 is being released into the atmosphere. Trees play an important role in producing oxygen from carbon dioxide through the process called photosynthesis. “A 115 year old Beech tree exposes about 200,000 leaves with a total surface to 1200 square meters. During the course of one sunny day such a tree inhales 9,400 litres of carbon dioxide to produce 12 kilograms of carbohydrate, thus liberating 9,400 litters of oxygen. Through this mechanism about 45,000 litres of air are regenerated which is sufficient for the respiration of 2 to 3 people.” (Breuer 1980: 1) Thus, as long as no more wood is burnt than is reproduced by the forests, no change in atmospheric CO_2 concentration will result.

2.3 Indoor Pollution

We cannot escape air pollution, not even in our own home. “In 1985 the Environmental Protection Agency (EPA) reported that toxic chemicals found in the air of almost every American home are three times more likely to cause some type of cancer than outdoor air pollutants.” (Miller 1990: 488) The health problems in these buildings are called “sick building syndrome”.

Poor ventilation causes about half of the indoor air pollution problems. The rest come from specific sources. Indoor pollutants such as cigarette smoke or carbon monoxide typically stay in the air for extremely long periods. This allows concentrations to reach dangerous, yet undetectable, level. Over time, buildings will produce their own pollutants. As walls and carpets age, they will produce dust and powders. There is also concern about moisture in buildings, which produces molds and fungi. Old homes may also have lead-based paint that can flake into the air.

The problem of indoor air pollution came to the forefront with the discovery of the dangerous effects of asbestos. It has been used as an insulator for ceilings, walls and pipes in many institutional buildings such as schools and factories. As these buildings age, asbestos form into powders and is inhaled. Asbestos exposure causes Mesothelioma, a cancer of the cells forming on the lining of lungs and ribs.

2.4 Global Warming and Climate Change

The Intergovernmental Panel on Climate Change (IPCC) that won the Nobel Peace Prize for 2007

has carried out extensive research about man-made climate change. According to IPCC, the observed trend in the Earth's annual average temperature is one of the factors leading to the scientific conclusion that the Earth is now in a period of global warming. It is reported that the scientists have found that the combined increases in carbon dioxide, methane, and nitrous oxide is the largest climate driver and its rate of increase during the industrial era is *very likely* to have been unprecedented in more than 10,000 years.[4]

According to the World Meteorological Organization (WMO), the decade of 1998-2007 was the warmest on record. The global mean surface temperature for 2007 was estimated at 0.41°C (or 0.74°F) above the 1961-1990 annual average of 14.00°C (or 57.20°F).[5]

The United States National Climatic Data Center (NCDC), found that in 2007 "the global land surface temperature was warmest on record while the global ocean temperature was 9th warmest since records began in 1880. ….. Including 2007, seven of the eight warmest years on record have occurred since 2001 and the 10 warmest years have all occurred since 1995. The global average surface temperature has risen between 0.6°C and 0.7°C since the start of the twentieth century, and the rate of increase since 1976 has been approximately three times faster than the century-scale trend."[6]

2.5 Conclusion

I do not know whether the first human beings who choked and coughed when they lit fire inside their cave thought of the implications of air pollution for the future of life on the Earth. But I know everybody today is concerned about it. I know every smoking chimney has a role in choking the life on the Earth. I know we are all guilty in one way or another. I know it is worth assessing and measuring the contribution of each of us towards this burning problem. However, I do not know how to proceed with such a research; but I believe in due course I might get some ideas. For the time being, I turn to studying occupational health hazards.

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[4] http://www.eoearth.org/article/Global_warming (Accessed on 6 August 2009).

[5] Ibid.

[6] http://www.ncdc.noaa.gov/oa/climate/research/2007/ann/ann07.html Accessed on 10 August 2009.

Chapter 3
Occupational Health problems

"The State shall make provision for securing just and humane conditions of work and for maternity relief."

(The Constitution of India, Article 42)

3.1 Introduction

After the home environment, it is the workplace where many people spend more of their time. In favorable circumstances, work is expected to contribute to good health and economic achievements. Ability to participate in the working life opens the individual possibilities to carry out economically independent life, develop his or her working skills and social contacts. However, in countries like ours there are work environments that expose many workers to health hazards that contribute to injuries, respiratory diseases, cancer, musculoskeletal disorders, reproductive disorders, cardiovascular diseases, mental and neurological illnesses, eye damage and hearing loss, as well as to communicable diseases.

The range of hazards also includes long working hours, poor housekeeping, inadequate welfare facilities, ventilation and lighting, poor work postures and work methods, chemical exposure and inadequate provision of protective equipment. Many of those working in small-scale industries (SSIs) suffer adverse health impacts due to exposure to dusts, heat stress, toxic substances, noise, vibration and poor hygiene. Many individuals spend one-third of their adult life in such hazardous work environments (World Health Organization 1995: 1).

According to World Health Organization, each year 160 million new cases of work-related illness occur and take 1.7 million lives (3 percent of all deaths). Selected occupational risks are responsible worldwide for 37 percent of back pain, 16 percent of hearing loss, 13 percent of chronic obstructive pulmonary diseases, 11 percent of asthma, 8 percent of injuries, 9 percent of lung cancer, and 2 percent of leukemia and caused 850,000 deaths worldwide.[7]

[7] http://www.who.int/occupational_health/en/ (Accessed on 10 August 2009)

3.2 The ILO Conventions and India

The Government of India has framed a number of legislations concerning occupational safety and health. The Government has in this derived conclusive guidelines from the conventions, recommendations and codes of practices framed by the International Labour Organisation (ILO). The ILO has so far adopted 182 conventions and 190 recommendations encompassing subjects such as worker's fundamental rights, worker's protection, social security, labour welfare, occupational safety and health, women and child labour, migrant labour, indigenous and tribal population, etc. The Government of India has so far ratified 39 conventions, and the recommendations relating to these 39 conventions have also been implemented to the extent possible (Government of India 2001: 18-19).

Government of India (2001: 68) reports that a number of surveys relating to working conditions in small scale units have been conducted by Labour Bureau covering a number of occupations including cashew nut processing. The findings of the reports reveal that there is an urgent need to address to the safety and health requirements of the workers employed in such un-registered manufacturing units.

3.3 Workplace Exposures

We know that workplace health hazards generally differ from those found in the general environment. Furthermore, because workers are often exposed in confined spaces, exposure levels to workplace hazards are often much higher than exposures to hazards in the general environment. In countries like ours, the situation is more hazardous: workers may be exposed simultaneously to workplace hazards, to an unsafe housing environment, and to a polluted general environment.

The World Health organization's (1995) *Global strategy on occupational health for all* which was adopted by the World Health Assembly in 1996 presents a detailed discussion of major workplace hazards such as mechanical hazards, unshielded machinery, unsafe structures in the workplace and dangerous tools. It is reported that approximately 30% of the workforce in developed countries and between 50% and 70% in developing countries may be exposed to a heavy physical workload or ergonomically poor working conditions, involving much lifting and moving of heavy items, or repetitive manual tasks.

3.4 Health Hazards in Cashew Nut processing

As already noted, cashew nut processing industry is a unit carrying on hazardous process and involves a number of health hazards. An assessment of the health problems involved in this industry is thus worth undertaking.

Commercial processing of cashew nuts at factories involves different stages of operations, such as roasting, shelling, peeling, grading and packing.[8] The most hazardous stages of cashew nut processing are roasting and shelling. Though the State Governments press the cashew nut processing units to use non-polluting stem-based technique in place of drum roasting (burning) technique that creates air pollution, many units still follow the oldest cheaper method (*The Hindu* daily April 10, 2007). It is worth noting that the method of steam-cooking and hand-cum-pedal operated sheller combination has been found to be more cost-effective when compared to other processing systems (*Business Line* daily July 5, 2003). Though foot operated shell cutters (mechanical device) for shelling are non-hazardous, this method also is not adopted by most of the units.

3.5 Conclusion

Thus we find that even though there are more efficient and non-hazardous methods in cashew nut processing, most of the factories run on old, cheaper techniques, which are hazardous to both the environment and workers involved. Hence an assessment of these hazards is in order. Since a scientific study on air pollution is out of my range, I take up a case study of the occupational hazards involved in cashew nut processing. The next two chapters discuss the results of the case study.

[8] See Appendix 1 for details

Chapter 4

A Tale of A Cashew Nut Factory in My Neighbourhood:

(i) Demographic and Socio-Economic Profile of Women Workers

"This job never gives me any satisfaction; but it provides me and my children with food. We just manage to be *alive*."

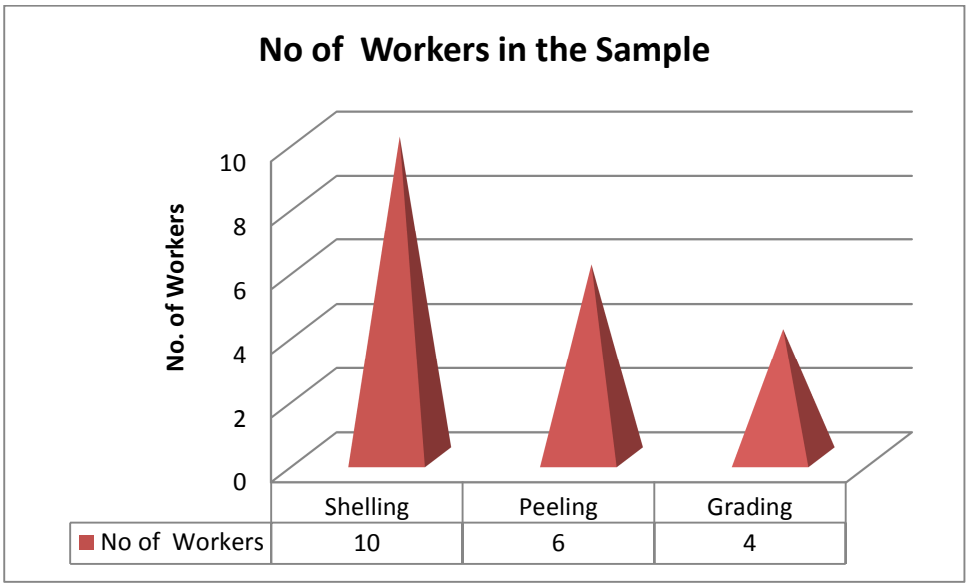
(Kanakabai, 42 years : in interview with me)

4.1 Introduction

As noted earlier, there are four cashew nut processing factories in my neighbourhood. Given the limited time available, I chose for my case study only one factory, the nearby one (Sabari Cashew Factory), which is accessible in three minutes walk from my house. The general particulars about the factory were collected from the Manager, who was very helpful. He explained to me the different operations involved in cashew nut processing in the factory, and took me on a *quick* visit to the different sections. It was a brief visit only, as he wanted not to disturb the work going on in the factory. I was not able to meet and talk with the workers in their work environment, lest it disrupt the factory functioning. I knew my interference would cost them dearly, since less work fetches less income. Therefore I waited and talked with the women workers during the off-work period, in all 15 of them; I also visited five workers in their houses on Sunday (9 August 2009) and collected their stories. Thus my sample consists of 20 women workers of this factory (see Figure 1 for the distribution of the sample workers).

4.2 The Sabari Cashew Factory

The factory, actually owned by a Kollam-based industrialist and leased to the present management, was established about 20 years back. By the size of employment, it is a small factory, employing only around 60 workers, mostly women. There are no regular workers, eligible for benefits such as Provident Fund. Packing also is not done in this factory. As reported in literature, about 95 percent of the workers in a cashew nut factory are engaged in shelling, peeling, and grading, all women (see for example, Government of India 1954; 1999). It was so found in this factory also, with two men engaged in the roasting section, and three men working as supervisors-cum-watchmen, in addition to the manager.



Source: Primary Survey

4.3 A Division of Labour

Three of the main tasks in processing cashews – shelling, peeling and grading – are unconditionally defined as female occupations. The manager of the factory told me that these three works could only be carried out by women and attributed certain characteristics to women (such as deftness, nimble fingers and patience) to justify this fact. Thus it seems that there is a division of labour in cashew nut processing also, with men engaged in such operations as roasting that require physical strength and aptitude for working with machinery. I have read in literature that such gender division of labour in cashew nut processing appeared only since the 1950s; "in the 1920s and 1930s, when there was a less strict gender division of labour for those involved in roasting and shelling, there was no clear gender tradition in the work process." (Lindberg 2005: 52).

4.4 Caste Division of Labour?

I had heard that there had earlier been caste division of labour in cashew nut factories, with women of lower castes engaged in the more unpleasant work of shelling and upper caste women in peeling and especially in grading (also see Lindberg 2005: Chapter 4). My enquiries with the manager and workers in general in this factory revealed that there is now no such caste division of labour in any of the cashew nut factories in our locality. Both the so-called lower and upper caste women work together sitting side by side, and sharing their stories and even food. This is indeed a welcome

sign, showing the age of 'mad house'[9] practices is long dead and gone.

4.5 Age, Education and Marital Status

Women of all ages I saw in the factory, except children. The young dominated in my sample of 20, with as much as 75% belonging to the age group of 17 – 30 years. One of the two women above 41 years is a widow and the other 'separated'. A majority of the women workers have High school education and three have completed +2 (see Table 1 for more details).

4.6 Wages and Earnings

Wages are paid to the women workers according to the quantum of work done (piece rate system) on a weekly basis. Thus the individual earnings vary widely. However, all appeared happy in that they felt important as earners: "life is beautiful", beamed an all-smiling Anjana, a +2 holder, single and working for more than one year; and "we are happy", laughed out Vanaja, a mother of two, whose husband is working as a watchman in the same factory. However, for some of them that happiness was only a momentary mask as they began to tell stories of privation and sufferings.

Table 1: Age, Education, Marital Status and Length of Service of the Sample Women Workers in the factory

	Number	%		Number	%
Age (years)			**Education**		
17 - 20	8	40.0	Primary	6	30.0
21 - 30	7	35.0	High school	11	55.0
31 - 40	3	15.0	+1 / +2	3	15.0
41 and above	2	10.0	Degree /Diploma	0	0.0
Total	20	100.0	Total	20	100.0
Marital Status			**Length of service**		
Single	13	65.0	Less than 6 months	3	15.0
Married	5	25.0	6 months - one year	5	25.0
Widowed/Separated	2	10.0	One - two years	4	20.0
Total	20	100.0	Two - five years	3	15.0
			More than five years	5	25.0
			Total	20	100.0

Source: Primary Survey

[9] Remember that Swami Vivekananda, pained at the caste-based atrocities, called Kerala a 'mad-house'.

Fig. 2: Manual shelling

It should be noted that cashew nut processing is one of the scheduled employments under the Minimum wages act of 1948.

4.7 Conclusion

As mentioned already, cashew nut has two-fold importance: at the national level as a foreign exchange earner and at the local level both as a money-spinning nut for the factory owner and as an avenue for extensive employment, especially for women. Some aspects of the last factor were discussed in this chapter, in the context of a neighbourhood cashew nut factory. Some less-researched aspects relating to occupational health hazards would be examined in the next chapter, to which I am turning now.

Chapter 5

A Tale of a Cashew Nut Factory in My Neighbourhood:

(ii) Occupational Health Hazards

> "I get pains in my knees from squatting all day. I get headaches, dizziness and vomiting from breathing in the smoke (caused by the cashew roasting process)."
>
> (Lakshmi, 45 years : in interview with me).

5.1 Introduction

It goes without saying that good working conditions and sound environment greatly influence the productive efficiency of workers. As a Government of India Report states, "adequate and satisfactory working conditions are needed to maintain the health of workers and to increase their productivity….Women workers normally require special treatment because they need more protection than men in their working environment because of their tenderness and sensitiveness." (Government of India 1999: 95). In this chapter I discuss the occupational health problems of the sample women workers in the cashew nut industry in my neighbourhood.

5.2 Working conditions

The Factories Act of 1948 lays down that no adult worker shall be required to work more than 9 hours a day and for more than 48 hours in a week. From the sample workers I found that on average they work from 7 hours to 9 hours a day. They also had at least one hour of rest interval. The workers are also allowed almost all the National and festival holidays. According to the workers, the work places are well-lighted and almost well-ventilated,[10] but fitted with only a few exhaust fans. There is no over-crowding and the atmosphere is peaceful (see Table 2).

5.3 Welfare Amenities

Chapter V of the Factories Act of 1948 deals in detail with the provisions for making various facilities to the workers at their work places such as drinking water, separate latrine and washing

[10] Kannan observed in 1978 in the context of Kerala that "most of the work sheds, especially in which women are engaged in shelling operations, did not have even proper ventilation" (Kannn 1978: 25).

facilities, crèches, maternity benefits, first aid boxes and other medical facilities, etc. Most of these facilities are available to the women workers of this factory, except crèches and some medical facilities (see Table 2). It is a relief to find that no asbestos is used for any work shed of the factory.

Table 2: Working Conditions and Welfare Amenities Available to Women Workers in the Factory

Hours of work (average per day)	7 to 9 hours	Welfare Amenities	
National and festival holidays	Allowed	Drinking water	Yes
Other working conditions		Separate Latrines	Yes
Well-lighted	Yes	Separate washing facilities	Yes
Well-ventilated	Almost	Crèches	No
Fitted with exhaust fans	Only a few	Maternity (ESI) Scheme	Yes
Over-crowding	No	First aid boxes	Yes
Atmosphere peaceful	Yes	Medical facilities	Limited
Asbestos for work shed	No		

Source: Primary Survey

5.4 Health problems

5.4.1 Cauterization

The cashew nut shell liquid (CNSL) causes cauterization, a severe dermatological problem.[11] Large, brownish thickened sheets of dead skin are seen over the dorsal side of the fingers and palms. The workers reported that before starting work and on completion of the work they apply coconut oil on the forearms and smear ash over it for checking this dermatological problem. But they themselves admit that this does not give effective protection against cauterization. The women respondents in my sample reported that all women working in the shelling units have typical scars of this allergic reaction. They also showed me the permanent scars on their hands due to it. Women in the peeling section are victims of finger deformities. Severe finger pain, numbness, and even bleeding from the finger nails are the problems reported by women working in this section.

[11] Cauterization means burning of skin tissues; it is an ancient medical practice that is still in use. It involves burning the tissue either to close wounds or to stop bleeding. Medical doctors used this practice long ago by applying hot metal after amputation. This practice would close wounds and stop bleeding because the heat would make the blood clot. A related term, *cautery*, means placing a brand on a human, which was a common practice as punishment. (See http://www.wisegeek.com/what-is-cauterization.htm. Accessed on 3 August 2009).

5.4.2 Postural stress

In the shelling section, the workers squat barefooted on the floor with the trunk bent and eyes fixed on the kernel to be hit. In medical literature, intra-discal pressure at the lumbar region is reported to be high with trunk in bent forward position (Anderson 1985). It leads to degenerative tissue changes and functional defects on the musculo-skeletal system. The sample women workers in the shelling section reported low back pain, stiff neck, pain in the heels, and strain on eye muscles, which are related to this problem. In the peeling and grading section, women workers squat flat on the ground. The sample workers from this section reported suffering from crampness, muscular discomforts, shoulder pain and neck pain.

The oil and the crushed nuts are seen spread over the floor on which the workers squat, walk and stand barefooted. This poses added cauterization problems and affects their convenience in squatting over the floor. Added to this are the problems of rising temperature and the pungent smell of the roasted nuts that pollute the indoor air in the work sheds and factories. This situation makes them prone to asthma and respiratory disorders.[12] Similarly, the workers reported that indoor workplaces were hot during summer months.

5.5 Conclusion

One of the most significant occupational hazards in processing cashew nuts stems from the caustic oil which can burn the skin and produce noxious fumes when heated. It leaves almost no women workers (in the shelling and peeling sections) from its affliction. It is also reported that long hours without regular breaks, repetitive movement, fixed working position and prolonged visual concentration are commonplace for work tasks such as cashew nut shelling. Despite the legislative provisions for good working conditions and sound environment and for welfare amenities, the health hazards associated with cashew nut processing are still rampant. It is not that there are no ameliorative measures; hazards are much less in steam cooking method as opposed to drum roasting, but it is very costly, and the processors go in for cheap methods, without caring for the health of the thousands of women workers exposed to these hazards and for polluting our Planet Earth. How can we save these poor women and our dear Earth?

[12] Kannan observed in 1978 in the context of Kerala that a large percentage of women workers were suffering from various types of lung diseases, and only 9 were in good health (Kannan 1978: 26).

Chapter 6

In lieu of Conclusion

> "Coming as I do from India, a land which gave birth to civilization in ancient times and where much of the earlier tradition and wisdom guides actions even in modern times, the philosophy of "*Vasudhaiva Kutumbakam*", which means the whole universe is one family, must dominate global efforts to protect the global commons. This principle is crucial to the maintenance of peace and order today as it would be increasingly in the years ahead, and as the well-known columnist and author Thomas Friedman has highlighted in his book '*The World is Flat*".
>
> (Nobel Lecture by R. K. Pachauri, Chairman of the Intergovernmental Panel on Climate Change (IPCC), Oslo, 10 December 2007)[13]

Cashew nut processing involves the hazards of both air pollution and indoor pollution; the former burns away our planet Earth and the latter affects the health of the factory workers engaged in different processes. The present study dealt with only the latter: the occupational health hazards involved in cashew nut processing. This aspect was examined by means of a case study of one cashew nut processing factory in my neighbourhood.

As a prelude to the case study, I gave a brief discussion of the issues in air pollution along with indoor pollution and climate change in Chapter 2 and of the occupational health hazards in Chapter 3. It was pointed out that with the industrialization of society, introduction of motor vehicles and the population explosion, air pollution has now become everybody's problem. It is heartening that the

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[13] See http://nobelprize.org/nobel_prizes/peace/laureates/2007/ipcc-lecture_en.html (Accessed on 13 August 2009).

role of IPCC in building up and disseminating greater knowledge about man-made climate change, and in laying the foundations for the measures that are needed to counteract such change has now been recognized by the world. A discussion then followed about the workplace exposure to hazards.

With this background, the core Chapters 4 and 5 appear as case study of a cashew nut factory near my house.

Cashew nut industry is important at the national level as a foreign exchange earner and is equally important at the local level as an avenue for extensive employment, especially for women. This factory (as well as other factories) stands out as the sole source of income for many poor families in my locality. Indeed many a happy face I saw on the factory premises on that Saturday (the pay day) and I too felt happy. But my happiness faded as I looked up at the smoking chimney, as I saw the scars on the hands of the women workers due to cauterization, as I heard about sufferings from long hours of drudgery without regular breaks, repetitive movement, fixed working position and prolonged visual concentration, etc.

True, the factory is a foreign exchange earner and a source of income for many poor. But that question thunders out and echoes in my mind: How can that condone for the deadly sin of polluting our planet?

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Appendix 1

Cashew Nut Processing

Commercial processing of cashew nuts at factories involves different stages of operations:[1]

1 Roasting

Roasting of raw nuts is done to separate adhering shell from the kernel. There are three types of roasting viz., drum roasting, oil bath roasting and steam roasting.

1.1 Drum roasting: This is one of the oldest and more widely used methods. The nuts are fed into a rotating red hot drum which will ignite the shell maintaining its temperature because of the burning of the shell liquid. The drum is kept in rotation for 3-4 minutes and the roasted nuts are discharged from the lower end of the drum and immediately sprayed with water and then covered by ash, so as to absorb the oil on the surface. This facilitates the removal of the remaining oil on the shell.

1.2 Oil bath roasting: In this method, conditioned nuts are passed through cashew nut shell liquid (CNSL) bath heated to 170-2000 degree C by conveyer buckets for 1-2 minutes during which period the shell gets heated rupturing the wall and releasing the oil into the bath. The oil is recovered by continuous over-flow arrangement. The roasted nuts are centrifuged to remove adhering oil, cooled and shelled by hand- and leg-operated shelling machines. The kernel with the adhering testa (seed coat) is scooped out using a sharp needle.

1.3 Steam roasting: The raw nuts are steam roasted at about 100-lb pressure for about 25-30 minutes. Then the nuts are allowed to cool for 24 hours and taken for shelling. Shell oil can be extracted in later stages by crushing. The nuts are shelled by hand and leg operated shelling

[1] For more details see

(1) http://www.techno-preneur.net/information-desk/sciencetech-magazine/2007/dec07/cashew-nut.pdf;

(2) http://itdg.org/docs/technical_information_service/cashew_nut_processing.pdf

machines.

A general comparison of the above three methods would show that the oil bath method and steam roasting systems require more initial investment and higher maintenance costs, the drum roasting method being the cheapest. From the point of view of environmental pollution the safest is the steam roasting method.

2 Shelling

Cashew nuts after roasting and cooling are to be shelled to remove kernels. One has to be very careful while shelling the nuts. Hands are to be protected from cashew nut shell liquid (CNSL) which is highly corrosive. Hand gloves are to be used while shelling. The nuts are also dusted with wood ash. This operation is done manually in most of the factories across India. Large commercial processing units use foot operated shell cutters (mechanical device) for shelling.

3 Peeling

This process involves the removal of testa from the kernel. Peeling is done using a sharp knife or bamboo piece. Care has to be taken while removing the testa. If kernels are scorched more it results in poor quality kernels.

4 Grading

Kernels are graded according to the size manually. In the international market, bold whole kernels fetch premium price. The grading standards developed in India refer to white whole (undamaged) kernels and indicate the number of kernels per lb of weight. The white whole kernels are priced according to size. Further classification refers to broken kernels, butts, splits, pieces, small pieces and whether kernels are white or scorched.

5 Packaging

The last stage is packaging. It is advised that as far as possible, packaging material used should be eco-friendly and recyclable and containers are hermetically sealed after filling carbon dioxide.