Chapter 3

Scholastics and Citation

In any scientific investigation and research, a comprehensive review of literature is very essential. Its main function, apart from determining the work done before concerning the problem area i.e. area of investigation, IS to provide an insight into the methods and procedures and create a basis for interpretation of findings. As direct references of all the items are not in abundance, certain specific references along with some indirect references have been incorporated in this chapter for the purpose of meaningful use. In the present study, reviews of literature have been summarized among following heads.

1. Causes of health problems
2. Occupational Health Hazards
3. Effect of health and occupational hazards on rural productivity of women
4. Acute exposures and poisonings
5. Agriculture and nutrition
6. Daily dietary intake
7. Low level of formal education and skills
8. Farm income and expenditure
9. Government policy

Occupational Hazards and Farm Women: Agony and Understanding
ISBN: **978-93-85822-72-8**

10. Size of holding

11. Frequency of visit to doctors

12. Psycho-social hazards

Women all over the world have been acknowledged for their major and complementary roles in providing livelihoods for their families. They have also won an enviable reputation for their economic contribution through food production, processing and trading (**IFPRI 2012**). It is in this area that women, particularly in Nigeria are mostly distinguished .**IFAD (2012)** described women as the principal, if not sole economic support for themselves and for their children. Their involvement in agricultural production and nutrition lies in their participation in activities at each stage of production of the food chain that determines the quantity and quality of food available. This implies that they are responsible for food security and nutritional well-being of their families **(World Bank 2008; Omonona and Agoi2007;).** They provide up to 60 to 80 percent of domestic food production **(Ajani 2008).**

Women unpaid work in the field crop production and other agricultural activities is increasingly an important labour force. Despite this, the impact of women's labour and their long work hours is ignored. In addition, they perform intensive labour on their own farms. Aside agricultural activities, on average, rural women spend almost an hour each day gathering fuel and carrying water to prepare meals. In some communities, these activities may take up to four hours a day. Often, dangerous back breaking and unrelenting drudgery are inevitable for them. The consequences of energy consuming tasks and multiple roles played by women can be disastrous to their health and family.

According to the International Labour Organization (ILO) definition, women are half the world's population, who receives one tenth of the world's income, account for two-third of the world's working hours and own only one hundred of the world's prosperity. Women in Nigeria constitute 49.12 per cent of the national population and most of them live in the rural areas where they explore the resources of nature **(NPC 2006)**. They are usually unskilled and obligated to accept whatever work they can

ISBN: **978-93-85822-72-8**

find. Besides, they occupy the lowest rung of the societal ladder and are the least educated thereby usually employed at the lower grades **(Annan-Yao *et al*. 2004).**

Yet, a significant proportion of women do not enjoy a level of health that will enable them to achieve socially and economically productive lives. The most vulnerable of these women are those in the rural areas, who are often incapacitated by illness, disability and occupational hazards to mention a few. This reduces their efficiency for both agricultural and non-agricultural activities. High prevalence of epidemic and endemic diseases in most rural areas further aggravates poor health and misery **(ILO 2000).** The health concerns of Farm Women can be categorized under…

i. Main Physical Problems
ii. No. of Miscarriage
iii. Daily Dietary intake
iv. Exposure to contaminants/animals
v. Basal Metabolic Rate (BMI)
vi. Literacy
vii. Size of Holding
viii. Family Income & Expenditure
ix. Frequency to visit Doctors
x. Psycho-Social Hazards

However, the right to health is the most basic of all human rights. The constitution of World Health Organization (WHO) asserts that: the enjoyment of the highest attainable standard of health is a fundamental right of every human being without distinction of race, sex, religion, and political belief, economic or social condition. This means that every human being has the right to live in an environment with minimum health risk, have access to health services that can prevent or alleviate their suffering, treat diseases and help maintain and promote good health throughout the individual's life **(WHO 2004).**

ISBN: **978-93-85822-72-8**

3.1. Causes of health problems

The agriculture workplace has long been known to be associated with respiratory disease. Respiratory disease is among the main chronic health conditions affecting farmers **(Brackbill*et al*, 1994)**. Those who are at potential risk include farmers and farm families, agricultural workers, abattoir workers, greenhouse and nursery workers, veterinarians, and grain elevator workers. While the massive exposures leading to severe acute disease have decreased, it is postulated that there has been a significant increase in subacute and chronic respiratory disease resulting from increased indoor air exposure (**Von Essen and Donham, 1999;Donham 2000**). Animal confinement workers or dairy technicians may spend as much time as 40-50 hours or more a week indoors in larger operations, resulting in longer exposures to higher levels of gases and dusts. This is a result from changing animal production techniques with higher animal densities and shift work in animal feeding units (AFOs) and high density concentrated animal feeding operations (CAFOs). Many of these conditions are found in Wisconsin. In fact, some of the early work in establishing the methods in the diagnosis of Farmer's Hypersensitivity Pneumonitis (FHP), formerly known as Farmer's Lung Disease, and Organic Dust

Toxic Syndrome (ODTS) was performed in Wisconsin at the Marshfield Clinic. There are a number of common exposures that will lead to respiratory illnesses, often with overlapping clinical signs and symptoms. These include organic dusts, moulds, bacteria, and gases from fermentation of silage and manure. Other respiratory hazards include inorganic dusts, pesticides, and other agricultural chemicals. There are also infectious respiratory conditions that are not unique to agriculture but may be encountered in the work and living environments associated with farm families. Rural providers are on the front lines and are in an excellent position to decrease morbidity and disability resulting from acute and chronic exposure to agricultural respiratory toxins. Prevention of unnecessary exposures and the early accurate diagnosis of respiratory disease resulting from the agricultural environment is best performed initially in the primary care clinic, rather than the tertiary referral center.

ISBN: **978-93-85822-72-8**

Unfortunately, it is recognized that rural primary care health care providers often do not have the training to provide this method of preventive health care. The focus of this paper will be to provide some of the tools for rural health care providers to recognize and accurately diagnose and treat respiratory conditions resulting from agricultural exposures utilizing an accurate occupational and environmental history and appropriate differential diagnosis. The occupational and environmental respiratory toxins and sources of exposures, path physiology, diagnosis and treatment, and prevention of the resulting respiratory clinical conditions will be discussed.

3.1.1.AGRICULTURAL RESPIRATORY HAZARDS

3.1.1.1. DUSTS

- **Organic Dusts**

Due to the nature of Wisconsin farming, organic dusts are the most common cause of agricultural respiratory disease on most Wisconsin farms. Silos, dairy and poultry barns, and grain bins are sources of high levels of organic dusts. Organic dust is a complex mixture of vegetable matter, pollens, animal dander, insect, rodent and bird faeces, feathers, microorganisms, bacterial and fungal cell wall toxins, pesticides, and antibiotics and can be thought of as a chemical soup. These components lead to an inflammatory response in the mucous membranes and respiratory tract. The components can lead to simple inflammation or an IgE-mediated immune response to allergens contained in the dust. Allergens include animal products, antibiotics and animal feed additives, pollens, storage mites, fungal and bacterial moulds, and protein components of grain dusts. Bacterial sources, particularly thermophillicactinomycetes such as Saccharaopolysporarectivirgula, and fungal molds, particularly members of Aspergillus genus, are associated with sensitization leading to hypersensitivity pneumonitis. Allergic conditions can include upper airway allergic symptoms such as rhinitis, as well as asthma. The levels of molds and bacteria are can be extremely high, particularly in moldy bedding, feed, and silage. High levels of dusts and molds are associated with particular activities such as unloading grain bins, and silo unloading and uncapping in the fall. Aerosols that are inhaled

ISBN: **978-93-85822-72-8**

while working in these areas contain in the range of 104 to 107 bacterial colony forming units/ cubic meter (cfu/m3) and 103 to 106 fungal cfu/m3. The size of these particles is also important and range from less than 0.1 microns to 100 microns. Reparable dust particles, or those particles that are 5.0 microns (u) in diameter or smaller, make up 40% of the organic dust and penetrate deeply into the air exchange unit consisting of the terminal bronchioles and alveoli. Respirable particles primarily damage the lower airways and terminal alveolar unit while the larger particles that settle out in the upper airways and are associated with upper airway irritation. A significant component of grain dust associated with inflammation is bacterial end toxin. This consists of a heat-stable lipopolysacchride (LPS) found in bacterial cell walls, primarily from gram negative bacteria, and released with bacterial death and cell wall lysis. LPS contains the biologically active lipid A that is considered to be responsible for the inflammatory effects. End toxins are found in dusts associated with agricultural operations found in Wisconsin, including animal confinement operations, livestock farming, grain elevators, and potato processing. Routine measurement of end toxins are not performed on agricultural operations nor are there regulatory levels set at this time for safe exposure to end toxins. Research has demonstrated a dose-response effect and deterioration of pulmonary functions have been shown at levels over 100 end toxin units/m3 (EU/m3) and also with organic dust levels **(Donham*et al*, 2000; Schenker, 1998; Reynolds *et al*, 1996; Schwartz *et al*, 1995a; Schwartz *et al*, 1995b).** Other microbial products that are probable sources of inflammation include (1,3) beta-d-glucans from fungal species, exotoxins from gram-positive bacteria, phytotoxins from plants, and T-cell-activating super antigens.

- **Inorganic Dusts**

Inorganic dusts are primarily an issue in field activities associated with ploughing, tilling, haying, and harvesting. The newer tractors and combines generally provide adequate respiratory protection because of the air filtration in enclosed cabs, but is dependent upon changing the filtration regularly. Grain handling, manual harvesting of tree fruit and grapes, Christmas tree farms, potato harvesting, and small vegetable harvesting by

ISBN: **978-93-85822-72-8**

hand can also cause an exposure to inorganic dust that may be higher than OSHA regulatory levels for nuisance dust (**Schenker, 1998**). Inorganic dust is much less of an issue in Wisconsin as compared to the Great Plains and the major fruit producing areas. Silicates, including primarily the noncrystalline diatomite silica but also crystalline silica or quartz, make up the bulk of inorganic dust (**Neiuwenhuijsen and Schenker, 1999**). Burning stubble, particularly rice stubble, can also expose workers to aerosolized inorganic dust. Inorganic dust is not as significant as organic dust or as toxic as industrial sources of quartz dust. Those individuals with underlying chronic obstructive pulmonary disease, including asthma and chronic bronchitis, can experience aggravation of the underlying disease. Persistent and repetitive exposure to high levels could lead to restrictive lung disease but that would be uncommon in Wisconsin. A common work practice in Wisconsin is hiring both retirees and students to sort potatoes on a conveyor belt during harvest which results in exposure to inorganic dust.

3.1.1.2.ANIMAL CONFINEMENT GASES:

The primary animal confinement gases of human health concern are hydrogen sulfide (H2S) and ammonia (NH3). Carbon dioxide (CO2) and methane (CH4) are also formed and are considered simple asphyxiants and are of secondary concern. CO2 is produced from animal respiration and is of concern if 5000 ppm or greater. CH4 may be a risk for explosion at higher concentrations. Bacterial decomposition of animal manure and urine results in the gas production. Hot summer days result in higher levels of gas production. Under facility manure storage pits and outdoor lagoons contain both high levels of hydrogen sulfide and methane but also oxygen deficient environments at levels immediately dangerous to life and health (IDLH) that are insufficient to support human life. These environments can be toxic to animals and humans.

- **Hydrogen Sulfide**

Hydrogen sulfide (H_2S) is a very toxic chemical asphyxiant and has a mechanism similar to cyanide. The primary mechanism is to inhibit the cytochrome oxidase system and interrupt the oxidative phosphorylation process. Paralysis of the respiratory center is the primary lethal toxic effect

ISBN: **978-93-85822-72-8**

and results in immediate “knockdown” at high concentrations. H2S is heavier than air and colorless. It has a very low odor threshold, which results in an unpleasant “rotten egg” odor at 1-3ppm. The toxic effects begin at 100-150 ppm with paralysis of the olfactory nerve and inability to detect the smell of H_2S at the higher toxic concentrations. Pulmonary edema can occur after thirty minutes of exposure to 250 ppm . Knockdown occurs at 500+ ppm and respiratory paralysis occurs at 500-1000 ppm. for significant levels of H_2S). Generally, the concentrations of H_2S are at low levels and may cause eye or respiratory irritation. Cough, dyspnea, and chest pain may occur at irritant levels. There is significant danger of lethal levels of hydrogen sulfide when manure is agitated, which occurs when under barn manure pits are emptied. H_2S, which is normally heavier than air, is carried into the air in gas bubbles and can result in indoor concentrations as high as 1000-1500 ppm. Permanent neurologic damage, including demyelination and basal ganglia damage and ataxia can occur after respiratory arrest if death does not occur. Temporary neurologic effects include hearing, visual, and olfactory loss. Treatment consists of immediate removal from exposure and removal of contaminated clothes in a manner not to risk other exposures. Mouth-to-mouth resuscitation is not recommended (**Deng, 2001**). Supplemental 100% oxygen and treatment of metabolic acidosis is imperative as is consultation with the Regional Poison Center. Treatment is considered to be similar to cyanide exposures but not as effective. A recommended treatment of 10 ml of a 3% intravenous sodium nitrite infusion injected over 2-4 minutes is given to induce methaemoglobin to scavenge the sulfide**(Deng, 2001)**. Initially amyl nitrate ampoules may be given by inhalation in the Emergency Department if the sodium nitrite infusion is not ready (**Deng, 2001**). Hyperbaric oxygen treatment should be considered in severe poisonings with associated coma and pulmonary edema.

- **Ammonia**

Ammonia (NH_3) is a pungent respiratory and mucous membrane irritant with a low odor threshold. It is lighter than air and causes respiratory inflammation. Ammonia is additive with the effects of dusts and can be carried further into the terminal respiratory bronchioles by adsorbing unto

ISBN: **978-93-85822-72-8**

respirable dust. It is at least additive and probably synergistic with cigarette smoke. Eye, nose, and throat irritation is common and higher concentrations result in cough and chest pain. Tolerance develops with continued exposure. This will lead to deeper and greater respiratory exposure as deeper breaths will occur when the person adapts to the irritant effects of ammonia. Ammonia does not exist as a single exposure agent but in combination with organic dusts and endotoxin and often results in sinusitis and chronic bronchitis after years of exposure. The regulatory Occupational Safety and Health Administration (OSHA) permissible exposure levels (PEL) are 25 ppm but recent research has indicated that respiratory disease disease can occur after chronic ongoing exposure to concentrations as low as 7 ppm (**Donham*et al,* 2000**). Prevention involves proper ventilation and the use of an ammonia specific chemical cartridge respirator and goggles. Gas concentrations can be measured with colorimetric tubes that are available through agricultural safety catalogues.

3.1.1.3.OTHER TOXIC GASES, FUMES, AND CHEMICALS

- **Nitrogen Oxides**

Nitrogen dioxide (NO_2) is a severe respiratory irritant and is associated with Silo filler's disease (SFD). Silos are can be hazardous confined spaces during the fall when being filled with grain (generally corn but also oats) silage and haylage.Haylage and oat age are harvested and blown into silos in the summer and corn silage is generally harvested in the early fall. The grain is stored in upright silos, forage bags, or covered bunkers to allow bacterial fermentation which makes for a more palatable food for cattle. Nitrogen oxide gases(NOx) begin to form within hours of filling the silos and nitrogen dioxide becomes the predominant gas. Corn harvested after drought or if heavy nitrogen fertilization has occurred will result in greater production of NO_2. The concentration rises quickly reaching a peak within 5-7 days with levels ranging from several hundred to several thousand ppm. The recommended safe level for eight hours of exposure is 3 ppm. NO_2 is heavier than air and yellowish orange in appearance with bleach-like odor at high concentrations. High levels of NO_2 can also be present

ISBN: **978-93-85822-72-8**

when opening the white plastic forage bags that are replacing silos for storage of haylage and can also result in SFD **(Pavelchuk*et al*, 1999**).

When combined with water in the lungs, nitrous and nitric acid is formed causing inflammation of the lungs. NO2 can cause rapid loss of consciousness at high concentrations and lead to permanent pulmonary fibrosis (scarring). Lower concentrations of up to 50-100 parts per million(ppm) can lead to milder symptoms of eye irritation, cough, nausea, fatigue, and laryngo/bronchospasm. Continued exposure can lead to worsening of symptoms and progress over a course of 6-12 hours with pleuritic chest pain, dyspnea, and pulmonary edema. High concentrations(over 200 ppm) can cause immediate loss of consciousness and the development of pulmonary edema in 12-24 hours. Delayed symptoms or relapse can occur in 2-6 weeks and consist of fever, chills, and respiratory symptoms. Brief exposure to high concentrations or prolonged exposure to lower concentrations can lead to pulmonary edema and eventually bronchiolitis obliterans (irreversible pulmonary fibrosis) which may develop within weeks to months. Another radiographic presentation seen in subacute disease is small opacities that may be mistaken for miliary tuberculosis.

- **Anhydrous Ammonia**

Anhydrous ammonia (NH_3) is a commonly used nitrogen fertilizer. It is a liquid under pressure but a gas under atmospheric conditions. It is injected into the soil under pressure. Exposure can occur when an injection port is plugged and the vapour is released into the face of a person unplugging the obstruction or from a leaking hose. The toxic property of concern is the extremely high hydroscopic property, or extreme affinity for water. Anhydrous ammonia avidly draws out water from tissues and causes a severe caustic burn, freezing and dehydration of tissue, particularly of mucous membranes, including the eyes, sinuses, nose, and upper respiratory tract. An extremely pungent odour is very noticeable. Corneal burns and laryngeal oedema can result. A sensation that the air is immediately “sucked out” and it is impossible to breath has been personally reported to the author by those with acute respiratory exposure to anhydrous ammonia. A death of a 78 year old male from anhydrous

ISBN: **978-93-85822-72-8**

ammonia inhalation occurred in the upper Midwest in 2000. Intubation may be necessary if acute respiratory distress syndrome (ARDS) develops. Cardiopulmonary arrest may occur. Later development of bronchiolitis obliterans or reactive airway dysfunction syndrome (RADS), a non-immunologic asthma-like syndrome can result. A recent rural health issue is also the theft of anhydrous ammonia from farm sites and used in the illegal production of methamphetamine.

- **Carbon Monoxide**

Carbon monoxide (CO) is a toxic odourless and colourless gas that kills. CO produced by internal combustion engines. Agricultural exposures can occur from kerosene heaters, gasoline-powered pressure washers in animal confinement operations, and running engines in shops or barns. Extremely toxic concentrations can rapidly accumulate in poorly ventilated buildings, as quickly as within 3-5 minutes (**NIOSH, 1993**). Foetuses of pregnant women and those with ischemic heart disease and angina are at particular risk for toxic effects at lower levels than healthy adults. Symptoms may initially consist of headache, fatigue, difficulty concentrating and dizziness progressing to chest pain, shortness of breath, visual abnormalities and eventually confusion, weakness, and coma at higher levels or prolonged exposure. Loss of consciousness can rapidly develop without warning signs in environments with high concentrations. Pulmonary oedema and respiratory arrest may occur. Delayed neurotoxicity can occur after significant poisoning but cannot be predicted by the initial presentation or carboxyhemoglobinlevel(**Seger and Welch, 2001**).

3.1.1.4. Pesticides

Acute exposure to organophosphates or carbamates resulting in poisoning can result in pulmonary symptoms. This can occur in applicators or in field workers entering a field before the safe re-entry interval guidelines. A concern could be in ginseng production due to the canopy covering the plants and reported high use of pesticides. Excessive bronchial secretions and bronchoconstriction can cause acute respiratory distress, wheezing, chest pain, cough and hypoxia. Hemoptysis and pulmonary edema may occur. The treatment consists protecting the airway, adequate oxygenation, and administration of large doses of atropine to reverse the

ISBN: **978-93-85822-72-8**

muscarinic effects of the pesticides. Cardio respiratory arrest is the usual cause of death in acute poisoning**(Reigert and Roberts, 1999).** The other characteristics of organophosphate poisoning are beyond the scope of this chapter.

- **Paraquat** is a dipyridyl herbicide that causes irreversible pulmonary fibrosis. The target organ of the toxic effects is the lung regardless of the mechanism of exposure. Increased oxygen will actually enhance the toxic effects. However, pulmonary effects are generally a result of acute intentional or accidental ingestion and not from low level inhalation. Pulmonary effects occur 7-14 days after ingestion and can result in respiratory failure **(Reigert and Roberts, 1999)**. Fumigants are gases or liquids under pressure used in interiors to kill pests in stored grain and injected into the soil in potato and other grain production. This class of pesticides is rapidly absorbed across the pulmonary membranes. Some may also penetrate skin and rubber and neoprene personal protective equipment. These include methyl bromide, ethylene oxide, and phosphine. The interior environment that is treated by fumigants is extremely dangerous. Inhalation toxic levels of fumigants are associated with respiratory irritation leading to pulmonary oedema and cardiogenic shock. Initial symptoms are nonspecific and include headache, nausea, fatigue, dizziness, and cough.

3.1.1.5.Disinfectants

Exposure to high concentrations of disinfectants such as chlorine gas, quaternary ammonium compounds, or mixing bleach with ammonia in poorly ventilated indoor settings may cause acute pulmonary irritation. If the concentration is high enough to cause acute pleuritic chest pain and significant shortness of breath or dyspnea, reactive airway dysfunction syndrome (RADS), a condition clinically identical similar to asthma, may occur. This condition is characterized by a non-immunologic reactive airways response and, may last six months or even cause permanent wheezing. It is provoked by subsequent exposure to lower level respiratory irritants such as chemicals, dust, and smoke and even cold and exercise. It does not respond as well to inhaled bronchodilators or corticosteroids as

ISBN: **978-93-85822-72-8**

true asthma. The diagnosis can be made from a history of an acute respiratory exposure causing shortness of breath and wheezing with an associated obstructive lung disease pattern on spirometry or abnormal methacholine challenge test.

3.2 Occupational health hazards:

Majority of the rural women are exposed to occupational hazards. UNFPA in its recommendation had advocated the need for more research to be carried out on hazards posed to health by occupational activities in rural settings with the synergistic effects of heavy household work, malnutrition, multiple pregnancies as they affect poor women in developing countries. In spite of this advocacy, few research works have been documented. Over the years, it was observed that modern technology has done little to improve the welfare of women **(Annan-Yao *et al*. 2004).**

The risk of miscarriage, premature delivery and spontaneous abortion has been related to exposure to pesticides. The **WHO (2004)** asserts that the Nigeria mortality rate is the second largest in the world caused by complications of pregnancy. Others occupational hazards of rural women are muscular fatigue, sunburn, migraines, and respiratory diseases and in a few cases still birth. Increased exposure to air pollution, organic dust from food processing, job overload and chemical hazards are also major risk factors in developing countries. According to the **ILO (2000)**, exposure to poor working conditions has serious repercussions on pregnancy.

For instance, pounding and cooking stages in the preparation of "fufu"–a cassava product–is most tasking and energy sapping and women used up their body strength for desired taste and texture. Modern processing techniques have not been introduced to women who are still engaged in using the traditional method of processing cassava. In addition, back ache, itching/scratching, cuts, skin irritation, dermatitis, pigmentation and fungal infection on skin, pains, tiredness, headache, cough and swelling of the eyes due to smoke characterizes occupational hazards of women cassava processors in rural communities **(Adejare 2001).Adejare (2001)** also found that processing of cassava into "gaari" causes exposure to cyanide, heat and burns.

ISBN: **978-93-85822-72-8**

Sims (1994) also listed health problems of women in pesticide exposure with adverse effect on pregnancy outcomes. Pesticides are absorbed into the body through three routes: inhalation (lungs), ingestion (stomach), dermal absorption (through the skin, eyes and mucous membrane of the respiratory tracts). The symptoms vary from headaches to cancer. Other notable symptoms of pesticide poisoning are abdominal pain, vomiting, headache, dizziness, mucous spasm, delirium, watery or bloody diarrhea and sometimes convulsions that reflect direct injury to the central nervous system plus extra cellular electrolyte disturbances and shock showing chemical poisoning. Because of heavy reliance on chemical pesticides, large quantities of toxic materials remaining in the environment cause irreparable human health hazards. Pesticide poisoning is toxic in small absorbed doses while others have harmful effects only when very large amounts are consumed or absorbed. Yet, rural women resort to injudicious and excessive use of pesticides due to illiteracy **(Sims 1994).**

In a study of women farmers in Edo state, **Egharevba (1992)** discovered that the most common occupational hazards of women engaged in crop production and other activities were heat related sicknesses such as heat exhaustion and heat stroke. The prolonged exposure to cyanide fumes, fire and smoke during processing were considered responsible for respiratory diseases, migraine and heat exhaustion. According to **Wallace (1991)**, during processing of food and cooking in smoke filled rooms, women inhale up to 40 times the volume of suspended particles safe by the WHO. They also inhale air during bush burning and fuel used in cooking. Besides, it was noted that carrying of heavy loads of firewood and raw farm produce can cause serious muscle and skeletal disorder such as chronic back pain, chest pain and miscarriages.

3.2.1 Noninfectious respiratory diseases and syndromes

3.2.1.1 Organic Dust Toxic Syndrome

Organic Dust Toxic Syndrome (ODTS) is identical to acute FHP in the initial presenting clinical symptom complex and occurs in similar environments of high dust producing activities

ISBN: **978-93-85822-72-8**

An essential difference is that the toxic inflammatory pulmonary reaction causing ODTS is caused by exposure to massive doses of organic dust with associated moulds and bacteria but immunologic sensitization does not occur as it does in FHP. End toxin is considered to be a probable chief cause of the inflammatory response but grain dust, particularly of grain sorghum and soybeans can be inflammatory in itself**(Von Essen *et al*, 1995).** Symptoms of ODTS have been identified in over a third of farmers and are particularly common in hog confinement workers**(Von Essen and Donham, 1999)**. Unlike FHP, there are no abnormalities of the arterial blood gases or pulmonary infiltrates. ODTS is self-limited and removal from the high levels of dust is adequate. Symptoms are the most severe for 24-72 hours then improve over another 2-7 days. Corticosteroids or antibiotics are not recommended. Prevention recommendations for ODTS are similar for FHP other than powered air purifying respirators are not necessary. There is debate whether chronic ODTS can occur but it is more likely that recurrent exposure to high levels of organic dust can lead to immunologic sensitization leading to either FHP or occupational asthma. Many farmers experience repeated symptoms with recurrent exposures but ODTS is not thought to progress as occurs in recurrent attacks of FHP.

- **Asthma and Occupational Asthma**

Asthma is a classic IgE antigen-antibody mediated sensitization to an environmental antigen and is defined as a chronic inflammatory pulmonary disorder with reversible obstruction of the lungs as a result of exposure to variable stimuli. The obstruction may reverse either spontaneously or with treatment. The clinical hallmarks are wheezing, cough, and dyspnoea (air hunger). The most common cause is from environmental allergens. Generally, farmers and agricultural workers have a lower prevalence of asthma than the general population. This may be because of the healthy worker effect in which those who do not tolerate the dusty work conditions leave that occupation. There is a recent body of literature from Europe and Australia that suggests that children growing up on farms have a lower prevalence of asthma, hay fever, respiratory, and allergic, or atopic, diseases compared to children not raised on farms**(Reidler*et al*, 2002).** It is hypothesized that early exposure to antigens in traditional agricultural operations provides life-long protection against the

ISBN: **978-93-85822-72-8**

development of allergy Occupational asthma (OA) is a form of asthma that occurs to an antigen that is unique or present at higher concentrations in the work place. OA is not generally common, usually 5% or less of the total workers. Animal confinement workers, including dairy, swine, and poultry workers and grain elevator workers are at increased risk. Continued exposure to dusts leads to recurrent and progressive symptoms of wheezing and shortness of breath with exposure to gradually lower levels of occupational or environmental antigen. PFTs show an obstructive pulmonary pattern of a decreased FEV1 and FEV1/FVC ratio. The Chest x-ray may show hyperinflation with chronic disease but usually is unremarkable. Diagnosis may also be made by a twenty per cent (20%) decrease in the peak flow readings while in the work place compared to baseline readings established away from work or a 20% improvement from an occupational baseline when away from the work exposure from 2-6 weeks. A twelve per cent or greater improvement in the post-bronchodilator FEV1 also indicates reversible airway disease that is compatible with a diagnosis of asthma. Methacholine challenge tests are also used as a nonspecific indicator of reactive airways and can be used to diagnose asthma when combined with a suggestive occupational history. Pre-existing asthma can be aggravated by dusty work conditions and workers in hog confinement operations or grain elevators may not tolerate the occupational conditions for very long **(Donham, 2000).** Treatment follows the step approach for asthma and avoidance of respiratory antigens and dust. Prevention is the use of appropriate personal respirators and decreasing dust levels by engineering controls.

- **Asthma-like Syndrome**

Asthma-like syndrome is a recently described non-IgE mediated reversible airway disease identified in up to 25% of swine confinement workers (**Donham, 2000; Von Essen and Donham, 1999**). It is identical in clinical presentation to asthma (cough, chest tightness, wheeze, dyspnea) except it may have a lesser decrement in FEV1 than asthma and more transient. Unlike asthma, eosinophils are not present in BAL fluid. A hallmark is that symptoms are more pronounced upon return to work after being away for a period of time or even after a weekend off (Monday morning response).

ISBN: **978-93-85822-72-8**

The diagnosis is difficult to make and requires cross-shift testing, which consists of spirometry before work and immediately after work, preferably on site. The FEV1 is lower after work but generally less than the 12% decrease seen in asthma **(American Thoracic Society, 1998)**. In true asthma, the decreased FEV1 is greater than 12% and more persistent. Protection requires adequate personal respiratory protection and decreased dust and gas levels in confined animal operations.

- **Chronic Bronchitis**

Chronic bronchitis defined as a daily productive cough for three months a year for at least two years. Chronic bronchitis is estimated to have a prevalence of 25-50% in animal and grain production workers, and grain elevator workers **(Von Essen and Donham, 1999)**. Swine confinement workers have the highest prevalence. Cigarette smoking by itself is a significant risk in developing chronic bronchitis but it also additive and probably synergistic with the agricultural exposures, particularly endotoxin **(Dalphin*et al*, 1998).** Prevention involves adequate respiratory protection, decreasing levels of dusts and gases in agricultural operations, and smoking cessation.

- **Sinus Conditions**

Sinusitis is common and occurs in up to 25% of swine confinement workers **(Von Essen and Donham, 1999).** Rhinitis symptoms are reported to occur in 20-50% of animal confinement workers. A recently reported syndrome, mucous membrane inflammation syndrome consisting of eye, nasal, and throat symptoms, has been recently described **(Schenker, 1998)**. This complex of symptoms is an irritant reaction and not IgE mediated and is the most commonly reported syndrome in animal confinement workers. Differential diagnoses include bacterial sinusitis and allergic rhinitis. Sinusitis secondary to aspergillus is considered if there is associated purulent sinus drainage. Evaluation may include sinus x-rays or CT scan, nasal scrapings for eosinophils, and allergy testing. Treatment is symptomatic and involves decreasing the exposure to dusts and gases. Antibiotics do not play a major role and recognition of the recurrent exposure is the key to reduction of symptoms.

ISBN: **978-93-85822-72-8**

3.2.3Zoonotic Respiratory Diseases

- **Inhalational Anthrax**

Inhalational anthrax is a disease that has been rooted in agricultural and occupational exposures but has been transformed into a primary disease of bioterrorism. It is important for rural practitioners to understand how to diagnose this illness. At this time, even one case of inhalational anthrax is considered to be from a bioterrorism source and is considered a Category A bioterrorism agent. Anthrax is caused by the ingestion, inhalation, or cutaneous inoculation of infective spores of the bacterium Bacillus anthracis, a Gram + soil organism. The spores vegetate and grow in the host causing illness. Toxins, including lethal factor, protective factor, and edema factor, are produced and are responsible for the pathophysiogical manifestations of the three disease forms. Susceptible animals, including cattle, sheep, goats, and horses, contract the illness from grazing in infected areas. Exposures include skin inoculation or inhalation of spores by wool and tannery workers, goat mill workers, and laboratory workers, and ingestion of contaminated meat. Of the three clinical forms of anthrax, cutaneous, inhalational, and gastrointestinal; inhalational is the most deadly manifestation but the cutaneous form is the most common. Anthrax is no longer common in the United States due to an aggressive state domestic animal vaccination and quarantine programs. In the United States, there had been only 224 reported cases of cutaneous disease from 1944-1994 and 18 cases of inhalational anthrax from 1900-1976. There were no reported inhalational cases after 1976 until the 11 cases resulting from the post September, 11, 2001 bioterrorism postal exposures**(Swartz, 2001).**

- **Influenza**

The first human case of Swine influenza was first identified in Wisconsin in 1976. A recent study in Wisconsin identified higher seroprevalence evidence of swine influenza infection was found to be associated with being a farmer or farm family member, or entering the barn greater than four days a week compared to nonfarmers**(Olsen *et al*, 2002).** Swine can be a source of zoonotic transmission of swine influenza (most commonly classic swine virus of the H1N1 strain) to humans. Avian influenza A (strains

ISBN: **978-93-85822-72-8**

H5N1 and H9N2) can be transmitted to humans but is rare. The future risk is the potential of poultry being source for re-assortment of mammalian viruses and resulting in human pandemics of new and virulent strains not included in routine immunizations **(Wilson *et al*, 2001).**

- **Tuberculosis**

Mycobacterium bovis can result in a pulmonary form of tuberculosis in veterinarians, farm workers, abattoir workers, and zookeepers but has become uncommon. Infection occurs through ingestion of contaminated raw milk or milk products and inhalation. It is rare in the United States since the introduction of mandatory milk pasteurization and animal infection control surveillance by the use of tuberculin tests. The animal form of the disease is most common in cattle but is also rarely found in swine. M. bovis is more common in deer in zoos and particularly in deer farms, and potentially can both infect humans and be reintroduced to countries free of the disease **(Acha and Szyfres, 2001).** The pulmonary infection of M. bovis in humans is identical to Mycobacterium tuberculosis in both symptoms and radiographic findings and is treated identically, with the exception of pyrazinamide (PZA). Infected humans can transmit the disease to cattle. Mycobacterium tuberculosis, the main cause of tuberculosis in humans, is not a zoonotic disease but should be mentioned as there is an increased prevalence found in migrant and seasonal agricultural workers. The highest rates for both latent tuberculosis infection and tuberculosis disease are found in Mexican and Central American workers in U.S.-Mexican border communities **(Lobala and Cegielski, 2001)**. The migrant agricultural workforce stream does come to Wisconsin, as it does to many other states. Clinical suspicion of symptoms consisting of productive cough of over two weeks, chills and fever, weight loss, anorexia, and hemoptysis in individuals of susceptible populations living in substandard housing with lack of access to health care services should include the possibility of M. tuberculosis infection.

- **Evil effects of pesticides:**

Cancer is a complex disease that relates a sequence of gene and environment interactions, the environmental pollutants can increase the risk of cancer **(Tabrez*et al*., 2014).**Organochlorine pesticides (OCP) are

ISBN: **978-93-85822-72-8**

environmental contaminants of major concern because their persistence, bioaccumulation, and adverse effects on humans and the environment **(Velasco *et al*., 2014; Sachin*et al*., 2013)**. Humans are exposed to many environmental carcinogens. The increasing prevalence of cancer is partly attributable to exposure to carcinogenic agents in the occupational work **(Soffritti*et al*., 2008).** Gene-Environment-Interaction (GEI) refers to the combined influences of genetic and environmental factors on the healthdisease process **(Tabrez*et al*., 2014).** The exposure to pollutants under environmental conditions, have effects in the genetic polymorphism, promoting the disease initiation. GEI involves the different effects of environmental exposure and the different effects of a genotype in people with different histories of environmental exposure **(Berwick, 2000)**, such interactions may be important determinants in the cancer development (Brennan 2002). OCP exposure is associated with blood, prostate, pancreas, brain, liver and other cancer types related with the geneenvironment- interactions (**Zahm and Devesa, 1995; Tabrez*et al*., 2014**).

In developing countries, OCP are still use although these countries are part of international conventions and treaties such as the Stockholm Convention, Rotterdam Convention, and the Prague Declaration (**Rotterdam, 2013**). The changing environmental scenery coupled with various anthropogenic activities, continue to result in the bioaccumulation of many substances, like pesticides **(Ali *et al*., 2014).** Exposure to OCP is a risk factor to female cancer because their potential of estrogenic activity **(Rachon, 2015)** and their immunosuppressive and development of tumor properties **(Iscan*et al*., 2002).**

The toxicological effects of environmental pollutants can play an important role on the aetiology of several diseases in humans, such as mutagenicity and carcinogenicity **(Tabrez*et al.*, 2014)**. The potential association between exposure to pesticides and endocrine activity has been discussed in the last decade **(Seidler*et al*., 2008).** OCP are endocrine disruptors chemicals (EDC) interfering with the synthesis, transport, storage, binding, and activity of natural hormones, those may be associated with the cancer risk **(EEA, 2010),** and affect the female

ISBN: **978-93-85822-72-8**

reproductive system **(Frade*et al*., 2014).** The International Endocrine Society and other international institutions and research groups suggest that EDC have adverse effects on men, such as the prostate cancer, as well as harm the female reproductive system **(Diamanti-Kandarakis*et al*., 2009)**. The OCP called xeno-hormones are known to alter the function of the endocrine system by binding with human estrogen receptors. EDC can bind and activate various hormone receptors (AR, ER, AhR, PXR, CAR, ERR) and then mimic the natural hormone's action. Since years 2000's, an increasing number of epidemiological studies tended to link environmental exposure to pesticides and hormone-dependent cancer risks. At the human level, endocrine disruptor such as OCP, have also shown to disrupt reproductive and sexual development, and these effects are depend on several factors, including gender, diet, and occupational factor **(Tabrez*et al*., 2014)**. Three million cases of intoxication by pesticides and 220,000 of deaths are annually registered worldwide **(WHO, 1992).** In Mexico, although statistics may not be reliable due to the lack of specific records linked to intoxications by OCP, intoxications and poisonings are causing 1400 death (87% adults and 13% children). Exposure to pesticides is the third cause of intoxication with a rate of 13.9%. The agricultural and industry workers are the most affected **(Rodríguez *et al*., 2005).** In Mexico, OCP are sold in stores of agricultural products and in the municipalities without restriction **(Polanco*et al*., 2015b).**

Cervical cancer is the second most common mortality cancer in developing countries **(Ferlay*et al*., 2015)**. In Mexico it is distributed mainly in the poor states in the South of the country including the Maya area, and is directly related to poverty, marginalization, low education levels, as well as insufficient access to services adequate of health **(Palacio-Mejía*et al*., 2003).** In Yucatan, the national average mortality of cervical cancer was 29.02100,000 during 1990e2005. During 2006e2010, Yucatan was the second State with cervical cancer related mortality with 94 deaths in 2010 **(SSY, 2011)**. Overall, over the period 1990e2010, Yucatan had the highest mortality rate. Yucatan has high agricultural activity, (579,000 ha of land for livestock; 145,715 ha of corn; 13,325 ha of citrus, and more than 10,000 ha for other crops) (**SAGARPA, 2012**). High level of poverty exists in Yucatan (**CONAPO, 2010**), therefore farmers use agrochemicals to improve

ISBN: **978-93-85822-72-8**

agricultural yields while ignoring the health impacts of OCP. The areas with highest pesticides use are Tzucacab, Ticul, Tekax, Peto, and Oxkutzkab at south in the agricultural area, as well as the livestock region of Tizimin and the surrounding areas of Dzilam Gonzalez and Buctzotz, in the northeast (**INEGI, 2007**).

About 86% of the population is applying agrochemicals, 94% of the population believes that the agrochemicals do not pollute the groundwater, around 30% of the population is drinking polluted water fromwells and sinkholes, and these risk factors cause chronic exposure to OCP and their bioaccumulation. The sociocultural background and low educational levels of the Mayan communities (45% of illiteracy) explains their low perception of risk in relation to the process of contamination by OCP (**Polanco*et al*., 2015b**). Recent study has detected OCP in water of 11 municipalities of the Ring of Cenotes (sinkholes), which is the main aquifer in the area. Very high concentrations were found during the dry season for heptachlor (13.617 mg/mL), a-HCH (6.538 mg/mL), endrin (3.265 mg/mL), 4,40 DDE (1.255 mg/mL), ɗ-HCH (10.864 mg/mL) **(Polanco*et al*., 2015a,b**). Yucatan has a context of high vulnerability in their natural landscape, such as well their karst soils, which easily filters all contaminants to the groundwater. There is also a high density of sinkholes in the state interconnected to the groundwater, with more of 4000 (**Seduma, 2012**), which allows the distribution of pollutants (**Escolero*et al*., 2002**). Furthermore, there are faults and fractures in the ground surface (**INEGI, 2010**), that facilitate the filtering of pollutants to the groundwater (**Bauer *et al*., 2011**), as well as 30% of deforestation in Yucatan (**Andrade, 2010**), which increases the vulnerability process for the contamination of water. In the few monitoring studies on bioaccumulation of OCP in breast milk, high levels of OCP were found for women from Chelem, Yucatan, in the coastal town **(Rodas-Ortíz*et al*., 2008**); and for women in the metropolitan, agricultural and the coastal areas of Yucatan (**Polanco*et al*., 2016**). This study is the first and unique survey conducted in Yucatan up-to-date to address environmental and health related issues linked to the use of OCP (**Polanco*et al*., 2015a**). The objective of this exploratory study is the monitoring of pesticides in the blood of Maya women with cervix uterine cancer in relation to the environmental and social vulnerabilities.

ISBN: **978-93-85822-72-8**

- **OCP in human breast milk:**

There is no doubt that organochlorine pesticides (OCPs) have played a pivotal role in increasing agricultural output and control of vector borne diseases in India **(Bhatnagar, 2001**). However, their widespread use in the last three decades has led to ubiquitous persistence in both the biotic and abiotic components of the environment (**Gupta, 2004**).

The bioaccumulation and magnification potential of OCPs in food chain has become a global issue with serious outcomes on wildlife and human health (**Tanabe, 2002**). Prolonged exposure to OCPs can affect the liver & kidney functions (**Peres *et al*., 2006**), disruption of endocrine system (Colborn et al., 1993), mental & psychomotor development (**Sagiv*et al*., 2008)**, neurological & immune system disorders **(Karmaus*et al*., 2003)**, risk of breast, lung, cervix & prostate cancer **(Ahmed *et al*., 2002)** and endometriosis, hypospadias &cryptorchidias**(Wolf *et al*., 2000).** The pre & post-natal exposure of infants to pesticides can result in impairment of intellectual function **(Eskenazi*et al*., 2004)** and delayed effects on central nervous system functioning **(Ribas-Fitó*et al*., 2006).** India was one of the foremost producer and consumer of OCPs particularly dichlorordiphenyltrichloroethane (DDT) and hexachlorocyclohexane (HCH), till the ban/restriction on their use in late 1990s **(Kannan*et al*., 1997)**. Still, a substantial amount of these chemicals are being permitted for malaria control program and agriculture **(UNIDO, 2006**). In India organophosphate (OP) and synthetic pyrethroid (SP) pesticides are swiftly replacing OCPs in agriculture **(Kumari*et al*.,2005**). Although reports on contamination of food articles with OCPs, OPs and SPs are there in the region covered in present study **(Kumari*et al*., 2002**), but there is paucity of data in human breast milk. Additionally, earlier studies in India on pesticide residue detection in human breast milk were confined to OCPs only **(Mishra and Sharma, 2011**). As humans are at the top of food chain, the exposure to pesticides through dietary intake and environment is a matter of great concern. Human breast milk is considered a suitable medium for investigating pesticide residues exposure to population and breastfed infants (WHO, 2009). Therefore, present study was contemplated to estimate the status of OCP, OP and SP residues in human breast milk in

ISBN: **978-93-85822-72-8**

Punjab which is amongst the highest user of pesticides in India (**Tiwana*et al*., 2009**).

3.3 EFFECT OF HEALTH AND OCCUPATIONAL HAZARDS ON RURALPRODUCTIVITY OF WOMEN

Health condition affects individual hours of work and its importance as a determinant of labor supply has been documented in several studies. The World Bank **(2007**) affirmed that capacity and ability for productive agricultural and nonagricultural rural activities are endangered by poor health. Illness and death from HIV/AIDS, malaria and other diseases reduce productivity of rural women. The negative effect of poor health on economic activity is enormous as women lost days of work and cost of treating illness may be significant in per capita GDP. Processing hazards often lead to reduction in quantity of product processed and hours of work of women. At times, it causes poor quality of the product (**Adejare 2001**). Besides, if it were found that lack of adequate information on cassava processing deleteriously affected the processors' health and output because many were not aware of any innovation in cassava processing and had no contact with the extension agent.

Until now, rural women constitute a large percentage of the poor in the society, who are relatively powerless to improve their health and quality of life. Tragically, more women throughout Nigeria rural communities do not want to spend on health because of conflicting demands on their little unstable and seasonal returns. At such times when there is no work and money, women probably cannot afford health services. **Feachem (2000**) had opined that poor health is a common consequence of poverty. Only healthy people can work more and easily earn an income and contribute to increased economic growth. Hence, there exists a chain relationship between poverty, health and rural labor because the study of one leads to the other.

The negative effect of poor health on rural productivity makes it very important to improve rural social services. The **ILO (2000**) declared that the delivery of occupational health to rural population should be integrated into the primary health care structure that includes, among others; environmental protective measures, improved statistics on

ISBN: **978-93-85822-72-8**

occupational accidents, injuries and diseases, health promotion and well-being measures and sustainable approach to agricultural safety in the use of Agrochemicals. Occupational health needs to be addressed with a well-defined strategy and must be integrated into a rural development policy.

3.3.1.Agricultural Work-Related Illness

In addition to the significant problem of fatal and nonfatal injuries associated with agriculture, there is a major problem with various illnesses associated with these activities. Based upon review of National Health Interview Survey data from 1986 to 1990, **Brackbill*et al.* (1994)** reported increased age-adjusted prevalence of cardiovascular disease, arthritis, and amputations in farmers as compared to blue collar workers. **Rautiainen& Reynolds (2002)** report a work-related morbidity of 30.9 per 10,000 workers based upon the 1998 Bureau of Labour Statistics data. Skin conditions accounted for 56% of illnesses, followed by cumulative trauma (14%), respiratory diseases (13%) and all other diseases (17%). The prevalence of hearing loss increased only in those farmers over age 65. A recent review of deaths among farmers and pesticide applicators from the period 1986 to 1994 by **Fleming *et al.* (2003)** estimated greater age-adjusted relative risk in males, more heart disease, more motor vehicle accidents, and an overall elevation of cancer when compared to other occupational groups. Just as occurs with the reporting of injuries, the same issue of inadequate reporting of agricultural illness exists, and all recorded data is likely to be a significant underestimate.

3.3.1.1 Respiratory Disease

Acute and chronic agricultural respiratory disease has been strongly associated with organic dust, ammonia, and bacterial and toxic exposure, and a dose-response relationship has been shown to exist **(KJ. Donham 2000).** An evolving trend is the development of high-density animal production facilities and an apparent increased prevalence of respiratory disease associated with them. Large-scale animal production facilities have been associated with high concentrations of toxic and irritant gases, and other problems are complicated by the increase in scale. Of the estimated 700,000 workers employed in concentrated animal feeding operations, 250,000 are employed in hog confinement facilities **(Von Essen *et. el*.**

ISBN: **978-93-85822-72-8**

1999). Such large-animal feeding operation workers may spend as much as 40 to 60 h per week indoors with an increased exposure to a variety of respiratory irritants including organic dust, hydrogen sulfide, various allergens, bacteria, mold, and volatile hydrocarbons, all of which can produce changes in the respiratory tract.

Respiratory diseases associated with agricultural work include acute chronic bronchitis, farmer's hypersensitivity pneumonitis, organic dust toxic syndrome, occupational asthma, mucus membrane inflammation syndrome, and sinusitis **(MB. Schenker, 1998).**Respiratory symptoms have been recorded in 93% of veterinarians treating swine **(Hafer*et. el*. 1996).**Smoking results in potential synergistic effects with agricultural exposures and increases the risk of chronic bronchitis six fold **(Melbostad. *et el.* 1997**). Organic dust toxic syndrome occurs in approximately one third of large-animal facility workers, and from exposure to grain dust **(Von Essen *et. el* 1999).** The seroprevalence of sensitization to antibodies associated with hypersensitivity pneumonitis is 5% to 20%, but only an estimated 1% of those sensitized appeared to have actual disease **(May. *et el*. 1996).** The prevalence of hypersensitivity pneumonitis in Wisconsin dairy farmers has been calculated at 4.21 per 1000 farmers **(Marx. *et el*. 1990)**. Mucus membrane inflammation syndrome, consisting of rhinitis, pharyngitis, and eye irritation, occur in 20% to 50% of animal feeding operators, and sinusitis has been reported in 25% **(KJ. Donham 2000).** The most common respiratory disease is bronchitis, and it is increased in grain elevator workers and animal and grain production workers. The prevalence ranges up to an estimated 50% for concentrated animal feeding facility workers, some of whom experience temporary acute bronchitic symptoms that may develop into chronic bronchitis in as many as 25% of all such workers **(KJ. Donham 2000).** There is a lower prevalence of diagnosed asthma in farmers and agricultural workers as compared to the general population **(Kimmbell-Dunn. *et el*. 2004).** This may be the result of self-selection out of a difficult workplace. Asthma-like syndrome, a non-immunologic reactive airway disease clinically similar to IgE-mediated asthma, occurs in 11%–25% of confinement workers **(KJ. Donham 2000).**

ISBN: **978-93-85822-72-8**

An interesting area of recent research is the apparent decreased risk of developing atopy in asthma in children of farmers. The odds ratio of developing asthma is 0.59 (CI 0.37–0.95), and the odds ratio for developing atopy is 0.58 (CI 0.46–0.75) **(Ernst. *et el*. 2000**). Others have reported a decreased odds ratio for atopic disease with increasing exposure to livestock **(Von Ehrenstein. *et el*. 2000).**

3.3.2Pesticide Exposure

Pesticides are widely used in the agriculture environment and can lead to health hazards. Among the areas of concern are reproductive issues and cancer. It should be noted, however, that there are lower cancer rates among farmers than the general population for some cancers, especially those cancers related to the use of tobacco and alcohol (**Blair &Zahm, 1995**). A recent review of mortality data in New York State byWang*et al*. (**Wang. *et el*. 2002**) did not reveal any increased combined cancer rates and indicated significantly lower rates for colorectal and ovarian cancer in female farm workers. However, Fleming and colleagues (**Cent. Dis. Control. 1998**) reported greater relative risks of cancers of the nervous system and lymphatic and hematopoetic systems. Multiple studies have shown an inconsistent association of various cancers in farming, including non-Hodgkin's lymphoma; prostate; skin and melanoma; brain; and soft-tissue sarcomas (**Khuder. *et el*. 1998). Holly *et al.* (1998**) reported an increased risk of childhood brain tumors with a maternal exposure to pigs and horses during pregnancy and the child's residence on the farm for at least one year beginning before six months of age.

Significant concern has been raised about exposure to pesticides and the subsequent development of cancer. The strongest association links non-Hodgkin's lymphoma and 2, 4-D, phenoxyacetic acid herbicide (**Blair &Zahm, 1995**). Other studies have not shown the association to be consistent (**Perry &Layde, 1998**). Several meta-analyses of cancers in agricultural associations have shown increased risk for lip cancer and multiple myeloma (**Acquevella*et el*. 1997**). There is not a demonstrated significant association with the extensively used and ubiquitous herbicide, atrazine, with colon cancer, soft-tissue sarcoma, Hodgkin's lymphoma, multiple myeloma, leukemia, or ovarian cancer (**Stump*et el*. 2000**). An

ISBN: **978-93-85822-72-8**

association with the endocrine disrupter DDE and breast cancer has not been consistently observed (**Hunter*et el*. 1997**). The limitations of the studies, particularly the meta-analysis, include lack of heterogeneity, inaccurate exposure assessment, lack of biomarkers and biological monitoring, focus upon principal operators rather than hired farm workers, and comparison of varying types of farming, time period, and geographic area (**Acquevella*et el.* 1997)**.

3.3.3 Reproduction Issues

The concern regarding non-cancer-related adverse health effects, particularly endocrine disrupters, of pesticides has been increasing. In an ecological study, **Garry *et al*. (1996)** reported an increased risk with an odds ratio of 1.36 (CI 1.11–1.59) of congenital birth defects in the children of Minnesota pesticide applicators, as well as in the general population living in geographical areas exposed to the higher concentrations of fungicides and chlorophenoxy herbicides. Other findings included greater effects on children conceived in the spring, higher prevalence in the male gender, alterations of the male to female ratio of offspring, and associations with trifluralin and 2,4-D. Infertility, miscarriages, and preterm delivery have been associated with women working in agricultural-related industries, living on farms, and mixing or applying yard herbicides **(Savitz*et el*. 1997**). Other ecological studies have linked oro-facial clefts and limb-reduction defects with pesticide use **(Nurminen, 1995)**.

3.3.4 Miscarriage and Associated Risk Factors

It can be suggested that developing countries, including India, are still racing towards achieving MDG goals 4 and 5. According to UNICEF [**Maternal Health in Focus, (2012)],** 800 women, globally, die every day of preventable causes related to childbirth and pregnancy, out of those, 160 women are from India. Although, maternal mortality rate has been successfully reduced from 197 in the year 2013 to 174 in the year 2015 [**The world Bank Group, 2016**], mothers living in remote areas will still remain at risk of dying in childbirth due to lack of awareness, illiteracy and inappropriate healthcare facilities. On other hand, 1.05 million infant deaths and 0.748 million new born deaths occur every year in India [**Maternal Health in Focus, (2012)**]. In addition, India has consistently

ISBN: **978-93-85822-72-8**

displayed efforts in reducing overall child mortality rates. In India, since the year 2013 neo natal mortality rate, infant mortality rate and under 5 mortality rate was 30, 41 and 52 respectively, that reduced to28, 38 and 48 in the year 2015 [**The world Bank Group, 2016a,b,c**]. Despite of modest reduction, occurrence of stillbirth is still highest in India indicating rates from 20 to 66 per 1,000 births in different states [**WHO, 2016**].

In India, there is dearth of statistical data on still birth, miscarriage and induce abortion. In addition to this, data on miscarriage on first, second and third trimester among unskilled daily wage women workers is lacking in India. Women even in their early age (20 to 30 years) suffers from physical, emotional and social trauma that are associated with still birth, miscarriage or induce abortion.

Miscarriage among women workers can be due to multiple factors such as nutrition, environmental factors, occupational factors, individual health status, socio-economic and demographic factors as well as various clinical parameters are associated. Women involved in manual labour with low socio economic status bear triple burden such as domestic, economic and work related responsibility which make them more vulnerable. Women with low socio economic status live in poverty with lack of basic amenities, low wage and lack of social security. In addition to this, there is poor housing, lack of sanitation, unhygienic migratory settlements, lack of safe and potable drinking water, improper nutrition and lack in health facilities making them more vulnerable. Unexpected or unfavourable pregnancy outcomes can be stress full for working women and their families. The research intended to estimate the prevalence of miscarriage among women and to study risk factors associated with it.

3.4 Acute exposures and poisonings

The number of pesticide poisonings has steadily decreased over the last decade.The number of pesticide exposures reported to the California Pesticide IllnessPrevalence Program has decreased 30% in 2000 compared to 1999 **(Calif. Pestic. Illn.Surveill.Program. 2000)**.California is thought to have the most accurate reporting system in the United States. This decline is similar to the one reported in the 1993 report. There were 1144 reports to the California program in 2000 as compared to 2011 in 1993. Of the 893

ISBN: **978-93-85822-72-8**

reports rated as possible exposures in 2000, 47% (656 reports) were related to agricultural occupational work as compared to 1007 occupationally related in 1993. The number of fatal pesticide exposures has also steadily decreased **(Litovitz, *et el.* 1999)**. Some 29% to 44% of farmers report symptomatic dermal or respiratory symptoms, including headache, skin and eye irritation, and flu-like symptoms, associated with pesticide use **(Padgitt*et el*. 1995). O'Malley (1997)** reports that skin reactions are the most commonly reported adverse reaction from pesticide exposure, but the number of reports of pesticide-related skin disease through the mandated California reporting system decreased between 1982 and 1999 **(Calif. Pestic. Illn.Surveill.Program. 2000).**

The use of poison control centers as a way to get a more accurate insight into the hazards of agricultural-related pesticide use is a current NIOSH-sponsored project between two of the national centers and covers significant parts of the agricultural counties in the Mississippi Delta region. This has been a collaborative effort between the southeast and southwest centers, on both sides of the Mississippi river.

3.4.1.Cumulative Trauma, Noise-Induced Hearing Loss, And Musculoskeletal Disease

Noise-induced hearing loss, an occupational problem resulting from noise exposure, is common in farming and affects 55% to 72% of the farming population **(Beckett*et el*. 2000)**. Noise levels are often above the Occupational Safety and Health Administration (OSHA) permissible exposure levels in swine confinement buildings; tractor and combine operations, vacuum pump use, and in feed unloading areas **(Holt*et el*. 1993).** Adolescents working on farms have been shown to have significant hearing loss compared to a control group of adolescents. Noise-induced hearing loss significantly increases with age. The sound dampening of cabs on farm equipment decreases noise levels to 85 decibels or less, but there is continued significant noise exposure from other sources in agricultural settings. Eighty-five decibels is the action level for OSHA-regulated facilities.

Musculoskeletal disorders and injuries are common in agriculture. A Colorado survey reported chronic back pain in approximately 25% of

ISBN: **978-93-85822-72-8**

Colorado farmers and ranchers and almost 50% among dairy farmers (**Xiang*et el*. 1999**). As many as 71% of swine producers report low back pain (**Von Essen & McCurdy, 1998**). Arthritis affecting the hips and knees was associated with dairy farming and driving tractors (**May JJ. 1998**). A survey of California farms reported overuse injuries including upper- and lower-back pain (43%) and wrist pain (18%). Meyers *et al*. reported sprains and strains accounting for 49% of the injuries in California nurseries, with 46% of those injuries affecting the back. Ergonomics stressors in fruit harvesting include working with raised arms, repetitive forceful lifting, pinching, stooping, continual bending, and twisting, all while lifting excessive or awkward weights (**Fulmer *et el*. 2000**).

3.5 Agriculture and Nutrition:

The evidence on the link between agriculture and nutrition has so far been tenuous. On the one hand, under nutrition rates are severe and more widespread among those involved in agriculture.

This evidence is more pronounced when the households or regions with agricultural predominance are compared with non-agricultural regions (**Dahiya and Viswanathan, 2015**). Countries and regions that have faster economic growth caused by structural transformation from agricultural to non-agricultural activities, with an accompanied shift in the pattern of employment, have reduced under nutrition at a faster rate. On the other hand, studies show that wherever there are policies which favour agriculture or regions which have sustained a high growth rate in value from agriculture, poverty and under nutrition are both lower (**Webb and Block, 2011and De Janvry and Sadoulat, 2001**).

3.6.1 Agriculture and Nutrition Outcomes in India:

Singh *et al*. (2011) find that the probability of low BMI among women is highest in cases where the husband's occupation is in the primary sector. While trying to connect trends in agricultural growth to changes in under nutrition rates among children and women, **Headey*et al.* (2011)** find that the patterns are mixed. The study finds agricultural GDP per worker to have a negative significant association with stunting but not with underweight (among children) at the state level. Compared to child under

ISBN: **978-93-85822-72-8**

nutrition rates, prevalence rates of low BMI among women responded the most to changes in indicators like wealth and per capita GDP growth. From the agricultural perspective, women's BMI improved due to changes in agricultural GDP per worker. The study further shows that, after controlling for other covariates including economic status, women and men involved in agricultural work had lower average BMI. Further, in the case of women, the gap was not (statistically) significant when compared to unskilled non-agricultural employment.

Gulati*et al.* (2012) show that the level of agricultural performance or income has a strong and significant negative relationship with indices of under nutrition among adults and children; suggesting association between improvement in agricultural productivity and reduction in under nutrition. The differences in the results of these two studies on the impact of agriculture on under nutrition is due to the nature of data and the measures used and hence the type of analysis. **Headey*et al.* (2011)** use a two-period data while **Gulati*et al.* (2012)**use a single cross-section so the former is a medium-run effect while the latter is a long run effect since a single cross-section is being compared. In the former study, agricultural growth and other forms of agricultural performance indicators, including agricultural GDP per worker, are used, while in the latter study the agricultural GDP is taken as a proportion of rural population. There is also a difference in the measure of under nutrition: **Heady *et al***. consider proportion of women with low BMI while Gulati et al. consider a normalised index of adult under nutrition that comprises of only thin women and (also) men.

Dahiya and Viswanathan (2015) find that women who participate in agricultural work have lower average BMI compared to those who do not work. However, between agricultural and nonagricultural labour, the average BMI is lower among the latter than the former. Between those who are in farming and agricultural labour, the latter are worse off. There are also variations across BMI quintiles; the average BMI is lowest across the quintiles for those who are both self-employed in agriculture and also work as farm labourers. These results, perhaps, reflect the nature of physical activity carried out by these women in the labour market and not

ISBN: **978-93-85822-72-8**

so much whether women in agriculture have a lower BMI than those who are not in agriculture.

3.5.2. Variations in Women's BMI

According to NFHS-3, 50 per cent of women from the poorest quintile have chronic energy deficiency (CED) i.e. having a BMI below 18.5, and so do women belonging to disadvantaged social groups. About one-half of women below 20 years of age have CED, while CED rates decline to one fourth for women of 40 to 49 years of age.

Navaneetham and Jose(2008) show that around 40 per cent women in rural India have CED, which is 15 percentage points higher than the incidence among urban women.1 The highest incidence of CED is found in the eastern States, such as Bihar (45.1 per cent), Jharkhand (43.4 per cent), Orissa (41.7per cent) and West Bengal (39.1 per cent), and the southern States have the lowest incidence of CED **(Deaton, 2008**). **Ackerson *et al.* (2008)** show from an earlier round of NFHS at a more granular level of districts and villages, that there are clear regional patterns. Contiguity of low BMI regions and high BMI regions and its association with regional development is an important finding of that study. Under nutrition was most prevalent among women belonging to the lowest quintile of standard of living and over-nutrition was observed among top-most quintile of standard of living.Clearly, there is improvement in CED rates with age but older women also show a higher rate of overweight and more so in urban areas and in States like Tamil Nadu and Kerala **(Seshadri, 2009**).

People from higher income groups consume a diet containing 32 per cent of energy from fat while people from lower income group consumed only 17 per cent of their energy from fat. This according to them partially explained the positive relationship between socio-economic standards and BMI of women. **Dahiya and Viswanathan (2015)** find that economic status captured by three different variables: per capita income, per capita total consumption and wealth status have an influence on the women's BMI after controlling for several other variables. It is noted that magnitude of the per capita consumption variable decreases and then increases with the BMI quintile, while the magnitude of the per capita income variable is very

ISBN: **978-93-85822-72-8**

similar across the BMI quintiles and there is a dissimilar effect of higher wealth status across all the BMI quintiles.

3.7 Daily Dietary Intake:

An overwhelming majority of women in rural India is associated directly or indirectly with agricultural production, processing and distribution. About two third of the manual labour in farming is constituted by rural women. Irrespective of their degree of affluence, they provide 14 to 18 hour of productive physical labour every day in a wide variety of activities directly connected with agriculture, allied and domestic chores. (**ManjuSuman - 2002**).

Nutritional surveys indicate large gaps in nutritional requirements and consumption among females as compared to males. A majority of rural and tribal women suffer from anaemia which leads to low birth weight among babies (**Jhamtani, 1995**).

It was found that cent percent women were consuming cereals, pulses and green leafy vegetable followed by 99.83 percent of them were found to be consuming roots and tubers and other vegetables in their daily diet. The results in case of cereals are in line with **Bhalerao (2002)**, **Pathak and Goswami (1989) and Jha (1994)**. The result in case of consumption of pulses is coinciding with **Bhalerao (2002)**. The requirements & there current intake by the farm women in rural India are as follows –

- **Energy** – It is the main content of our food. Energy is essential for rest, activity and growth. Certain amount of energy is also expended by the body for respiration, blood circulation, digestion, absorption and excretion, maintenance of body temperature etc. It is evident that energy consumption of Farm women ranged between 469.09 – 3374.95 kcal, whereas average energy consumption was 1372.33 kcal which is less than recommended intake. The calorie gap observed in present study might he mainly due to low calorie density of their diets which are largely in the form of cereals, inferior grains and also due to the use of inadequate amount of fats and oils in their diets. Recommended energy intake for moderate woman worker is 2225 kcal. **(SunitaKumari, 2000).**

ISBN: **978-93-85822-72-8**

- **Proteins** - They are vital to any living organism. These are one of the most important nutrients required by the body and should be supplied in the adequate amounts in the diet. It can be stated that protein intake ranged between 15.89 – 91.81 gm., while average protein intake was found to be 42.04 gm which is slightly less than the recommended protein intake. Recommended protein intake is 50 gm for a moderate worker woman. **(Roy et al.,2003**).
- **Fat** - is an important component of diet and serves a number of functions in the body. It is a concentrated source of energy. It also imparts palatability to a diet and retards stomach emptying time. It can be said that the fat intake ranged between 6.17 – 240.63 gm while average fat intake of the women was 22.23 gm which is nearer to the recommended intake (20 gm). In rural and tribal areas its use is limited due to high cost and less paying capacity of the poor people.
- **Micronutrients (Ca, Fe):** Calcium is required for the formation and maintenance of skeleton and teeth and Iron is an essential element for the formation hemoglobin of red cells of blood and plays an important role in the transport of oxygen. The calcium intake of the women ranged in between 131.29 – 1762.59 mg whereas its average intake was 394.17 mg which was quite normal. Recommended intake of calcium is 400 mg. The iron intake of the selected respondents was found to be ranged between 2.98 – 60.90 mg. Average intakes was very poor as 14.74 mg which was half of the RDA (Recommended Dietary Allowances) iron intake (30 mg) (**SunitaKumari, 2000).**
- **Vitamins (Thiamine, Riboflavin, Niacin, Folic acid, Vitamin C):** Thiamine is an important B-group vitamin. It is concerned in the proper utilization of carbohydrates in the body and for full utilization of sugars and starches for meeting the energy needs. Riboflavin, as a part of a coenzyme is essential for several oxidation processes inside the cell. Niacin, also called as nicotinic acid, is a vitamin intimately connected with several metabolic reactions. Folic acid, is required for multiplication and maturation of red cells. Vitamin C - also called as ascorbic acid, is an essential nutrient for human as he lacks the capacity to synthesis it like many other animal species. Thiamine intake of the

ISBN: **978-93-85822-72-8**

farm women ranged between 0.34 – 11.68 mg and average intake was noted as 1.31 mg which is slightly more than RDA i.e. 1.1 mg. It can be stated that the intake of riboflavin ranged between 0.19 – 1.63 mg. Table indicates that average intake was 0.62 mg which was less than half of the RDA (1.3 mg). The average intake of niacin of the selected women was 12.26 mg whereas the recommended intake is 14 mg. The average intake of this vitamin by the selected women was 40.08 µg while recommended intake is 100 µg. The actual requirement of free folic acid ranges between 50-100 µg depending on the age. It can be said that the average intake of vitamin C was 36.47 mg which is quite nearer to recommended intake i.e. 40 mg.

Table 3.6.1: Information on BMI

The detailed reference can be given from the following tables...

Sr. No.	Particulars	Average
1	Height (cm)	149.46
2	Weight (kg)	51.20
3	Body Mass Index	22.88

Table No. 3.6.2: Anthropometric measurements of the respondents

Sr. No.	Particulars	Percentage(%)
1	Cereals	100.00
2	Pulses and legumes	100.00
3	Vegetables -	
	a) Greenleafy	100.00
	b) Roots and tubers	99.83
	c) Othervegetables	99.83
4	Nuts and oil seeds	40.16
5	Fats and oils	90.16
6	Milk and milk products	71.66

ISBN: **978-93-85822-72-8**

Table No. 3.6.3: Daily intake of foods by the respondents

Sr. No.	**Nutrient**	**Recommended Nutrient Intake (for moderate woman worker)**	Meat, fish, eggs (not frequently)	49.00
1	Energy (kcal)	2225		
2	Protein (gm)	50		
3	Fat (gm)	20		
4	Calcium (mg)	400		
5	Iron (mg)	30		
6	Thiamine (mg)	1.1		
7	Riboflavin (mg)	1.3		
8	Niacin (mg)	14		
9	Folic acid (µg)	100		
10	Vitamin C (mg)	40		
7				
8			**Fruits (not frequently)**	**76.33**

3.8 Low level of formal education and skills

Education and skills are important for improving farming practices, investment and productivity. Table 4 gives literacy levels and mean years of education for unorganized self employed agriculture workers by farm size. It shows that literacy and mean years of education are lower for small holding farmers compared to medium and large farmers. For example, literacy among males and females for marginal farmers respectively were 62.5% and 31.2% while the corresponding numbers for medium and large farmers were 72.9% and 39% (Table 4). Similarly, mean years of education for males among marginal farmers were 3.9 as compared to 5.3 for medium and large farmers. It is important for small holding farmers to have a reasonable level of awareness regarding information on agriculture. The low level of farmers' education limits public dissemination of knowledge. The NSS farmers' Survey clearly shows that awareness about bio-fertilizers, minimum support prices and WTO is associated with education levels which are lower for marginal and small farmers.

ISBN: **978-93-85822-72-8**

Table 3.7.1.: Literacy and Mean Years of Education of Unorganized Agricultural Self-employed Workers, 2004-2005

Land Size/Class	Literacy Rate			Mean Years of Education		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**
Landless	45.6	25.5	34.0	2.2	1.5	1.8
0.01 – 0.40 ha	59.2	31.1	43.7	3.7	1.7	2.6
0.41 – 1.00 ha	64.5	31.7	51.4	4.1	1.7	3.2
Marginal	62.5	31.2	48.1	3.9	1.7	2.9
Small	68.7	34.8	55.9	4.7	1.9	3.6
2.00 – 4.00 ha	70.2	37.1	57.6	4.9	2.1	3.8
> 4.00 ha	77.4	42.0	63.3	5.8	2.5	4.5
Medium & Large	72.9	39.0	59.7	5.3	2.2	4.1
All	67.4	34.1	53.4	4.5	1.9	3.4

(Source: NCEUS (2008) Computed using NSS unit level data 61st Round in Employment and Unemployment Situation in India.)

Literacy & Health have a deep relation within. A recent definition by **UNESCO (2015a)** states that:

Literacy is a key component of adult learning and education. It involves a continuum of learning and proficiency levels which allows citizens to engage in lifelong learning and participate fully in community, workplace and wider society. It includes the ability to read and write, to identify, understand, interpret, create, communicate and compute, using printed and written materials, as well as the ability to solve problems in an increasingly technological and information-rich environment.

And Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. (**WHO, 1948**)

The relationship between literacy and health has been the focus of much research and policy debate. In the US, for instance, people with low literacy competency were found to be 1.5 to 3 times more likely to have an adverse health outcome as compared with those who read at higher levels (**DeWalt*et al.*, 2004**). In low-income countries, particular attention has been given to women's literacy, as linked to positive health outcomes, including the adoption of family planning, improved nutrition and sanitation. 50% of child deaths avoided between 1970 and 2009 were attributed to women's increased levels of education **(Langer *et al*., 2015).**

ISBN: **978-93-85822-72-8**

UNESCO (2014b, p. 3) stated that a literate woman is on average 23% more likely to seek support from a midwife and educated mothers are more likely to ensure their children are vaccinated. Based on such assertions, literacy policy and programmes have generally taken an instrumental and limited approach to women's empowerment, focusing on literacy in relation to their reproductive role as mothers. Conversely, looking at the impact of health on literacy and education, research has shown that the healthy adults are less likely to rely on daughters' labour, freeing them to attend school (**Langer *et al*., 2015**).

Does 'health literacy' mean the same as 'literacy and health'? First used at a health education conference in 1974, the term has evolved, as **Frisch *et al*. (2011, p. 119**) point out, to mean more than 'functional literacy in the health domain'. This section looks at how the meaning of 'health literacy' has evolved over time and in different contexts.

The definition of health literacy emerged in the health sector with a narrow focus on reading and writing health materials, but has broadened to include the use of such knowledge, reflecting the more holistic health promotion approach outlined earlier. This is illustrated by the **WHO's (1998)** definition of health literacy:

The cognitive and social skills that determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health (**WHO, 2013**).

Since 1998, various types of 'health literacy' have been defined, often in terms of the different kinds of skills developed in relation to health knowledge/citizenship. **Nutbeam's (2000**) distinction between three types of health literacy has been particularly influential, consisting of:

- Functional health literacy (basic reading and writing skills which enable the understanding and use of health information);
- Communicative or interactive health literacy (more advanced cognitive and literacy skills to interact with healthcare providers and the ability to interpret and apply information to changing circumstances);

ISBN: **978-93-85822-72-8**

- Critical health literacy (more advanced cognitive skills to critically analyse information in order to exert greater control over one's life) (From **Frisch *et al*., 2011**, p. 118)

But in developing countries like India, basic education is still to reach its remotest corners. In this context the issue of Health Literacy is of great concern, which is to be explored through this study.

3.8 Farm income & Expenditure(Prajapati, 1993):

India is now in the era of planned economic development. To pursue such development apart from other factors capital plays the most crucial role. It has been universally admitted that a country which wants to accelerate the pace of growth has to save a major part of its income with the objectives of raising the levels of investment. As agriculture is the main stay of Indian economy increase in agricultural production accompanied by a rise in productivity is important for its development. However, more important is increase in surplus in agricultural sector to provide room for investment. It has been rightly told that surplus in agricultural sector determines, in an under developed country like India, the limits to the possible rate of industrialization.

In recent years a new source of income has emerged in the rural areas in the farm of renting of machineries and sale of water. The sale of agricultural produce, however, is still the main source of income for the rural people. Thus source of income is mainly determined by the rate the agricultural production exceeds to its consumption. Better the rate better is the surplus available for marketing. The sale proceeds of such surplus, in fact helps the farmers to save and to reinvest in capital assets which in turn enhances their income by letting them out.

In the previous chapter, the impact of several factors which had influenced the net income of farmers of the block under study was made. In this chapter an effort is made to study the pattern of income, expenditure and savings per farm of our sample block.

Gross income includes income from agricultural output and allied income as shown in the following Table.

ISBN: **978-93-85822-72-8**

Table 3.8.1: Per Farm Gross Income from Different Source

Size Group	No. of Farms	Avg size	Gross Ag. income	Allied Income	Total Income
Upto 2	62	0.75	22897	8679	31576
2-4	55	2.50	88667	20829	109496
>4	33	7.39	138921	34198	173119
All	150	2.85	72538	18748	91286

In Table 5, Gross income relating to the sources of agriculture allied and their break up in the different size group of farms is presented .A review of the table reveals that the gross agricultural income which is Rs. 22897 per farm for small size of farms increased to Rs. 88,667 and Rs 138921 for the remaining two categories of farms with the average for Rs. 72,538 for all farms. Likewise, the allied incomes increased from Rs. 8679 per farm for small size farms to Rs. 20,829 and Rs. 34,198 per farms for medium and large size farms respectively with the average of Rs. 18,748 for all farms. However, in turns of percentage the share of small farms which is 27.48% has declined to above 19% for the remaining two farm size respectively as for the allied incomes are concerned.

3.8.1 Agriculture Working Expenditure

Now-a-days, India is facing an acute scarcity of food. In order to meet this situation, the government of India has launched the "Green Revolution" for which improved method of cultivation is necessary. The expenditure on input is a short-terminvestmentbecausetheyincreaseoutputswhichcontributetothe increasing farm income. The inputs which are used for agriculture production are put into two categories: Traditional and New. The Traditional inputs include human and bullock labour, rent land revenue and new inputs are chemical fertilizer, irrigation, running cost of machinery and plant. As seeds of high yield varieties are being used through-out block, it has became part in both categories of inputs.

ISBN: **978-93-85822-72-8**

Table 3.8.1.1: Per farm Agriculture Working Expenditure (In Rs)

GROUP (ha)	Labour Power	Animal	Seed	Land Revenue	Rent	Total	Seeds	Fert.	Plant Protection	Machinery	Irrigation	Total	Working Expenditure
Upto 2	5,054	1,073	913	210	1,138	8,388	913	1,192	247	486	92	2,930	11,318
2-4	11,808	1,527	2,425	676	627	17,063	2,425	2,998	797	2,270	200	8,690	25,753
>4	25207	2,858	5,218	1,468	985	35,736	5,218	4,864	1,824	11,381	441	23,728	59,464
All	11,968	1,633	2,415	658	918	17,592	2,415	2,666	797	3,532	208	9,618	27,210

(100)

3.8.2.Expenditure on Consumption

The expenditure on consumption depends upon the total income. A change in income brings a change in the, propensity to consume. An increase in income induces to go for the consumption of superior goods than inferior ones. Thelevelofincomedeterminestheexpenditureamountofpatternon-consumption.Aslightchangeinincomemakesasignificant changein consumption expenditure. An increase in income induces for higher expenditure on luxury and non-essential items.However it is common that smaller income group spend more on food than that of the larger ones.

Table 3.8.2.1 :Consumption expenditure per farm (in Rs.)

Size Group (Hect)	Food and light	Clothing goods and services	Housing	Fuel	Medicine	Education	Misc.
Up to 2	18,870	1,288	188	340	418	120	481
2-4	26,981	3,208	920	426	1,892	3,840	928
4-above	34,820	8,920	2,180	612	4,721	9,280	2,890
All farms	25,353	3,671	895	431	1,905	3,499	1,175

3.9 Government Policy

ISBN: **978-93-85822-72-8**

Government plays a major role in providing basic amenities to people and hence these variables also reflect regional effectiveness of the provisioning and maintenance of essential public goods. Even if these amenities are available, their irregular use could be a matter of preference or the lack of awareness of households towards leading a hygienic life. For instance, there may be a preference for cooking with firewood in spite of LPG being available and use of open area for defecation despite having a toilet inside the house.2Jose and **Navaneetham (2010)** show that CED rates for women inIndia in 2005-06 was higher by about 15-20 percentage points when there was no access to toilets;or when water was not available on premises and had to be fetched from outside; or there was use of cooking fuel that creates indoor air pollution. This same study further reports that even after wealth effects, rural/urban residence and other socio-demographic variables were controlled for,each of these variables were individually relevant in explaining the presence or absence of CEDamong women in India.

9.10 Size of Holding

India is a land of small farmers. According to Agricultural Census 2000-01, there were an estimated 98 million small and marginal holdings out of around 120 million total land households in the country. As shown in Table 8, the share of marginal and small farmers accounted for around 81% of operational holdings in 2002-03 as compared to about 62% in 1960-61. Similarly, the area operated by small and marginal farmers has increased from about 19% to 44% during the same period. Recent data for 2005-06 shows that the share of small and marginal farmers in land holdings was 83% (**Chand *et al*, 2011**). Thus, the small holding character of Indian agriculture is much more prominent today than even before. The average size of holdings in India declined from 2.3 ha. in 1970-71 to 1.33 ha. in 2000-01. It may be noted that 63% of land holdings belong to marginal farmers with less than 1 ha. The average size of marginal holdings is only 0.24 at all India level. The average size of small holdings is 1.42 ha.

3.10.1 Farm Size, output and productivity

The contribution to output is higher for marginal and small farmers as compared to their share in area. The share of these farmers was 46.1% in

ISBN: **978-93-85822-72-8**

land possessed but they contribute 51.2% to the total output of the country (Fig 1 and Table 9) at all India level in 2002-03. There are significant regional variations in their contribution to output. The share of output is less than the operated area in ten states (Table 10). In rest of the states, the reverse was true. *The contribution of small and marginal farmers to output ranges from 19% in Punjab to 86% in West Bengal*. It is less than 50% in 9 out of 20 states. In the Estern states, the share of both area and output are high for these farmers. On the other hand, in some of the states in Central, Western and North-Western regions, medium and large farmers still dominate in both area and output.

In terms of production, small and marginal farmers also make larger contribution to the production of high value crops. They contribute around 70% to the total production of vegetables, 55% to fruits against their share of 44% in land area (**Birthal, 2011**). Their share in cereal production is 52% and 69% in milk production. Thus, small farmers contribute to both diversification and food security. Only in the cases of pulses and oilseeds, their share is lower than other farmers.

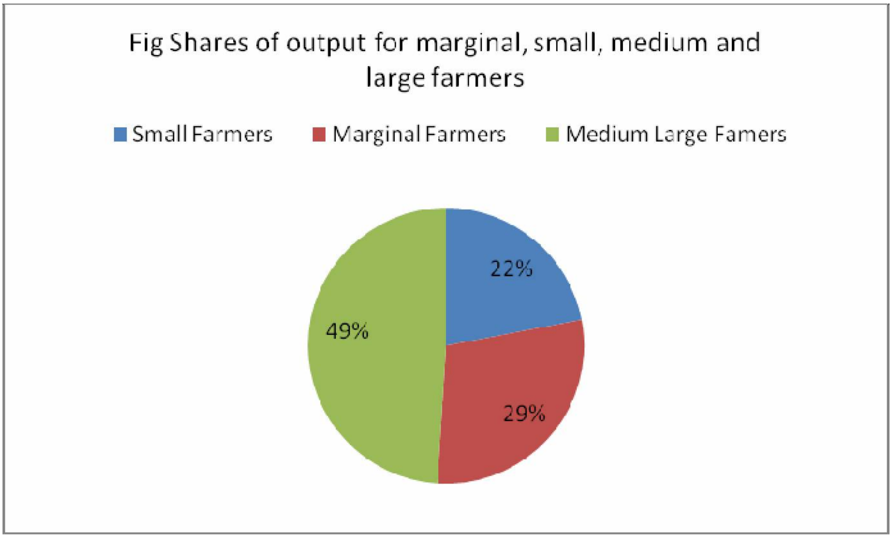

Fig. 3.10.1.1.: Shares of output for marginal, small , medium and large farmers

ISBN: **978-93-85822-72-8**

Table 3.10.1.1: Changes in Percentage Distribution of Operate Holdings and Operated Area

	Percentage Distribution of farm holdings				Percentage Distribution of Operated Area			
Land Class	1960-61	1981-82	1991-92	2002-03	1960-61	1981-82	1991-92	2002-03
Marginal	39.1	45.8	56.0	62.8	6.9	11.5	15.6	22.6
Small	22.6	22.4	19.3	17.8	12.3	16.6	18.7	20.9
Small&Marginal	61.7	68.2	75.3	80.6	19.2	28.1	34.3	43.5
Semi-medium	19.8	17.7	14.2	12.0	20.7	23.6	24.1	22.5
Medium	14.0	11.1	8.6	6.1	31.2	30.1	26.4	22.2
Large	4.5	3.1	1.9	1.3	29.0	18.2	15.2	11.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 3.10.1.2: Share of Small and Marginal farmers in land possessed and in crop output (%)

States	Share in Area (Land Possessed)	Share in Output
West Bengal	83.0	86.2
Uttaranchal	81.4	46.7
Kerala	79.8	78.1
Himachal Pradesh	73.7	73.9
Orissa	73.2	72.5
Jharkhand	73.1	78.1
Assam	72.4	70.7
Bihar	67.2	69.2
Jammu and Kshmir	66.4	77.3
Uttar Pradesh	59.4	65.1
Tamil Nadu	54.4	51.7
Chattisgarh	49.4	46.1
Andhra Pradesh	47.5	46.7
Haryana	42.2	29.9
Karnataka	37.4	38.5
Madhya Pradesh	34.3	27.9
Gujarat	34.3	35.3
Maharashtra	31.7	35.2
Punjab	29.9	19.3
Rajasthan	22.6	33.2
All India	46.1	51.2

ISBN: **978-93-85822-72-8**

Note: Marginal 0.01 to 1.00 ha.; Small 1.01 to 2.00 ha; Semi-Medium 2.00 to 4.00 ha; Medium 4.01 to 10.00 ha; Large above 10 ha.

Source: NCEUS (2008) National Sample Survey Land Holdings 8th, 17th, 26th, 37th, 48th, 55th Rounds, Central Statistical Organization, Government of India

3.11 Frequency of Doctor`s Visit:

3.11.1 Poor Health Status of Women

Health status largely depends on behavioral factor and health care system variable. Posited by **Iyun*et al* (1995)**, it is a dependent variable that varies as a function of lifestyle factors, demographic and socioeconomic characteristics such as age, sex, income, social, physical and medical environment. Health status is not only determined by the physical make up but also by socioeconomic status. **Adejare (2001)** used self rated health status, frequency of seeking treatment and frequency of inability to work were used to compute the health status rating scale of rural women. Similarly, the burden of diseases can be measured in terms of disability adjusted life years (DALYs), physical quality of life index (PQLI) and gender related development (GDI) to determine the overall level of physical well-being.

Rural women have extremely limited access to services such as health centers. Their ability to take full advantage of health care programs is related to their economic status. **Adejare (2001) and Ukeje (2004)** found that access to health care varies from one community to another and less than half the population under the study utilizes these facilities. Although other issues determine accessibility and utilization of health care services for women, distance from the woman's home is a factor. To make a life changing difference for women, equitable distribution of health facilities is necessary and provision of social amenities such as electricity, good roads, and portable water to make their life more comfortable for rural dwellers**.** **Chinai (2005)** suggested that getting health care to these vulnerable groups who are in the rural communities whose access to treatment and care is minimal is inevitableThough life expectancy of rural women is increasing, however, the numbers of years free from disability is stagnating. This phenomenon of living longer, but not necessarily enjoying a good quality of life has implication for health services and family care.

ISBN: **978-93-85822-72-8**

Taylor, *et al* (2005) conducted a study on “Women’s Health Care Utilization and Expenditures” and the study examines women’s use of and expenditures for medical care in the United States. In 2000, 91% of women aged 18 years and older used any health care services. Overall 82% of adult women reported an ambulatory care visit, while 11% had an inpatient hospital stay. Mean expense per person with expense was $3219 for that year. We examined use and expenditures by sociodemographic characteristics. The most notable findings indicate that women with private insurance, and those on Medicaid, are more likely to use health services than uninsured women.

White women, compared to Black and Hispanic women, are more likely to have an ambulatory care visit, buy prescription drugs, and use preventive health care services. In addition, white and Hispanic women pay a higher proportion of medical care expenses out-of-pocket than do Black women.

Finally, nearly 30% of older women in fair or poor health spent 10% or more of their income out-of-pocket on medical care. In order to reduce disparities and improve the quality of health care for all women, it is important for policy makers to understand the factors that influence their utilization and expenditures for medical care.

While the government of India has expanded its health infrastructure in the last decade – increasing the number of primary healthcare centers (PHC), community health centers (CHC), and district hospitals – large shortfalls of between twenty to forty percent remain (**GOI, 2013**). These gaps are particularly large in Bihar, Jharkhand, Madhya Pradesh, and Uttar Pradesh (Ibid.). We are far from meeting the facility to population benchmark as spelled out by Indian Public Health Standards. Besides limited coverage, which is exacerbated by high vacancy rates and absenteeism (**Rao*et al*., 2011**), the poor quality of services in the public sector results in extremely low usage levels (**Wharton, 2013**). Institutional structures within the health system do not fully support the integration of health, nutrition, and other social services (**GOI, 2013; Deo, 2013**). Usage patterns reveal that the rich use a greater share of public services than do the poor. The rich are more likely to use hospital based or inpatient care in

ISBN: **978-93-85822-72-8**

public facilities, including tertiary medical services (**Balarajan*et al.,* 2011**). A 2000 study revealed that thirty six percent of public funding for hospital care benefitted the top income quintile, and only 8.1 percent benefitted the lowest quintile (**Mahal*et al*., 2000**). By wide margins – estimated at above seventy per cent – the private sector is the dominant source of health service delivery in India, for the rich and poor alike (**Rao*et al*., 2011; Das *et al*., 2013**). The private sector is characterized by ambulatory or outpatient facilities that provide care at a variety of price points and quality standards. The qualifications of providers vary, from bachelors of medicine or surgery (MBBS); to certificates obtained under the Indian Schools of Medicine and homeopathy (AYUSH), including Unani or Ayurveda; to no formal medical training (**Das *et al*., 2013**). Research on healthcare use in rural areas shows that a stark ninety per cent of the population seeks care from private providers, with over seventy percent of those providers being unqualified (**MAQARI, 2011**). With little emphasis placed on preventive, diagnostic, or affordable care, this system can also result in delays before people seek quality care. People often address their basic healthcare needs in hospital settings (**Rao and Mant, 2012; Wharton, 2013**). Hospital based care typically involves higher levels of investigation, potential for inappropriate or overtreatment, and use of expensive nongeneric medicines. The lack of systematic screening and prevention for both acute and chronic illness is a greater constraint for poor and rural populations. It disproportionately affects their burden of disease and expenditures (**Rao and Mant, 2012**). Recent evaluations show that the uptake of care in the public sector for chronic illnesses remains very low in Uttar Pradesh (forty five percent), Madhya Pradesh (sixty three percent), and Jharkhand (seventy percent), but high in Tamil Nadu (ninety four percent). This variation is attributed to a difference in service quality (**GOI, 2013**). Rehabilitative and palliative care for the sick and elderly also remain neglected. This lack of availability of preventive care services in the public system has negative consequences for individuals suffering from multiple morbidities and leads to high treatment costs. Another area deserving attention, particularly in northern states, is family planning services. Integrated programs are needed to prevent early childhood marriage and to encourage birth spacing (**GOI, 2013**).

ISBN: **978-93-85822-72-8**

3.12 Psychosocial Hazards:

Developments at global level are marked by an intensification of the processes of interaction involving travel, trade, migration and dissemination of knowledge.

These have shaped the progress of the world over millennial), and have introduced a shift towards more insecure forms of employment, reduced control in trade, reduction in public spending in real wages, and problems of reduced regulation and lack of enforcement of regulation on working conditions. Overall, recent data suggests that faster industrialization, urbanization and outsourcing, with a great increase in construction, and agricultural mechanization in developing countries has led to a rise in the number of workers exposed to traditional (for example, heavy physical workload) and new occupational risk factors(WHO, 2007) . Working conditions and the physical and psychosocial hazards they may pose, therefore, have the potential to affect workers' health also in developing countries. Although we currently lack research data, the changing nature of work and the impact of globalization increase the importance of addressing psychosocial risk factors and work-related stress in developing countries(Houtmanet.el, 2008).

It is essential to keep the developing countries in our sight, considering that approximately 80% of the global workforce resides in the developing world (Rosenstocket.el, 2006) . Approximately 30-50% of workers report hazardous physical, chemical or biological exposures or overload of unreasonably heavy physical work or ergonomic factors that may be hazardous to health and to working capacity; an equal number of working people report psychological overload at work resulting in stress symptoms. Psychological overload is caused by psychosocial risk factors. There is considerable evidence, and reasonable consensus, within the research community of industrialized countries of work aspects which are experienced as stressful and/or have the potential to harm. Recent studies

ISBN: **978-93-85822-72-8**

indicate that contemporary and emerging psychosocial risks are changing and go beyond the traditional workplace-cantered approach. These include external factors such as globalization.Increased vulnerability of workers in the context of globalization, precarious contracts in the context of the unstable labor markets, new forms of employment contracts, and the feeling of job insecuritys). Psychosocial hazards have previously been described as an integral element of the stress process, in terms of the interaction among job content, work organization and management, environmental and organizational conditions on the one hand, and the employees competencies and needs on the other; an interaction that can prove to be hazardous to employees health through their perceptions and experience.

The global definition of work-related stress underlines that the most stressful type of work is that which values excessive demands and pressures that are not matched to the workers knowledge and abilities, where there is little opportunity to exercise any choice or control, and where there is little support from others. This view is based on contemporary theories, such as the job-demand-control- support theory, and the effort-reward imbalance model.

A meta-analysis (2004`2005) suggested that particularly combinations of high demands and low decision latitudes as well as high effort and low rewards are associated with psychological disorders, such as depression and anxiety. Furthermore, the effort-reward-imbalance model could be associated with cardiovascular disease, poor self-perceived health, and several mental disorders. Therefore, the psychosocial work environment has an impact on workers' health.

Some positive developments have been taking place, for example, in Latin America, where awareness about the importance of psychosocial risks and their impacts has been increasing recently. Research shows an increase in studies that deal with psychosocial risks each year, reaching up to 25% of all studies in occupational health presented in 2006. Burnout studies in service occupations are the most common type of investigation and between 16-30% of prevalence has been reported and associated with

ISBN: **978-93-85822-72-8**

various psychosocial aspects of work. For example, high job strain in 24% of workers was reported in studies conducted in Argentina and MeXico.

On the African continent, the First Inter-ministerial Conference on Health and Environment recognized in its report that "Africa not only has to cope with traditional environmental risk factors to human health, it now also has to cope with new and emerging threats, including new occupational risks" These are explained to add to the burden of traditional occupational health problems such as injury, respiratory disorders, dermatitis and musculoskeletal problems. The report further states that"Africans are now suffering from asthmatic conditions and psychosocial stress". The African report neither eludes any further to psychosocial risks, nor does it indicate how to tackle this emerging risk. However, the recognition of psychosocial risk as an issue that requires addressing is a first step towards future action.

Workers around the world, despite differences in their environments, face practically the same types of workplace hazards in terms of chemical, biological, physical and psychosocial. This part of the study aimed at addressing part of the knowledge gap in developing countries by exploring the perceptions of experts and their knowledge of the nature of psychosocial hazards and their understanding of workplace risks that require urgent attention. Eventually it will be such experts who will deliver research evidence and provide the basis for policy developments in their countries

Kortum, *et al* (2010) in their paper “Psycho-social Risks and Work Related Stress in Developing Countries: Health Impact, Priorities, Barriers and Solutions” published in ‘International Journal of Occupational Medicine and Environmental Health” explores experts’ perceptions of psychosocial risks and work-related stress in emerging economies and developing countries. This paper focuses on knowledge of potential health impact of psychosocial risks and preliminary priorities for action, and discusses potential barriers and solutions to addressing psychosocial risks and work-related stress in developing countries. This research applied a mixed methodology including semi-structured interviews, two rounds of an online Delphi survey, and four focus groups. Twenty nine experts with

ISBN: **978-93-85822-72-8**

expertise in occupational health were interviewed. Seventy four experts responded to the first round of an online Delphi survey and 53 responded to the second round. Four groups of experts with a total of 37 active participants with specific or broader knowledge about developing country contexts participated in focus group discussions. Results: High concern was expressed for the need to address psychosocial risks and work-related stress and their health impact. Developing country experts' knowledge about these issues was comparable to knowledge from industrialized countries, however, application of expert knowledge was reported to be weak in developing countries. Socio-economic conditions were regarded as important considerations. Priorities to be addressed were identified, and barriers to implementing possible solutions were proposed. The future research and action paradigms in relation to psychosocial risk management will need to be broadened to include the larger social, political and economic contexts in developing countries beyond issues focusing solely on the working environment. Work-related psychosocial risks and the emerging priority of work-related stress should urgently be included in the research and political agendas and action frameworks of developing countries.

ISBN: **978-93-85822-72-8**