

Occupational and environmental health hazards of women workers in cashew nut industries

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■ **ABSTRACT :** In India cashew (*Anacardium occidentale L.*) is mainly found in Kerala, Maharashtra, Andhra Pradesh, Odisha, Meghalaya, Assam, and Tripura. There are lots of cashew processing industries, refers to the conversion of raw cashew nuts in shell to its blancher graded Kernel form, so a large number of washer are involved in this sector. The labour intensive processes are shelling and peeling of brown skin where women are the majority of workers. They perform extremely tedious time and labour intensive work resulting in fatigue and drudgery. These labour forces are subject to the exposure of a corrosive anacardic acid during manual process of roasting, shelling and peeling. The 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. Therefore ergonomic intervention is required to improve occupational health as well as productivity of worker. Some precautionary measures can be taken upto prevent or minimize the air pollution and indoor pollution in the cashew nut factories.

■ **KEY WORDS:** Occupational health hazard, Environmental health hazard, Cashew nut industry, Women worker

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In industry, occupational health hazards are gradually increasing in certain type of diseases which are mainly known as work related health disorder because of hazardous working environment. Environmental health problems frequently originate in work places and work-related hazards, environmental degradation, poverty and social injustice are often interrelated (Levy *et al.*, 2011).

Work – formal and informal, paid and unpaid – plays a central role in the lives of people all across the world. Through work, women and men define themselves and their roles in society. Yet while many jobs provide both

income and personal satisfaction, they may also pose hazards and risks to health and safety. The ILO estimates that each year about 2.3 million men and women die from work-related accidents and diseases; including close to 360,000 fatal accidents and an estimated 1.95 million fatal work-related diseases (ILO, 2008). Hazardous substances cause an estimated 651,000 deaths, mostly in the developing world. These numbers may be greatly underestimated due to the inadequate reporting and notification systems in many countries (Anonymous, 2008). The risks to men workers are better

known that occupational safety and health considerations had previously focused on dangerous jobs, in sectors dominated by male workers. Today, however, women represent over 40 per cent of the global workforce, or 1.2 billion out of the global total of 3 billion workers (Anonymous, 2009). This increasing proportion of women in the workforce has led to a range of gender-related questions about the different effects of work-related risks on men and women, in terms of exposure to hazardous substances, or the impact of biological agents on reproductive health, the physical demands of heavy work, the ergonomic design of workplaces and the length of the working day, especially when domestic duties also have to be taken into account. Moreover, occupational safety and health (OSH) hazards affecting women workers have been traditionally under-estimated because OSH standards and exposure limits to hazardous substances are based on male populations and laboratory tests (Anonymous, 2000).

According to world scenario, India occupies premier position contribution about 43% of the cashew nut production. India is a leading producer, processor and exporter of cashew in the world with annual production of 6,20,000 Metric tone (Anonymous, 2007a). In India cashew is mainly found in Kerala, Maharashtra, Andhra Pradesh, Odisha, Meghalaya, Assam and Tripura. There are lots of cashew processing industries, refers to the conversion of raw cashew nuts in shell to its blancher graded Kernel form, so a large number of washer are involved in this sector. The Cashew tree is evergreen. It grows upto 12 meter height and has a spread of 25 meters. Its extensive root system allows it to tolerate a wide range of moisture level and soil types, although, commercial production is advisable in well-drained sandy loom and red soil. Annual rainfall needs to be at least 889 mm (35 inches) and not more than 3048 mm (120 inches). In North East India cultivation of cashew nut is mainly found in Meghalaya, Assam and Tripura. The raw Cashew has a very caustic acid content (caustic oil) which can burn the skin of worker and produce noxious fumes when heated and therefore it required to undergo an elaborate process of sun drying, roasting, breaking (shelling), heating and peeling of brown layer (*testa*) to become suitable for consumption. There are two commonly followed methods of cashew nut processing, viz., Roasting process and Steam (roasting) Cooking process. The major steps in Cashew nut processing

(Anonymous, 2007b) is shown in Fig. 1.

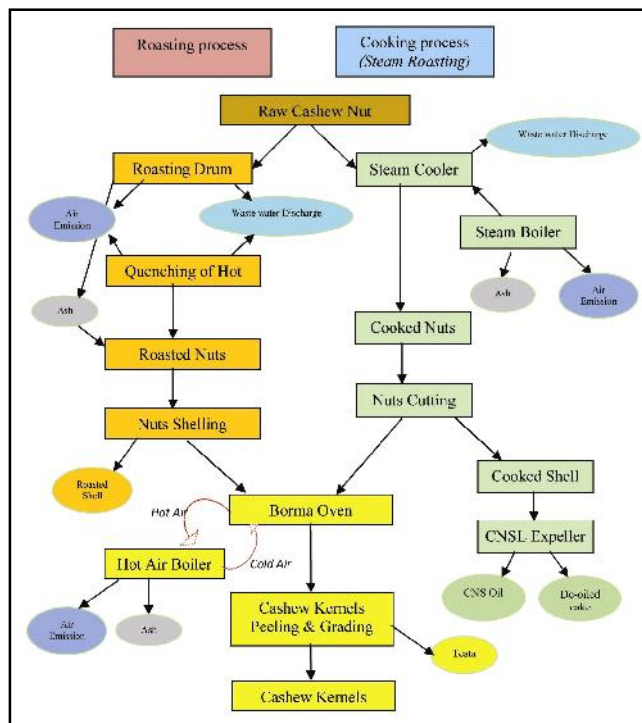


Fig. 1 : Cashew nut processing and discharges to environment

The labour intensive processes are shelling and peeling of brown skin where women are the majority of workers. They perform extremely tedious time and labour intensive work resulting in fatigue and drudgery. They have to work for a long time without any rest and also the improper facility in the working premises lead to their ill health. In addition to this the use of improper tools to break and peel off the nut gives rise to certain discomforts in the workers body. Cashew nut industries also create air pollution in the time of roasting. Cashew nut industry also creates air pollution in the time of roasting. Thus the women workers employed in cashew nut processing industries face several health hazards and to safeguard the health of the worker working in these industries requires ergonomic intervention to promote their occupational health and safety (Borah, 2012).

The present review deals with the occupational and environmental health hazard in cashew nut industry.

Occupational health hazard:

After the home environment, it is the workplace where many people spend more of their time. In favourable 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 India, 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 (Anonymous, 1995). Again according to World Health Organization, each year 160 million new cases of work-related illness occur and take 1.7 million lives (3 % of all deaths). Selected occupational risks are responsible worldwide for 37 per cent of back pain, 16 per cent of hearing loss, 13 per cent of chronic obstructive pulmonary diseases, 11 per cent of asthma, 8 per cent of injuries, 9 per cent of lung cancer, and 2 per cent of leukaemia and caused 850,000 deaths worldwide (Anonymous, 2009).

Government of India (2001) 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. Though the State Governments press the cashew nut processing units to use non-polluting steam-based technique in place of drum roasting (burning) technique that creates air pollution, many units still follow the oldest cheaper method (Anonymous, 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 (Anonymous, 2003). Though foot operated shell cutters (mechanical device) for shelling are non-hazardous, this method also is not

adopted by most of the units (Rjumohan, 2009).

The raw cashew has a very acid content (caustic oil) which can burn the skin and produces noxious fumes when heated and, therefore, it is required to undergo an elaborate process of sun drying, roasting, breaking (shelling), heating and peeling to become suitable for human consumption. The labour intensive processes are breaking (shelling) and peeling of brown skin where women are the majority of workers. They perform extremely tedious time and labour intensive work resulting in fatigue and drudgery. All the time unnatural squatting posture on a fourfold gunny bag are adopted by the women labour while performing these activities which create severe musculo-skeletal problems such as back pain, knee pain, arthritis, cervical pain, joint pain etc. The long static posture demands high physiological cost and low productivity. Due to the adoption of long static sitting posture on the ground, they always suffer from paraesthesia (tingling) in legs which may lead to many nerves and musculo-skeletal problem (Borah and Baruah, 2013). Grandjean (1982) has reported that sitting posture has a disadvantage because it affects digestion and breathing due to prolonged slacking of the abdominal musculature and the purported ill effect of the flexion of the lumbar spine. These labour forces are subject to the exposure of a corrosive anacardic acid during manual process of roasting, shelling and peeling. This causes occupationally acquired severe to mild skin dermatitis. Studies by different professional groups revealed that unorganized working women labour specially in Cashew nut processing industries are mostly illiterate, socio-economically poor and belong to under privileged section of the society and therefore these women are exploited without any consideration of workload demands, physical fitness, nutritional status and their biological status as they performed a dual role. As a result, the aggregate workload placed on them was so high that it became incompatible with their physical fitness leading to fatigue thereby lowering efficiency and impairing health in the long run (Bhat, 1988).

In this occupation health hazards expressed by the women worker in both the activities were collected, causative factors were analyzed and type of hazards was noticed (Table 1). In both the activities *i.e.* shelling and peeling of cashew nut, they had lots of physical hazards including pain in fingers, wrist, wounds in fingers, pain in joints, upper and lower extremities due to

continuous breaking of cashew shell and peeling of brown layer, lack of proper equipments (wooden mallet and knife), working of arms in repetitive fashion prone to Repetitive Strain Injury (RSI), adoption of continuous sitting posture on gunny bag, bending of leg for hours and complained about neck stiffness due to bending on neck for long hours. There are some environmental health hazards due to lack of natural and artificial lighting, the lighting in a workplace if not sufficient for the work task, may result in workers assuming awkward postures to accomplish work tasks and a loss of product quality and also eye strain etc. The working environment was dusty as they used ash for shelling the cashew shell which may lead to respiratory problem in near future. It was also noticed that there was no provision of fans, therefore prevailing hot and humid condition, which leads fatigue easily. There is a chemical health hazards also because of contact of caustic acid which is come out from cashew shell after roasting and women labour have to break the shell of cashew after sprinkling ash on that. They had the skin contact of caustic acid as well as ash for long duration which may lead to skin infection, dermatitis on fingers and toes, discolouration and tanning of palms etc (Borah, 2012).

Environmental health hazard:

Cashew Nut Industries are mostly in small scale and cottage sector without any effective pollution abatement system. Though the pollution load from individual unit is relatively small but the magnitude of pollution problem from the cluster of units becomes very high (Srivastava and Akolkar, 2009). 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 (Breuer and Georg, 1980).

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.

The Ministry of Environment, Forest and Climate Change (MoEFCC) has developed the criteria of categorization of industrial sectors based on Pollution Index which is a function of the emissions (air pollutants), effluents (water pollutants), hazardous wastes generated and consumption of resources. Industrial sector having Pollution Index Score of 60 and above, 41 to 59, 21 to 40 and upto 20 are categorize as Red, Orange, Green and White, respectively. Pollution Index Score of cashew nut industry is 49 which come under Orange Category (Anonymous, 2016). It is indicated that through air emission with pollutant of individual factory may not be in high range, but in cluster its emission magnitude is hazardous to environment as well as to human health.

In the cashew nut roasting process, thick black smoke is released from the rotating roasting drum through the stack. Air emissions in the form of thick black smoke are the major pollutants generated from the cashew nut units. The smoke, when it reaches the ground, has irritating odour and is public nuisance in the neighborhood. High concentration of Suspended Particulate matter (SPM), NOx, CO, SOx and phenol compounds are the

Table 1 : Perceived health hazards of women labour involved in shelling and peeling activity of cashew nut factory

Sr. No.	Health Hazards	Causative factors	Types of hazards
1.	Pain in fingers and wrist, wounds in finger	Continuous breaking of cashew shell and peeling of brown layer, lack of proper equipment (wooden mallet and knife)	Physical
2.	Pain in lower and upper arm, elbow and shoulder joint	Working of arms in repetitive fashion	Physical
3.	Upper and lower back pain	Adoption of continuous sitting posture on gunny bag	Physical
4.	Pain in knee and upper leg/thigh, tingling in calf muscle, lower leg and toe	Bending of legs for hours	Physical
5.	Neck stiffness	Bending of neck for long duration	Physical
6.	Eye strain	Lack of visibility	Environmental
7.	Skin infection, dermatitis on fingers and toes, discolouration and tanning of palms	Contact of caustic acid, and ash for long duration	Chemical
8.	Respiratory problem	Inhalation of ash	Environmental
9.	Fatigue	Bad posture, repetitive work, no provision of fans, lack of artificial and natural lighting, no proper ventilation	Physical as well as

Source : Borah and Baruah (2013)

major pollutant constituent of smoke emissions. The combustion of raw cashew nuts in the drum roaster, *i.e.* combustion of CNSL and fibre of outer shell of raw cashew nut inside the drum, while roasting is the major source of air pollution. Besides, the initial heating of rotating drum (used in roasting process), baby boiler (used in Cooking process), Borma Oven with Cashew nut shell as fuel also results into the air emissions. Borma heater is also a source of air pollution. Wastewater is generated from the quenching operation of the roasted cashew nut discharged. Cooking process also discharges wastewater from the steam cooker and emits air pollutants by Baby Boiler for steam generation and Borma heater. Shelling is the breaking operation of the quenched and cooled cashew nuts, carried out manually and the hands of workers get damaged due to CSNL. In India skilled women cracks the nuts and they use lime ash, linseed or castor oil to protect their hands (Russel, 1969). The kernel coming from the shelling section contains a brown cover, known as 'Testa', over it. To remove Testa over the kernel and also control the moisture content in the kernels, they are exposed to prolonged and controlled heating with hot air at 80 - 90°C for about 9 hrs to 10 hrs in a chamber. This process is known as "Borma". The hot air is generated by indirect heating of atmospheric air over hot surface in an "Oven".

Many cashew nut processing units in Kanyakumari district pose a serious health threat to the local people as they throw to the winds environment related rules and regulations in commissioning chimneys. It was stated that over 400 such industries were functioning in the district, most of which industries adhered to the rules in commissioning chimneys with the required height of above 60 feet. A survey was conducted in the district to identify violations by cashew nut industries a few years ago after repeated complaints from the public on the ill-effects of air pollution from chimneys. The survey was conducted by the government with the help of NGOs. After receiving the survey report, the Tamil Nadu pollution Control Board (TNPCB), along with the district administration, initiated action against erring factories, leading to a majority of the companies taking corrective measures. However, smaller companies continued to violate the regulations, posing a health threat to residents in some pockets. The small oily particles coming out of the chimneys with low height caused respiratory problems and other health hazards (Arvanantham, 2015).

In India, many state governments have banned drum roasting of cashew nuts because of its contribution to air pollution. Its economical afford ability is at the price of the ill-effects to the environment. Eco-friendly steam cooking is an alternative. A study claims that the combined use of steam cooking and hand-cum-pedal operated Sheller is more cost-effective than other processing systems (Karthickumar *et al.*, 2014). However, the method is not adopted in most units. Also, the thick acid fume generated during the roasting process pollutes the environment (Azam-Ali and Judge, 2001). With considerations to environmental protection, cashew processing units need to strictly adhere to environmental protection standards which have been approved by the Peer and Core Committee of Central Pollution Control Board (Mohod *et al.*, 2010).

Precautionary measures and environment standards:

Srivastava and Akolkar (2009), indicate that once all the units start operation simultaneously, there is visible build up of smoke in the atmospheric air. It is suggested for such clusters to change roasting process into cooking process. Each unit requires about Rs. 10 lakhs for changing the process method from roasting to cooking process. The Central Govt. has recently announced a subsidy scheme in this regard under which it is offering Rs. 10 lakhs to each unit, of which subsidy component is Rs. 2.5 lakh while Rs. 7.5 lakhs is towards tax concessions. The cashew manufacturers in Palasa, the largest Cashew market in Andhra Pradesh are gradually switching to boiler cooking from traditional drum roasting system (Rama Raju, 2009). The study reveals that noise pollution is not an issue associated with the cashew nut processing Industry.

Solid Waste Disposal Practices the ash generated during initial drum firing with roasted cashew shell is spread over the roasted and quenched nuts to prevent sticking. The ash generated at the bottom of Borma air heater as well as the Steam Boiler has to be properly land filled with necessary precautions so that there are no secondary air emissions. The cashew shell generated both by roasting process and cooking process, which is presently used as fuel by the industry, has to go through bio gasification route to convert into less polluting fuel gas as a long-term measure. However directions may be given to the industries that the cashew shell should

not be sold to retail users for domestic and commercial firing purposes, due to the obnoxious odor generation by the flue gases. The ‘Testa’, which is removed from the surface of the cashew kernel after Borma is also a source of solid waste. In all the cashew nut industries the *testa* produced has market value, which is used as vegetable tanning agent in tanneries (Anonymous, 2007c).

Since these industries are small and cottage category units and no conventional and techno-economically cost effective pollution abatement systems are in operation elsewhere, it has become necessary to study the entire cashew nut processing industry sector in India to suggest techno-economically feasible environmental standards. Even though the pollution load from individual unit is relatively low, the magnitude of pollution problem from the cluster of units is very high (Mohod *et al.*, 2010).

The Peer and Core Committee of Central Pollution Control Board, India has approved some environmental standards for cashew nut industries which are presented in Table 2.

Conclusion:

It is revealed from the study that women worker working in cashew nut industry is having occupational and environmental health hazards which can be prevented or eliminated through some ergonomic intervention and careful precautions. Ergonomic intervention programme may be implemented by using personal protective equipment, ergonomically designed tool, good working posture etc to reduce the drudgery and promote safety for the worker of cashew nut industry. A suitable counter irritant can be developed and use to prevent skin dermatitis from the exposure of corrosive anacardic acid during manual process of shelling of cashew nut.

The use of cashew shell generated especially by roasting process, as fuel, has to go through bio gasification route to convert into less polluting fuel gas as a long-term measure. The ash generated at the bottom of ‘Borma’ air heater as well as the Steam Boiler and excess ash from initial firing of the roasting drum, have to be properly land filled with necessary precautions so that

Table 2 : Environmental standards for cashew processing industries

Parameter	Environmental standards
Air pollution emission	Roasting, cooking and Borma operation are summarized in Table 3.
Sulphur dioxide, Nitrogen oxide and Phenolic compounds	The height of chimney should be above 60 feet, resulting in minimum possible ground level concentration. Hence no separate emission standard suggested resulting in minimum possible ground level concentration. Hence no separate emission standard suggested.
Waste water discharge standards	Waste water discharge standards for disposal on land are summarized in Table 4.

Table 3 : Air Pollution standards for cashew processing

Parameter	Roasting process (2 - 4 h of operation and 560 – 640 kg of cashew nut processing)	Cooking process-steam (4-6 h of operation)		Borma oven heater (4 – 6 h of operation)	
		Roasted Shell	De-oiled cake	Roasted shell	De-oiled cake
Particulate Matter	150 mg Nm ⁻³ at 4% CO ₂	150 mg Nm ⁻³ at 4% CO ₂	150 mg Nm ⁻³ at 4% CO ₂	150 mg Nm ⁻³ at 4% CO ₂	150 mg Nm ⁻³ at 4% CO ₂
Minimum Stack height	20 m from ground level	15 m from ground level or 2 m above the height of the nearest building which ever higher		20 m from ground level	

Source : Mohod *et al.* (2010)

Table 4 : Waste water discharge standards of cashew nut processing

Parameter	Limit (mg L ⁻¹)
BOD (27° C and 3 days)	100
Oil and grease	10
Suspended solids	100
Phenol	1.0
pH	6.5 – 8.5

Source: Mohod *et al.* (2010)

there are no secondary air emissions. The cashew shell or de-oiled cake should not be sold to retail users for domestic and commercial firing purposes due to their obnoxious odor.

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