UNIVERSITY OF CAPE COAST

OCULAR HEALTH AMONG COCOA FARMERS AT MFUOM IN THE CENTRAL REGION OF GHANA

SAMUEL BERT BOADI-KUSI

2013

UNIVERSITY OF CAPE COAST

OCULAR HEALTH AMONG COCOA FARMERS AT MFUOM IN THE CENTRAL REGION OF GHANA

BY

SAMUEL BERT BOADI-KUSI

THESIS SUBMITTED TO THE DEPARTMENT OF POPULATION AND HEALTH OF THE FACULTY OF SOCIAL SCIENCES, UNIVERSITY OF CAPE COAST IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR AWARD OF MASTER OF PHILOSOPHY DEGREE IN POPULATION AND HEALTH.

MARCH, 2013

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidates name: Samuel Bert Boadi - Kusi

Signature:... Date:.............................

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on the supervision of thesis laid down by the University of Cape Coast

Principal Supervisor: Prof. Kofi Awusabo - Asare

Signature.. Date.............................

Co-Supervisor: Dr. Akwasi Kumi - Kyereme

Signature.. Date.............................

ABSTRACT

Agricultural work is one of the riskiest occupations for the eye due to high level of exposure to hazards. However, most often the needs of such workers especially in developing countries such as Ghana are not met as a result of inadequate infrastructure and health professionals.

A community-based cross-sectional survey was carried out to evaluate the ocular health status, working conditions and perception of safety among 185 cocoa farmers at Mfuom. A structured questionnaire was used for the survey and a comprehensive eye examination was conducted.

Of the 185 cocoa farmers, 68% were males and the rest females. The ages of the respondents ranged between 19 and 70 years with a mean age of 52.7 (SD= 11.7). About 37% had spent 5 to 9 years in farming with 12% spending more than 30 years. Disease conditions were observed among 58% of the farmers. The anterior segment eye diseases diagnosed were mainly conjunctivitis (13%), Pterygium (2.7%) and cornea opacity (2.2%). Major posterior segment diseases diagnosed were cataract (20.0%), glaucoma (11.7%) and hypertensive retinopathy (2.7%). Refractive conditions were identified in 41.1% of the participants. Weeding recorded the highest incidence (40.5%) of injury followed by spraying of chemicals (10.8%) and pruning (9.7%). Spraying of chemicals recorded the highest use of goggles (25.4%) among the farmers.

The data suggests that cocoa farmers have high level of vision problems but make insufficient use of proper medical care. It is therefore recommended that cocoa farmers are educated on ocular health and safety and use of protective eye wear.

ACKNOWLEDGEMENTS

My heartfelt gratitude goes to my supervisors and the entire Academic staff of the Department of Population and Health for their contribution towards my education, and their guidance in bringing me this far.

I am also grateful to my wife and children for the numerous sacrifices they have made in the course of my studies. I also thank my parents and siblings for their support and encouragement. I want to extend my profound gratitude to Odile Swagemakers (Netherlands) who made great financial contributions towards my undergraduate education leading to my postgraduate education.

To my former head of Department of Optometry, Dr. Alfred Owusu, who granted me permission to enrol for this programme, I say a big thank you. I also want to appreciate the efforts of my colleagues and students at the Department of Optometry, University of Cape Coast, who helped in diverse ways in my data collection, as well as the chief and people of Mfuom for allowing me to use their community for this study especially Rev. Kojo Ntrakwa who organized the cocoa farmers.

I also appreciate the generosity of Mr. Kenneth MacChee of Tullow Oil- Ghana, Takoradi, for donating free boxes of focus spectacles used during the screening exercise.

Finally, I thank all who helped in diverse ways in making this study a success especially Miss Wilhemina Coker Davis of the Department of English, University of Cape Coast.

DEDICATION

To my wife and children.

TABLE OF CONTENTS

CHAPTER THREE: METHODOLOGY

CHAPTER FOUR: RESULTS AND DISCUSSION

LIST OF TABLES

LIST OF FIGURES

LIST OF ACCRONYMS

BCDVA	Best Corrected Distance Visual Acuity
BVA	Best Corrected Visual Acuity
CDC	Centre for Disease Control
CDR	Cup disc Ratio
CF	Counting Fingers
CI	Convergence Insufficiency
HM	Hand Movement
HVA	Habitual Visual Acuity
ICCO	International Cocoa Organization
ICD	International Classification of Disease
ILO	International Labour Organization
IOP	Intra Ocular Pressure
LI	Legislative Instrument
LP	Light Perception
NAD	No Abnormality Detected
NLP	No Light Perception
OD	Ocular Dexter
OS	Ocular Sinister
PH	Pin Hole
PPE	Personal Protective Equipment
RVA	Reported Visual Acuity
UV	Ultraviolet
VA	Visual Acuity
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

Background to the study

Assessment of a population's health status helps to design interventions (Allingham, 2008). This is particularly important, especially if it has to do with the working population, due to the crucial role they play in developing the economies of nations. The eye is the sense organ for sight; as a result, its role in task performance among workers is essential. It is therefore important to maintain a good visual status at all times since any level of impairment, as a result of injury or disease, poses great challenge to task performance in most cases.

Workers are exposed to a variety of ocular hazards including exposure to chemicals, dust, unintentional injuries, ultraviolet and other radiations, infectious agents that may lead to several diseases to the eye, among others. While acknowledging that there is potential for eye injury and predisposition to ocular diseases in all occupations, it has been reported that agricultural workers suffer a great deal more than others. Agricultural workers suffer eye injury and diseases 2.5 times more than other occupations (Quandt, Elmore, Arcuy & Norton, 2001). Agricultural work has also been reported as one of the riskiest occupations for the eyes (Forst et al., 2006). However, most often the needs of such workers are not met especially in developing countries where there may be absence of adequate human resources and infrastructure, and sustainable management of eyecare facilities and service (Trabelsi, 2006). The ocular health needs of agricultural workers in Ghana may not be different from those reported elsewhere across the globe (Gyasi, Amoaku & Adjuik, 2007). Despite this knowledge, very little detailed documentation has been done on the ocular health and conditions among farmers in Ghana such as cocoa farmers.

Currently, Ghana is the second leading producer of cocoa worldwide after Cote D'Ivoire (Anang, 2011; Annan, Adusei & Mintah, 2011; Vigneri, 2007; Vigneri & Santos, 2007), with an average of 19.3 percent of the world's total production of 4,309,000 metric tonnes (ICCO, 2012). It is estimated that the cocoa sector in Ghana employs over 800,000 smallholder farm families. Cocoa farm sizes are relatively small ranging from 0.4 to 4.0 hectare with an estimated total cultivation area of about 1.45million hectares (Teal, Zeitlin & Maamah, 2006; Anim-Kwapong & Frimpong, 2004; COCOBOD, 2002). It employs about 51 percent of the labour force and is the major source of income and employment for about 70 percent of the rural work force (Anang, 2011; Asuming-Brempong, Sarpong, Asenso- Okyere & Amoo, 2006). Cocoa production is also the biggest activity in the Ghanaian agriculture and plays a strategic and critical role in Ghana's economy (Tutu, 2011; Dormon, Van-Huis, Leeuwis, Obeng- Ofori & Sakyi-Dawson, 2004; BulíÍ, 2003), contributing greatly to Ghana's foreign exchange earnings. Cocoa contributes about 70-100 per cent of annual income of small-scale farmers, and other stakeholders like licensed cocoa buyers (LCB's) also depend largely on their products for market, employment and income (Asamoah & Baah, 2003). Therefore, any practices that negatively affect the general health and the ocular health of this workforce will adversely affect the production of cocoa in Ghana.

Cocoa production increased from 395,000 metric tonnes in 2000 to 740,000 metric tonnes in 2005 with an increase of cocoa's share in agricultural

GDP from 13.7 percent in 2000-2004 to 18.9 percent in 2005/2006 (Breisinger, Diao, Kolavalli & Thurlow, 2008). It has been reported that Ghana has achieved its target of one million metric tonnes of cocoa production at the end of the main crop season in 2010, the highest since the country registered its name on the international market as a producer of cocoa (GCB, 2011; MOFEP, 2011). Though various governments continue to put measures in place to ensure high production of cocoa to boost Ghana's economy, very little has been done to assess the visual needs of these workers and this has prompted this study. Knowledge of the visual status of the farmers could be an added advantage since good vision has been shown to enhance productivity at the workplace (Pitts & Kleinstein, 1993). The implication is that with good vision, cocoa farmers can produce more to help sustain the Ghanaian economy.

Cocoa production in Ghana

The Dutch missionaries first planted cocoa in the coastal areas of present Ghana in 1815, and in 1857, the Basel Missionaries planted cocoa at Aburi (COCBOD, 2000). However, these farms did not form the basis for the growth of the industry in the country until Tetteh Quarshie, from Osu in Accra, who had travelled to Fernando Po and worked there as a blacksmith, returned with Amelonado cocoa pods in 1879. He established a farm at Akwapim Mampong from where other farmers bought pods to plant, which resulted in the spread of cocoa cultivation to other parts of the Eastern Region. Tetteh Quarshie, thus, became a prominent cocoa farmer with his farm serving as a source of supply of cocoa planting materials until his death in 1892. It is generally accepted that the commercial growing of cocoa in Ghana began after the introduction of the beans into the country by Tetteh Quarshie in 1879 (Grossman & Bayer, 2009; Anim-Kwapong & Frimpong, 2004). Since then, the sales of cocoa beans have been one of the country's major foreign exchange earners.

Cocoa production in Ghana is predominantly a smallholder activity, often with only 1-2 hectres of the crop (Grossman- Greene & Bayer, 2009), and tends to be labour intensive. The main sources of labour for cocoa farming activities are caretakers or sharecroppers, hired labour, and family labour (Asuming-Brempong et al, 2006; Bøås & Huser, 2006). Cocoa is an annual crop and its production year starts in October and ends in September in Ghana. Cocoa fields usually have an economic life of some 25-30 years; and the crop is mostly grown under extensive management systems.

Cocoa production begins with land preparation for establishing the cocoa farm which involves tree felling, slashing of the vegetative cover, drying and burning of the bush and clearing of the debris. The land preparation is largely undertaken by men. After the preparation of the land, the cocoa beans may be sowed directly or planted as seedlings, which may be purchased or nursed by the farmer. The young cocoa plants are interspersed with food crops to provide shade for the plants and food for the farmer during the formative years of the farm. Before the cocoa trees form a canopy, weeding is carried out about three times in a year. The farm is sprayed with insecticide about four times in a year to control pests and diseases. Occasionally, cocoa plants are pruned to allow for proper growth and movement within the farm. Harvesting (plucking) of cocoa beans is carried out when pods mature, and then beans are prepared for sale (Asuming-Brempong et al., 2006). However, several processes are involved from the time of flowering of the cocoa tree to the end of processing. The fruits (pods) take about 5 months from flowering/fruit-set to ripeness and are subject to a number of pests (in West Africa most importantly capsids) and diseases (most importantly the West Africa species of the pathogen Phytophthora). Several steps are involved from harvesting to processing by the farmers as presented by the World Agro- forestry centre (Bartel, 2010). These activities can predispose cocoa farmers to several ocular diseases and injuries. There is, therefore, the need for occupational vision and ocular health examination of cocoa farmers.

Reasons for high prevalence of eye conditions among farmers

Agricultural workers are more likely to suffer from eye conditions due to predisposing risk factors, harsh working conditions, environmental exposures, and lack of ocular protection (Verma, 2010; Taylor et al, 2006). Airborne soil and particulates that result from farming practices create environmental conditions that pose a risk to eye health. Exposure to allergens such as pollen has the ability to cause allergic reactions or abrasions to the eyes (Lacey, Forst, Petrea & Conroy, 2007; Brison & Pickett, 1991). Similar symptoms of irritated eyes also result from exposure to pesticide residues on crops, as well as from pesticide mixing, loading and other application tasks (Lacey et al, 2007). In addition, living in housing located next to fields sprayed with pesticides provides a mechanism for continuous exposure (Quandt et al, 2004; Lucas & Gilles, 2003). Sunlight is also considered to be a continuous risk exposure that is detrimental to eye health (Quandt et al, 2008; Threlfall & English, 1999). Agricultural workers spend a significant amount of time outdoors in extreme ultraviolet light. Short-term ocular conditions as a result of exposure to intense ultraviolet light include eye irritation and eye sensitivity, while long term conditions include cataract formation, retinal damage, and pterygium development (Carson, 2009; Taylor et al, 2006)

Additionally, agricultural workers are sometimes exposed to aging equipment that lacks protective physical barriers. There have been cases where farmers accidentally sprayed their eyes with chemicals. Agricultural workers use grinding wheels to sharpen tools, which can results in corneal abrasions from foreign bodies invading the eye (Lacey et al, 2007). Abrasions to the eye have also been documented due to thorns, stalks, vines, and bushes. The prevalence of eye abrasions may be high among farmer due to failure to use ocular protection (Verma, 2010).

Occupational vision and eye health assessment

Occupational vision is concerned with the efficient and safe visual functioning of an individual within the work environment. It encompasses more than just the prevention of occupational eye injuries, and includes vision assessment of workers, taking into account their specific vision requirements and the demand these requirements place on them (Good, 2001). In this regard, occupational vision assessment includes identification of potential hazards to the eye and devising strategies to reduce or eliminate such hazards.

Occupational vision-related diseases and injury in agriculture may result from infections, contact with vector and parasites, the use and exposure to organophosphate and carbamate insecticides and pesticides as well as accidental injuries. Poorly maintained equipment, improper use of farm machinery, failure to understand and observe safety instructions and poor supervision are key factors responsible for these accidents which may affect the eye (Lucas & Gilles, 2003). For example, farmers are at risk of traumatic eye injuries caused by plants, tools and equipment as they work in farms (Quandt et al, 2001). Injury to the eye by plants may result in fungal keratitis, and infections from infectious agents may lead to various forms of anterior segment eye diseases (Kanski, 2009). There is also the exposure to carbamates, dust, wind, allergens which may lead to allergic reactions and photosensitivity (Quandt et al, 2001). Such diseases contribute in no small way to productivity loss time as workers spend considerable hours seeking solutions to them either through orthodox or modern methods of health care.

While some of the cocoa farming-related ocular problems are addressed in instructions to farmers by some agricultural extension officers and at hospitals, there are a number which go undetected because there is no comprehensive system for identifying and educating farmers on eye care. Furthermore, the nature of the responses to such diseases may be related to socio-economic, cultural and environmental conditions in which they work and live (Lucas & Gilles, 2003). These factors may also affect the health seeking behaviour of some farmers. It is, therefore, important to study some of these inter-relationships which affect the visual status of cocoa farmers.

In promoting occupational vision, due consideration must be given to the fact that certain environmental, cultural and behavioural differences may influence the frequency of occurrence of some diseases in some communities or environments than others. For example, in some communities, it is difficult to distinguish between home and farm as the farmers leave on farms. Equally, behavioural patterns such as excessive smoking, excessive alcohol intake among others may influence visual outcome of individuals in the community.

Statement of the problem

The working conditions of cocoa farmers predispose them to high risk of ocular injuries and other ocular-related diseases. In a study in West Virginia, the highest incidence rate of work related eye injuries and diseases for any industrial sector was among agricultural workers. (Islam, Doyle, Velilla, Martin & Ducatman, 2000). Eye injuries and illness account for 5.7% of lost workdays in the agricultural sector, with a rate of 16.8 injuries and illness per 10,000 workers (ILO, 2004; Sprince et al, 2003)

Some farm-work-related injuries and diseases can lead to serious visual impairment or blindness which could result in serious repercussions for the individual, the family and the entire nation thereby contributing immensely to the global burden of disease. Work-related morbidity results in suffering and hardship for the worker and family and contributes to the overall cost to society through lost productivity and increased use of medical and welfare services. The cost of agricultural injuries and disease burden to society has been estimated at 2-14% of the gross national product in different studies in different countries (Leigh, Macaskill, Kousma & Mandryk, 1999).

Reliable data on occupational disease are much more difficult to obtain than for injuries because occupational diseases develop over a longer period and need much effort and resources to monitor. Cocoa farmers are exposed to agricultural chemicals, wind, dust, allergens, and ultraviolet radiations which may result in varied forms of ocular conditions. Despite the high risk of ocular illness and injury among farmers, few of them seek professional eye examination. For example, a survey of workers in California, showed that two-thirds had never had an eye examination (Villarejo & Baron, 1999).

Regardless of farmworkers' elevated risk of eye injury and illness, research on eye problems in farmworkers has been limited (Quandt et al, 2008). In Ghana, policies and interventions to boost cocoa production have always been in the areas of diseases and pests control, farm rehabilitation, producer price management, produce payment processes, soil fertility management, planting materials, and research and extension services (Asuming-Brempong et al, 2006). Virtually no research has been published documenting detailed eye injuries, eye illness or eye protection measures among agricultural worker in Ghana. There is lack of published data on ocular health status of agricultural workers and factors related to the use of ocular safety devices on farms. The few available studies in literature about eye conditions focused on eye irritations and use of protective devices among agricultural workers (Anim-Kwapong & Frimpong, 2004). The prevalence and causes of eye injuries, diseases, use of ocular protective devices and the ocular health seeking behaviour of agricultural workers have rarely been reported

Due to the invaluable role sight plays in all the activities on the farm, the visual care of cocoa farmers should be a major concern since cocoa is the major agricultural crop in the Ghanaian economy. It is for these reasons that this study examined the ocular health of cocoa farmers in the Central Region.

Objectives of the study

The main objective of this study is to evaluate the ocular health status, safety and working conditions of cocoa farmers at Mfuom.

The specific objectives are to:

1. Evaluate the perception of cocoa farmers on their visual status.
2. Ascertain the prevalence of major ocular conditions among cocoa farmers;
3. Determine the prevalence of ocular injuries among cocoa farmers and;
4. Assess the frequency of use of protection among cocoa farmers for ocular care.

Hypotheses of the study

H_o: There is no significant relationship between ocular injuries and socio-economic background (age, sex, education) of cocoa farmers.

H_o: There is no significant relationship between ocular injuries and farm characteristics (area under cultivation and duration of farming) of cocoa farmers

H_o: There is no significant relationship between eye diseases and socio-economic background (age, sex).

H_o: There is no significant relationship between eye diseases and duration of farming.

Rationale

Visual impairment is an impediment to task performance. For example in the case of farming, workers need to see and avoid branches from entering their eyes, to position ladders properly, to be able to see co-workers and machinery in order to avoid injury. All these are crucial to the level of productivity on the farms. Poor vision and blindness can lead to inability to work or supervise farm activities. Eye conditions such as cataract (age related and post traumatic), severe conjunctivitis, fungal keratitis, corneal laceration, pterygium and refractive errors have been reported as common among farmers (Quandt et al, 2001). Unpublished records from Our Lady of Grace Catholic Hospital Eye Clinic, Bremang Asikuma, indicate that cocoa farmers report varied forms of farm-related injuries and diseases. These are reported cases and one is not sure of the actual number of cocoa farmers with eye problems. However, health interventions among cocoa farming families have focused on HIV/AIDS and malaria (Stuart, 2008). While the focus on malaria and HIV/AIDS is important, it is equally imperative to address other health problems (such as ocular health) which can incapacitate farmers for life. This study therefore sought to understand issues on ocular health status of cocoa farmers, document ocular health problems among cocoa farmers and also document visual hazards on cocoa farms in Ghana. The study will help develop a comprehensive package which can be replicated to provide eye care services and education to cocoa farmers to enhance their quality of life and that of their family members and to provide data which can be used for informed decision on quality eye care for cocoa farmers.

Chapter Organization

The thesis has been organized into five different chapters. Chapter One deals with the introduction to the study, which covers the background, the research problem, objectives and the rationale for the study of ocular health among cocoa farmers at Mfuom.

Chapter Two discusses perspectives on occupational health and safety, and how they relate to the ocular health of farmers. Issues such as workplace and ocular hazards, work and personal health practices, work, physical safety and health and community environmental factors influencing the health of workers are discussed. Ocular conditions among farmers including injuries and safety practices have also been reviewed in this chapter to enhance our understanding of issues relating cocoa farmers' attitude to ocular health and other health practices.

The third Chapter is on methodological aspect of the study. A brief historical background of the study area has been provided in addition to the research design and sampling procedure used for the study. Instruments used for the data collection are explained and field experience provided to help future researchers in their preparation concerning research in this field and in the study area.

Results from the field are presented and discussed in Chapter Four. This chapter deals with the background characteristics of respondents for the survey which included farm characteristics such as years spent in farming and number of cocoa bags produced. The results also include self-reported visual status of farmers as well as the health seeking behaviour of farmers. Reported cases of injury and use of ocular protection as well as eye diseases identified during the examination procedures are also presented in this chapter.

Chapter Five of the thesis is on summary, conclusions and recommendations. Essential issues in the study have been summarised and conclusions have been drawn pertaining to ocular health of framers at Mfuom. This chapter also provides recommendations for stakeholders in the health and agricultural industry on identified challenges. Recommendations for further research have been provided for future researchers who may be interested in this field of study.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Introduction

This chapter discusses issues relating to occupational health and safety, and relates the issues to cocoa farmers and their activities. Issues such as the global burden of occupational injuries and diseases, workplace ocular hazards, work and personal health practices and community environmental factors influencing the health of workers are discussed. The chapter also discusses various perspectives on occupational safety and health, safety interventions and ocular conditions among farmers. Finally, the chapter reviews the legal framework on occupational health and safety in Ghana and concludes with the conceptual framework that guides this study.

Global burden of occupational injuries and diseases

There is widespread agreement among global agencies, including the World Health Organization (WHO) and the International Labour Organization (ILO), that the health, safety and well-being of workers, who make up nearly half the global population, is of paramount importance (Burton, 2010). It is important not only to individual workers and their families, but also to the productivity, competitiveness and sustainability of enterprises or organizations. This importance translates to the national economy of countries and ultimately to the global economy (Ylikoski, Lehtinen, Kaadu & Rantenen, 2006)

ILO (2004) estimates that two million women and men die each year as a result of occupational accidents and work-related illnesses while 160 million new cases of work related illnesses occur every year, and stipulates that workplace conditions account for over a third of back pain, 16% of hearing loss, nearly 10% of lung cancer and 8% of depression. Global workplace fatalities, injuries and illnesses remain at high levels and involve an enormous and an unnecessary health burden, suffering, and economic loss amounting to 4-5% of gross domestic product of nations across the world (McKenzie, Pinger & Kotecki, 2008). Occupational injuries result in 250,000 potential productive years of life lost annually, more than cancer and cardiovascular disease combined (ILO, 2009).

These data reflect injuries and illnesses that occur in formal, registered workplaces. In many countries especially in Africa, the majority of workers are in the informal sector, where there are no records of their work-related injuries or illnesses (Burton, 2010). The case is not different in Ghana where about 53.9% of the total labour force works in the informal agricultural sector (GSS, 2009; Heintz, 2005). The situation makes it difficult for any effective interventional planning.

Workplace Ocular hazards

Workers in general are exposed to a variety of ocular hazards including exposure to chemicals, dust, unintentional injuries, ultraviolet and other radiations and infectious agents that may lead to ill health. While acknowledging that there is a potential for eye injury and predisposition to ocular diseases in all occupations, it has been reported that agricultural workers suffer more than others (Quandt et al, 2001). Indeed, agricultural workers suffer eye injury and diseases about 2.5 times more than other occupations

(Quandt et al, 2001) and agricultural work is one of the riskiest occupations for the eyes. (Forst et al, 2006).

In general, while traumatic injuries are usually immediately apparent to both the victim and observers, this is not the case of work-related diseases and cumulative injuries such as visual impairment due to long term exposure to radiations and many musculoskeletal disorders. Often it may take years for a disease to become evident, and then the link to workplace exposure may be unclear or not recognized at all. For this reason, occupational diseases and cumulative injuries have been grossly under-reported and generally under-recognized in terms of their toll. In addition, inadequate monitoring systems together with ineffective policies have culminated in poor reporting of occupational diseases (Drummond, 2007; ILO, 2003; Pantry, 1995). This fundamental situation underpins this study.

Concept of health (healthy worker)

Creating a healthy workplace that does no harm to the mental or physical health, safety or well-being of workers is a moral imperative (Burton, 2010). The World Health Organization (WHO, 1948, p.100) defines 'health' as "a state of complete physical, mental and social well-being and not merely the absence of disease and illness". Physical health includes a spectrum of conditions, from having a diagnosed illness at one extreme, through a condition in which the person has no specific disease, yet is not at maximum health potential, to exuberant health and well-being at the other extreme. It has always been difficult to define a normal or healthy person. Work can impact on any worker's position on this continuum. From this definition of health, people may claim to be healthy even though their assertion may not be the case because they may not have had any manifest symptom of a pre- clinical illness. The implication is that not everyone has the same expectations of what is meant by health since they may be operating in a state they perceive convenient and normal. However, a healthy worker should be able to accomplish the task by which he or she earns a livelihood (Diamantopoulou, 2003).

Health cannot be maintained if there are hazards in the workplace such as noxious fumes, dust, chemicals, heat, which can undermine the health of workers (Pantry, 1995). For example, a farmer may not be able to continue if the person suffers from cataract which was developed as a result of a trauma suffered at the workplace or long term exposure to radiations and heat. Such a person may be a danger to himself and others as a result of the inability to see. The achievement and maintenance of an optimum state of health is not only an individual matter, but of companies, communities and governments.

Work and personal health practices

Protecting health by removing hazards in the workplace, and thus avoiding disease, does not guarantee that workers will experience good health. An employee's health is also influenced by personal health practices such as smoking, eating habits, exercising, rest and use of alcohol. (Hiratsuka & Li 2001; Cheng et al, 2000). Workplace environment can influence personal health. For instance, smoke-free workplaces are associated with lower daily cigarette consumption by employees and a reduced prevalence of smoking (Fichtenberg & Glantz, 2002), and conversely, increased workplace stress can lead to increased cigarette smoking (Benach, Muntaner & Santana, 2007). In addition, high energy expenditure during working hours is negatively associated with physical activity in leisure time (Kaleta & Jegier, 2005). If work is stressful, many employees will react to the stress by increasing bad habits that help them (temporarily) cope with the stress, such as drinking excessive amounts of alcohol or smoking more than necessary. If workers are expected to work long hours and overtime, it will be difficult for them to incorporate physical activity into their schedule. Thus, work can, and does, influence personal health choices that can increase risk factors for acute and chronic, communicable and non-communicable diseases as well as injuries.

Work, physical safety and health

Various situations in the workplace can be labelled "psychosocial hazards" because they are related to the psychological and social conditions of the workplace, rather than physical conditions, which can be harmful to the health of workers (Cox, Griffiths & Rial-González, 2000). These are sometimes referred to as work stressors which include long working hours, poor remuneration, disaster and other tragic events. Hazards that pose threats to physical safety of workers include mechanical hazards, electrical hazards, slips and falls from heights, ergonomic hazards such as repetitive motion, awkward posture and excessive force, and flying fragments or risk of a work-related motor vehicle crash. Both physical hazards and non-physical or psychosocial hazards in the workplace can affect physical safety. For example, the perception of work overload has a strong association with injuries among young workers (Breslin et al, 2006). The physical and non-physical hazards have the potential of causing damage to the eyes of workers. Such hazards formed the basis of the investigation into the major causes of eye injuries in this study.

Psychosocial hazards can be associated with injuries in either a direct or indirect manner (Burton, 2010). When employees lack sufficient influence over hazardous conditions in the workplace, they lack the control necessary to abate threats to life. Thus, lack of control can contribute directly to an injury. However, indirect influences can be just as dangerous. Workers experiencing psychosocial hazards may sleep or dose off of work, over-medicate, drink excessively, feel depressed, feel anxious, become jittery and nervous, and feel angry and reckless. When people engage in these behaviours or fall prey to these emotional states, it is more probable they will become momentarily distracted, make dangerous errors in judgement, and put their bodies under stress, increasing the potential for strains and sprains, fail in normal activities that require hand-eye or foot-eye coordination (Burton, 2010). In the case of cocoa farmers, being nervous and jittery may set in when they are overwhelmed by the pests which affect their yields. Stress arising out of such circumstances and others could also lead to ocular injury.

Community environmental factors influencing health of workers

No matter how healthy and safe a workplace may be, without clean, safe water to drink in the community, workers will not experience good health. If primary health care in the community is inadequate, and workers and their families are unable to get health care they need, they will not experience good health. Characteristics of workers can influence their exposure to hazards. For instance if the literacy rate in the community and among employees is low, they may not be able to read health and safety information, and may put their health and safety at risk as a result (Adeogun & Agbongiarhuoyi, 2009). For example, illiterate farmers may not be able to read and comprehend the guidelines on protective materials required by cocoa farmers before spraying their farms such as the use of goggles, gloves and hats (Bateman, 2010). Therefore, prevailing environmental, socio-economic and demographic conditions within a community can influence the health of workers.

Workplace and workers health

Other than the home environment, the workplace is the setting in which many people spend the largest proportion of their time (Saha, Dasgupta, Butt & Chattaopadhyay, 2010; Roy & Dasgupta, 2008; WHO, 1997). Indeed, for many people, particularly in developing countries, the boundary between their home and workplace environments is blurred, since they often undertake agricultural or cottage activities either within or close to home. This is the case for most of the cocoa farmers involved in this study.

Occupational injuries and diseases play an even more important role in developing countries where approximately 70-75% of the working populations of the world live (Osotimehin, 2011; WHO, 1994). By affecting the health of the working population, occupational injuries and diseases have profound effects on work productivity and on the economic and social well-being of workers, their families and dependents.

History of occupational safety, health and disease

The study of occupational safety and health has been in existence for as long as there have been structured work environments. Hippocrates (460-377 BC), for example, wrote of the harmful effects of an unhealthy workplace on slaves, and Caesar (100–40 BC) was reported to have had an officer in charge of the safety of his legions (Pease, 1985). In the midst of the middle ages, George Bauer (1492-1555) wrote several books on mining/metallurgy describing several innovative approaches for improving ventilation for workers in mining shafts (Raouf & Dhillon, 1994).

Ramazzini (1633-1714), the father of occupational safety and health, also wrote on the safety aspects of mining as well as glass working, painting, grinding, and weaving. In *De Morbis Artificum*, or the *Disease of Workers*, Ramazzini (1713) was the first to document the deleterious effects of working conditions on employees' health and studied the injury and death rates of many different occupations. Appreciative of the social importance of the progress and economical development of these occupations, Ramazzini discussed and suggested several preventive strategies for reducing occupational disease and injury (Barber, 2007; Tayyari & Smith, 1997; Raouf & Dhillon, 1994).

Although these early safety engineers did not focus their energies on implementing intervention strategies in the workplace, they certainly laid the foundation for current approaches to reduce occupational illness and injury. Earlier attempts to reduce occupational illness or injury were hindered by the fact that employee would seldom report the sickness because serious or frequent illnesses were cause for dismissal (Pettinger, 2000).This has changed over the years with increased awareness of the health of workers.

Perspectives on Occupational Safety and Health

Within the industrial safety literature, there are research lines drawn between occupational safety, occupational health, and worksite health (Tayyari & Smith, 1997; Baker, Israel & Schurman, 1996). In fact, there is some debate over whether research in industry should be referred to as occupational health and safety (Baker et al., 1996; Goldenhar & Schulte, 1994) or occupational safety and health (e.g., Burton, 2010).

Occupational safety research focuses on injury prevention, engineering/human factors, education/training, discipline/compliance, and property damage (Bird & Germain, 1997). Occupational health focuses on controlling employees' exposure to occupational diseases, while worksite health programmes concentrate on individuals' lifestyles and health-related behaviours (or habits) that may occur on or off the job (Kerr, Griffiths & Cox, 1996; Opatz, 1994)

In terms of safety-related interventions within the workplace, there is considerable overlap of effort between occupational safety, occupational health, and worksite health promotion. Occupational safety and health and worksite health promotion all focus on health behaviour, but there is little theoretical overlap in terms of intervention research. Health behaviour refers to the behaviours of individuals, groups, organizations, communities, and institutions and how those behaviours relate to staying healthy and safe, seeking help when an illness is perceived, and following the appropriate medical advice when sick (Winett, 1998; Glanz, Lewis & Rimer, 1997; Gochman, 1997).

There are three categories of health behaviour: preventive health behaviour, illness behaviour, and sick-role behaviour. Kasl and Cobb (1966a, 1966b) define preventive health behaviour as any proactive response taken to maintain a healthy lifestyle (e.g., buckling safety belts, using personal protective equipment (PPE), following policy and procedures, (Pettinger, 2000; Geller, 1998a, 1996). The other set of categories (illness behaviour and sick-role behaviour) focus on individuals when they have already been hurt or injured. Since the targets for most occupational safety and health interventions are proactive or primary in nature, the definition of preventive health behaviours overlaps with the targets of occupational safety and health. As a result, this study examined the preventive health behaviour (such as use of goggles and other protection) and the illness/sick role behaviour of cocoa farmers after sustaining injury in farms.

Traditional Safety and Health Interventions: three "E" of safety

From the early 1900s, employers and safety practitioners adopted the philosophy of the three *E's* (engineering, education, and enforcement) to guide their safety-related interventions (Pettinger, 2000; Wilde, 1998; Geller, 1996; Petersen, 1996; Guastello, 1993). To make a difference in the health and safety of employees, the three Es of safety focus on: developing *engineering* strategies that decrease the probability of an employee engaging in at-risk behaviours; *educating* and training employees regarding equipment, environmental hazards, policies and procedures; and *enforcing* the policies and procedures related to operating equipment, wearing proper personal protective equipment, and handling specific hazardous substances.

Engineering/human factors

Industrial safety engineering research has suggested that injuries occur as a result of excess energy between the body and the work environment (Pettinger, 2000). The pioneering work of William Haddon during the mid-1900s hypothesized that engineering modifications would make the largest impact and achieve the greatest long-term reductions in injuries. Haddon's engineering philosophies helped develop personal protective equipment (e.g., ear plugs, hard hats, gloves, safety glasses, and steel-tipped boots) for occupational safety (Pettinger, 2000).

Engineers have made great contributions to safety by designing safer machinery, using better quality materials, and advancing the design of personal protective equipment the employee would have to use while operating hazardous equipment (Casali, 1990). Many engineering developments tried to completely eliminate the human element by automating many hazardous jobs. With an estimated 88% of all industrial accidents being attributed to the at-risk behaviour of the employee, this assumption may seem well-founded (Pettinger, 2000; Smith, 1999). Ruling out workers involvement on the farm is not possible, especially in Africa where mechanization is low. Therefore, a sub-discipline of engineering, embracing human factors (termed ergonomics), considers the interaction between the human, machine, and their work environment to be of the greatest importance in causing and preventing injury (Menendez et al, 2012; Tayyari & Smith, 1997; Roughton, 1996).

The discipline of human factors/ergonomics has gained prominence as a way to reduce occupational injuries in numerous settings. Ergonomic (or the natural law of work) is the study of the human-machine interface or the science of designing the workplace to fit the employee, and thus reducing the potential for excess energy exchange between the person and their work environment. Guidelines developed by human factor researchers were originally concerned with increasing human performance or efficiency, with an increase in safety considered a by-product (Grether, 1975). Human factors research now focuses on productivity, cumulative trauma disorders (including back strain), work spaces, workload, workplace layout, automation, and other physical factors (including temperature, noise, vibration, illumination) that affect workers' safety and health (Mittal, Apoorva, & Ramakrishnan, 2008; Kroemer, & Grandjean, 1997; Tayyari & Smith, 1997; Roughton, 1996).

As an occupational safety intervention, human factor programmes have been quite successful, with an estimated average reduction of 52% in occupational injuries (Guastello, 1993). However, human behaviour plays a major role in every safety-related process. It is estimate that 98% of all injuries are preventable, with 88% caused by at-risk behaviours of employees and 10% originating from the hazardous mechanical or physical conditions of the workplace (Pettinger, 2000). Thus, human factor programmes and engineering modifications have made an impact on the 10% of the hazards in the workplace. However, the remaining 88% of the at-risk behaviours are largely not being tackled. In other words, engineering and human factors interventions can produce a safer workplace, but "it is difficult to provide a safe work environment solely through safety engineering" (Hoyos & Ruppert, 1995, p. 107). There is therefore, the need for intense safety education and training.

Education/training

A common method to encourage safe work-related behaviour is for organizations to create or purchase an education and/or training programmes (Jewell, 1998; McAfee & Winn, 1989). In one survey, 96% of respondents indicated that they offered safety training, while another questionnaire found that 46% provided some form of safety training as part of their regular occupational safety efforts (McAfee & Winn, 1989). Furthermore, a 1996 survey of over 1200 readers of Industrial Safety and Hygiene News revealed industrial education and training in safety to be a top priority (Johnson, 1996).

Educational safety programmes focus on increasing peoples' knowledge by giving them a background on theories, principles and techniques for improving their future problem-solving abilities. Geller (1996) stresses the need for safety-related processes to begin with theory and build from solid psychological principles, and emphasizes the importance of training. Training compliments education by providing employees opportunities to apply the knowledge provided by the education. Thus, the purpose of an education/training procedure "is to provide an environment for the acquisition of attitudes, knowledge or skills, so that newly acquired behaviours may be transferred to the job setting" (Goldstein, 1975, p. 97). A successful education/training programme can impact on workers' safety by giving them the tools and knowledge to use when faced with a novel emergency on or off the job. For example, while it may be easy to educate farmers on the need to use protective equipment (Bateman, 2010), it will take practical training, provision of equipment and monitoring to ensure that the knowledge acquired is practised on the farm.

Viscusi, (1983) hypothesizes an alternate motivation for occupational safety and health education/training. He examined the motivation behind adopting various types of education/training programmes and criticized the content of such programmes. Although employers never provide prospective employees the average annual death risk or chance of acquiring an injury, when workers begin a job they have some general idea of the risks they face. However, once they gain experience on the job, their risk perception changes. From a sample of 6,000 employees, Viscusi (1983) found that when workers' risk perceptions increase, their propensity to quit also increases by 35%. Since hiring new employees is costly (due to retraining and loss of experience), the content of education/training programmes "is not intended to enable workers to assess the risk more accurately but it is directed at lowering workers' assessment of the risk" (Bromley & Segerson, 1992, p. 197; Viscusi, 1983, p. 71). Consequently, the information given to employees in education/training sessions reduces the perceived risk of their job and avoids costly turnover (Bromley & Segerson, 1992). However, in the case of the area and target population of this study where most of the farmers work on their own farms, this assertion may not be entirely so.

Additionally, results of education/training efforts have been inconclusive, since intervention research seldom solely relies on education/training alone (Petersen, 1996). Due to inconclusive findings, occupational safety research needs to address the longer-term benefit of educational/training programmes and how these approaches can be combined with others to accelerate behaviour change (Institute of Medicine, 1988). Additional research is also required to identify the conditions under which employees are most likely to participate willingly in the development and implementation of methods to increase the occurrence of safe work behaviours among themselves and others. Finally, if education and training methodologies are combined (Geller, 1996), implemented in good faith and evaluated systematically to assess the transfer of knowledge (Enos, Kehrhahn & Bell, 2003), education/training programmes have great potential to make a difference in the safety and health of many employees.

Enforcement

There are two types of enforcement in occupational safety and health: enforcement within the industry referred to as discipline and enforcement by governmental agencies referred to as compliance. Within an industry, a company imposes safety rules or policy and procedures as guidelines for employees to follow. This form of enforcement is common in the agricultural industry. For example, there are several regulations regarding the use of pesticides, fertilizers, machines and several others on the farm (Bateman, 2010) When employees do not follow these guidelines, there is the possibility of disciplinary action (e.g., verbal warning, written warning, time off work, job termination).

Discipline

One of the most common techniques used to reduce at-risk behaviour within the workplace is to introduce stricter rules, increase supervision of the target behaviour or increase the number of reprimands given out for failure to comply with the companies' policy and procedures (Geller, 1998b, 1996;

McSween, 1995; Harms-Ringdahl, 1993). The introduction of new safety rules followed by discipline for not following those rules can be an effective intervention if delivered correctly. However, discipline is seldom implemented correctly and has several other negative effects (e.g., escape behaviour, aggression, apathy, counter control). In an industrial setting, there are even more barriers in administering discipline (or punishment) in an effective manner.

To have the greatest impact, discipline needs to be given in close temporal proximity to the at-risk behaviour. It also needs to be given every time the at-risk behaviour occurs. Also, the negative consequences should be sizable (as in severe and aversive) to the employee (Geller, 1996; Harms-Ringdahl, 1993). In the workplace, it is very difficult to give discipline in a soon, certain, and sizable manner. The threat of discipline can suppress behaviour, but typically only while the supervisor is observing the employee or until the disciplinary "phase" passes.

Unlike the industrial settings, the administration of disciplinary measures (self-discipline) on cocoa farms where the farmers themselves work on their farms with little or no supervision at the time of work or where labourers are involved and are their own supervisors may pose a great challenge to disciplinary issues. Thus, where the farmer himself is involved, no disciplinary measure may be instituted. In this regard, studies have been conducted on the use of personal protective equipment among farm workers.

Protective equipment such as goggles is recommended for activities such as spraying of chemicals, cutting and grinding on the farm that may predispose farmers to ocular injuries. The use of such equipment has generally been successful in preventing injuries. However, there have been situations where injuries have occurred while farmers were wearing safety glasses/goggles (Sprince, et al, 2008). Although the use of appropriate eye protective equipment is a recognized strategy to prevent eye injury, farmers report infrequent use of goggles or safety glasses (CDCP, 1995).

The Centre for Disease Control and Prevention, (1995), reported that 50% of 491 farmworkers never used eye protection for high-risk activities such as spraying pesticides. In a study of eye safety practices of migrant farmworkers, fewer than 1 in 10 wore eye protection at work (Quandt et al, 2008). In a related study of Latino farmworkers, 98.4% reported not wearing glasses/goggles when working in the fields. Reasons included lack of glasses and interference with field task (Quandt et al, 2001). In a study by Okoye and Umeh, (2000), 16.7% out of 646 used protective eye cover affirming this trend of low use of goggles among industrial workers. This was further affirmed in an industrial study which revealed only 7.2% use of protective glasses (Omoti, Edema, Akinsola & Aigbotsua, 2009). However, despite this low trend, eye examination of 392 participants showed that 89.7% of the farmers claimed to protect themselves from the sun during work: 83.7% wore a head protection, 71.0% wore sunglasses, and 54.4% usually worked in the shade (Schmid-Kubista et al, 2010). This is in sharp contrast to the low use of goggles and other ocular protection use as widely reported in literature.

Goggle use has been closely linked with the perception of risk of ocular injuries. In a survey of 1554 cocoa farmers in six cocoa producing districts of Ghana, the use of personal protection equipment correlated with risk perception especially for children involve in pesticide spraying (Asuming-

Brempong et al, 2006). In the study all the 13 children who perceived chemicals as health hazard used personal protection equipment. This was quite significant because it points out that increasing awareness of the health risk of farming activity will increase the use of personal protective equipments. The reported low use of personal protection equipment among farmers has been found to be due to lack of awareness of various risks associated with farm activities, indiscipline and low level of compliance (Diamantopoulou, 2003).

Pirani and Reynolds (1976; cited in Pettinger, 2000) compared the effect of common safety interventions (i.e., safety posters, safety films, fear posters, discussion, role-playing, and discipline) on the use of personal protective equipment (i.e., hard hat, gloves, safety glasses, and proper footwear). Discipline did show a moderate increase across all types of personal protective equipment (39%), but achieved the worst long-term effects, falling by an average of 7% below the original baseline periods. Whereas self - discipline can be an effective means of altering employees' safety behaviour, it does not seem probable that it can be carried out in an effective manner periodic unless training is conducted (Pettinger, 2000; Geller, 1996).

Governmental influence and policies

The most effective interventions for improving occupational safety, and health appeared to be implementation of top-down governmental regulations. As Heinrich, et al. (1980) point out, "legislation is one process by which government affects safety and judicial process is another. Together they change the impetus for safety or create a new impetus and the impetus is defined as "time, money and effort" (Heinrich, et al., 1980 p.361). Thus, regulations can positively make it cost-effective for employers to attend to working conditions that adversely affect employees' health and safety, though they may not always be in the best interest of the employee (Geigle, 2000; Pettinger, 2000).

Governmental agencies establish laws or regulations for organizations to follow. When employers do not comply, they receive citations with accompanying fines. For occupational safety and health, it is very common for employees and employers to be held accountable for their actions (Geller, 1998b). There is however, a shortfall since most legislations on occupational health and safety are made for establishments. This raises a considerable debate, regarding the effectiveness of discipline and compliance as a motivating intervention for safe behaviour (Geller, 1998b, 1996; Petersen, 1996). For example, monitoring of adherence to safety guidelines within the farming industry is poorly done or not enforced in our setting since most of the farms are owned by the local people themselves. Monitoring is usually better where there are hired workers with injury implications for the employer. (Mitchell, Blitzstein, Gordon & Mazo, 2003)

Occupational diseases

According to the 2002 Protocol on Occupational Safety and Health Convention, the term "occupational disease" covers any disease contracted as a result of an exposure to risk factors arising from work activity (ILO, 2009). The diagnosis and identification of causes and the subsequent control of risk to reduce occupational disease are complex and there is the recognition that the challenges of preventing occupationally induced diseases are delicate (ILO, 2009). The period between exposure and diagnosis of diseases can be as long as 30 years (ILO, 2009; Pantry, 1995). Therefore, resources would have to be committed into studies of occupational diseases in developing countries to aid appropriate interventions since the manner in which employees are hurt varies dramatically, and prevention strategies need to address a myriad of environmental, behavioural and personal factors that contribute to each injury (Geller, 1996)

Ocular conditions among farmers

Farmworkers have significant levels of vision problems (Arcury & Quandt, 2007; Quandt et al, 2001) and high risk of injury (Sprince et al, 2008; Tesfaye & Bejiga, 2008). A survey of 197 Latino farmworkers in North Carolina showed that 40% reported eye pain and redness after working all day in the field (Quandt et al, 2001). In a related study, fair or poor eyesight was reported by 21.3%, but only 5.1% reported wearing glasses or contact lenses and 20% reported each of several eye symptoms (Quandt et al, 2008).

Further, in a survey of 1554 cocoa farmers in six cocoa producing districts of Ghana, an estimated 6% of the participants reported eye irritation from the application of pesticides and 4% reported eye irritation from the application of fertilizer (Asuming-Brempong et al, 2006).

An epidemiological screening to examine possible ultraviolet-induced ocular changes and pathologies in Austrian farmers confirmed numerous studies that seem to suggest that farmers are exposed to hazards that predispose them to some ocular conditions (Schmid-Kubista et al, 2010).

The kinds of farm activities engaged in by farmers have a bearing on the types of ocular conditions they suffer from. Farmers are at risk of eye injury from a number of activities such as weeding, burning, pruning, spraying of chemicals, grinding and cutting metal, welding, drilling and fertilizer application for which eye hazards may not have been anticipated. Farmers involved in fieldwork also risk traumatic eye injuries from plants, tools, and equipment. In a study by Sprince et al (2008), farm activities of grinding or cutting metal accounted for 27.5% of the eye injuries, welding 7.5% and drilling for 5%. The other eye injuries were related to diverse farm activities such as injury caused by an animals and chemical exposure. Foreign body in the eye was the most frequent type of eye injury, accounting for 80% of eye injuries with over 60% from metallic foreign bodies. Although none of the injuries required hospitalization, 25% resulted in the farmer missing 1 to 5 days of work. At least three injuries occurred while farmers were wearing safety glasses/goggles. .

Farmers are mostly exposed to some specific hazards which are associated with ocular conditions. Notable among these are agricultural chemicals, wind, dust, allergens, and ultraviolet (UV) light (Villarejo & Baron, 1999). Working outdoors during daylight hours also exposes one to UV-A and UV-B rays resulting, in the short term, in photokeratitis, eye sensitivity, and eye irritation, and in the long-term, in pterygia, pingueculae, cataracts, and retinal damage partly responsible for band keratopathy (Omoti et al, 2009; Taylor et al, 2006; Quandt et al, 2001; Threlfall & English, 1999).

Residual effects of the chemicals used on cocoa farms also constitute health hazards. According to Atu (1990, cited in Adeogun and Agbongiarhuoyi, 2009), pesticides are toxic and can have serious health hazards to human beings. To guard against these dangerous effects, Adeogun and Agbongiarhuoyi, (2009), recommended precautionary measures in chemical application. These include wearing of nose shield to avoid inhalation; putting on of protective clothing, such as rubber gloves and boots; refraining from smoking, eating and drinking; covering of food and water to avoid contamination. Several studies have reported eye injuries from chemical causes. (Sprince et al, 2008; Mittal et al, 2008; Retzlaff & Hopewell, 1996; CDCP, 1995)

Occupational Health and Safety in Ghana

Although, there are legislations on occupational health and safety in Ghana, they apply only to mining (The Mining Regulations Legislative Instrument, L.I. 665 of 1970 and factory related workers (Factories, Offices and Shops Act, Act 328 of 1970. Other laws which have implications for occupational health and safety are Workmen's Compensation Law (1987), small scale Gold Mining law, Act 218 of 1989, the Mining and Mineral Act, Act 703 of 2006 and the Environmental Protection Act, Act 490 of 1994. Section XV of the Labour Act 651, 2003, covers occupational safety, health and environment. This is based on the tenets of ILO Conventions 155 and 161 which the country has not yet ratified (Wilson et al., 2006; Clarke, 2005)

There are several shortcomings of the legal provisions on OHS. The Factories' Act and Mining Regulations which have for years provided guidance for implementation are very limited in coverage. While the Factories Act caters for factories, offices, shops, ports and construction, the mining regulations cater only for the mining sector. Industries in the informal sector such as agriculture are not specifically covered.

In 2001, Ghana ratified ILO Convention 184 on safety and health in agriculture. The ratification of this convention should have marked a turning point for safety and health in agriculture but that has not been the case since implementation of the convention has not been comprehensive. The absence of any direct regulatory body on farm practices compounds the challenges in reporting and keeping track of farm related ocular diseases and injuries. The predominance of subsistent or small household cocoa farming with individual ownership limits the extent to which policies can apply as compared to other countries like the United States of America and the United Kingdom where farms are owned by identifiable companies. The implication is that though individual owners of cocoa farms may hire labourers, they do not take particular interest in the safety of their workers with particular reference to ocular safety.

Conceptual framework

Work-related eye diseases and injuries among farmers are as a result of the interactions between the physical and psychosocial hazards of work and the biological components of the individuals involved. Recognizing these interactions, a number of models such as the healthy workplace model, Stress traumatic accident model (Burton, 2010) and the occupational safety and health in the workplace model of the European Agency's for safety and health at work (2003) have emerged to explain the phenomenon.

The Occupational Safety and Health in the Workplace model of the European Agency's for safety and health at work was chosen due to its applicability to the settings of cocoa farmers in Ghana. This was due to the fact that the model recognises the traditional set up of cocoa farms and the employment relationships such as the use of labourers. Also cocoa farmers are exposed to all the hazards mentioned in the model such as physical, biological, chemical and ergonomic. Finally, occupational health and safety practice which is a component of the health care system in Ghana is also acknowledged by the model. Despite these strengths, the model does not take into consideration the fact that in our Ghanaian setting; most of the cocoa farms are owned by the farmers and therefore there are no complex employment relationships as it happens in Europe.

According to the model, factors within and outside the workplace can influence the health and well-being of workers. These include physical working conditions, the occupational safety and health system, life outside work and social policy. The model has three main components: work organization, working conditions and occupational health and safety systems. These components interact to influence vision, safety and health outcomes of farmers.

Work organization in the model recognizes modern and traditional methods of farming. Each of these methods may have different levels of predisposition to injuries and diseases to farmers. These farmers may be full-time workers or part-time workers with different working conditions which may impact on their health. The model also recognizes that working time flexibility or long hours and other stressors may influence health outcomes in farm organizations

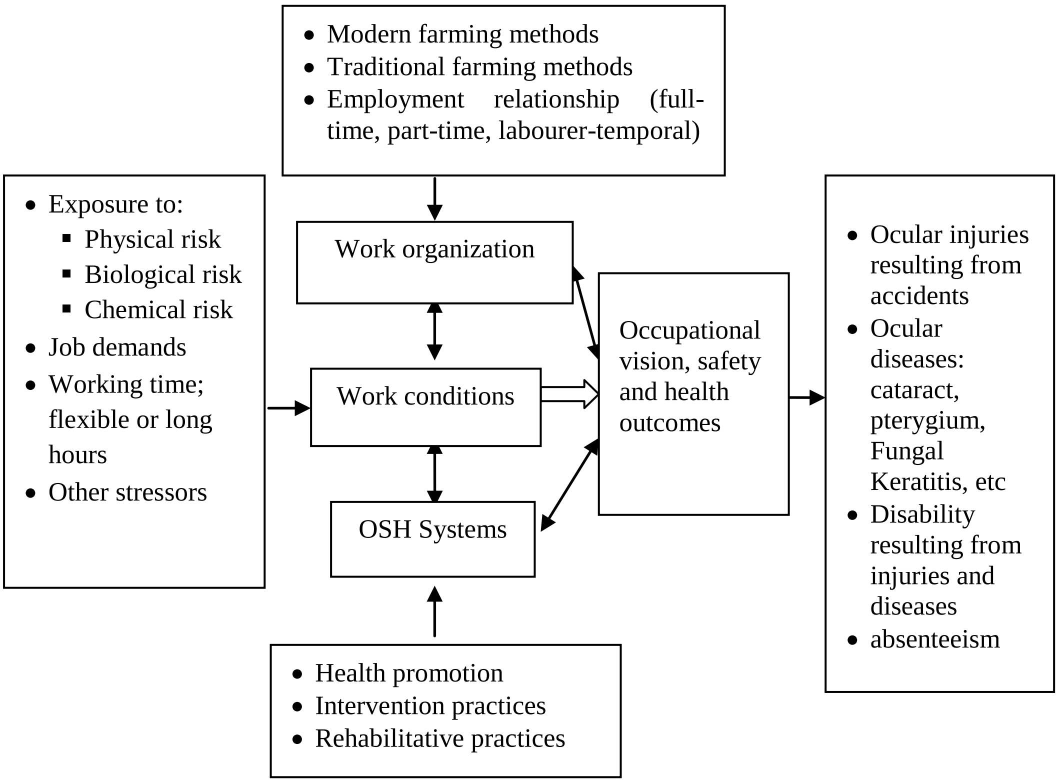

Figure 1: Occupational Safety and Health in the Workplace Model

Source: European Agency for Safety and health at work, 2003

Working conditions in the model refers to differences in exposures to physical, chemical and biological risks. These risks and hazards on the farm may come from a variety of activities including spraying with agrochemicals and pesticides, weeding, cutting and plucking of pods, pricks from trees, bites from animals and insects falling into the eye.

Occupational safety and health systems such as health promotion, interventional practices, the use of protective eye wears and rehabilitative practices, and occupational health policies and their implementation form the third component of the model.

The three main components interact to produce different health and visual outcomes which may include pterygium, cataract, pinguecula, keratitis among others. The model recognizes occupational systems, health and policies as fundamental element. The model recognizes that these systems will influence the working conditions within work organizations and subsequently the health outcome of workers.

Again, the model recognizes that the type of work organization and employment relationship - degree of freedom, time spent on farms and level of exposure to hazards and risk will have different influence on the health (visual) outcome of farmers.

The entire model takes into account individual biological differences and its influence on health outcomes. However, individual differences (biologic) and the influence they have on the other components of the model will be difficult to achieve in this study. Despite this, the model will apply to the settings of cocoa farmers.

The three key levels of providing health care in the model are health promotion, prevention and curative. Health promotion seeks to ensure that activities and life style are such that undesired visual health outcomes will not occur in a population. Prevention deals with attempts to ensure that an individual or a group is not affected by a problem. Primary prevention and patient counselling on proper eye protection are essential because over 90 percent of injuries can be avoided with the use of eye protection devices (Peate, 2007). Curative measures entail seeking treatment after undesired visual condition has occurred.

Conclusion

It is known that occupational factors contribute to the overall burden of disease globally, but it is difficult to assess the extent of the problem for a variety of reasons (Drummond, 2007). Occupational diseases are multifactorial in nature, with workplace exposure representing one risk factor. This makes developing a system for collecting data and reporting cases a challenge from the start, as cases are difficult to define. Leigh et al (1999) reported that even advanced established market economies have fragmented reporting systems. While experts agree that enhanced data collection for occupational diseases should be a public health priority, it is generally agreed that no single data source, or even solution, has been identified that can provide an accurate picture of the extent of the problem in any country. In most countries, a range of data sources is used to estimate the burden of occupational disease, such as death records, hospital records, workers' compensation claims, cancer registries, workplace records, surveys and sentinel reports (Driscoll, Takala, Steenland, Corvalan, & Fingerhut, 2005; Leigh et al, 1999).

The challenges to case identification for occupational disease, and consequently data collation and classification, are well documented (Driscoll et al, 2005; Kendall, 2005; ILO, 2002; Herbert & Landrigan, 2000; Leigh et al, 1999) and are summarised here:

• Definitional issues: agreement on the meaning of occupational or work relatedness is not always straightforward. It requires agreement on what is meant by work and work exposure and the required connection between the exposure and the disease in question. Distinctions can be made between whether work caused a disease, contributed to its development or exacerbated a pre-existing condition.

• Exposure: The mere presence of a hazardous substance or activity in the workplace does not mean that workers were necessarily exposed. There is no risk unless the worker is actually exposed to the agent.

• Latency period: exposure to agents that can cause chronic occupational diseases, such as cancer, may occur years or decades before the disease manifests and is diagnosed. Exposure may not have been recognised, acknowledged or recorded.

• Record keeping: while modern legislation requires keeping detailed records of many hazardous agents, exposed personnel, health surveillance and monitoring, this is a relatively recent development in the context of the typically long delay between exposure and manifestation of many diseases. Even where records exist, they can be incomplete and/or inaccurate.

• Multi-causation: It is well accepted that a single factor or agent does not necessarily cause most occupational diseases. A person exposed to hazards in the workplace may also be exposed to hazards in other environments, and this may be related to lifestyle.

• Medical history: medical history taking does not always include a detailed occupational history. Unless the physician has knowledge of both the agents that can cause occupational disease and of the nature of work that can expose employees to the risk, vital information or links can be missed. The histology and clinical presentation of a work-related disease are no different to the disease due to another cause.

• Data collection issues: different systems collect data for different purposes and with all occupational diseases there are difficulties with primary reporting, collating and classifying.

• Establishing a case of occupational disease in an individual can be difficult.

• Liability and responsibility for the disease can be difficult to establish. The distinction between occupational diseases and work-related ill-health is a subject of much debate and ILO defines it as follows:

> "Occupational diseases are those that are included in international or national lists, and are usually compensable by national workers' compensation schemes and are recordable under reporting systems (for example, silicosis and diseases caused by many chemical agents). For occupational diseases, work is considered the main cause of the disease. Work-related diseases are those where work is one of several components contributing to the disease. Such diseases are compensated only in very few cases and in very few countries." (ILO, 2005; p.11).

Data on occupational injuries in Ghana is relatively available (Mock, Adjei, Acheampong, Deroo & Simpson, 2005). However, little records exist on occupational diseases, work related diseases and occupational injury especially among agricultural workers (Alfers, 2010). It is in this light that this study among farmers is being undertaken.

CHAPTER THREE

METHODOLOGY

Introduction

The method of data collection takes into consideration the study area, the type of study and the research design that was employed for the study, the target population and the sampling procedure used for the study. It explains in systematic order what the researcher did to obtain answers to achieve the objectives of the study. The chapter considers among other things how the target population for the study was selected and the rationale for the selection procedure. Instruments that were used have also been indicated and the procedures for data collection and analysis of the data collected from the field.

Study area

The study was undertaken at Mfuom, a farming community in the Twifo-Hemang-Lower Denkyira District in the Central Region of Ghana with Twifo Praso as the capital. The population of the town was 1,910 in 2000 and was estimated to be 2,500 in 2009 (Ghana Statistical Service, 2010). The settlement is located about 40 kilometres north of Cape Coast, the regional capital. The predominant industry in the region is agriculture (52.3%), followed by manufacturing (10.5%).

In the Twifo- Hemang-Lower Denkyira district, agriculture employs more than two thirds of the work force (Ghana Statistical Service, 2010) and it is one of the three main cocoa producing districts in the region, the other two being Assin and Upper Denkyira Districts (Ghana Statistical Service, 2010). The concentration of cocoa production in the Twifo-Hemang Lower Denkyira district and the proximity of the town to the University of Cape Coast informed the choice of Mfuom. A map of Ghana showing the geographical location of Mfuom is as shown in Figure 2.

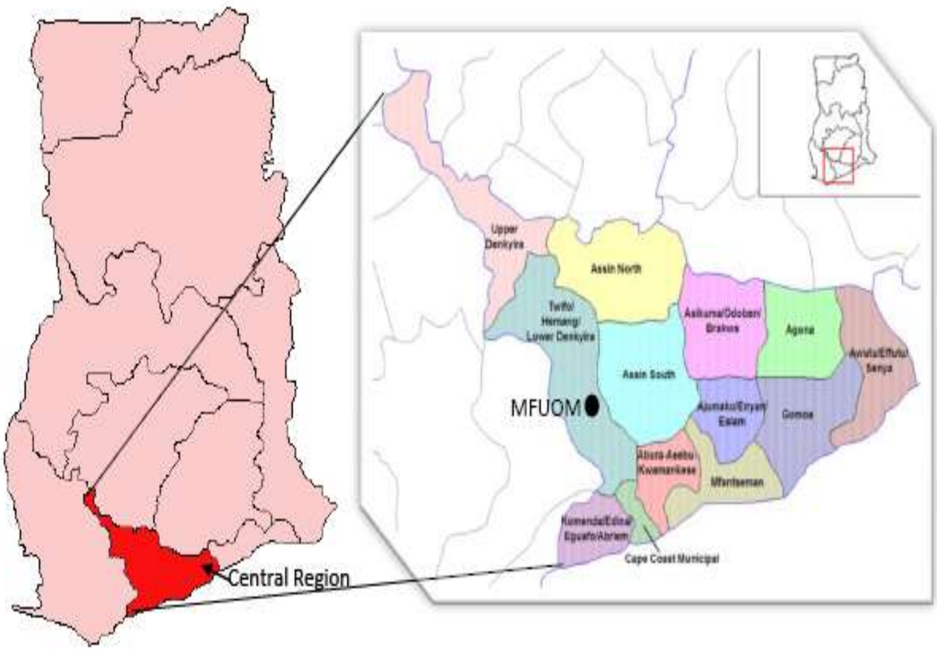

Figure 2: Map of Ghana showing the location of Mfuom

Source: Ghana Districts, 2006.

In 2011, there were four hospitals and six clinics in the district. As of 2011 (the time of this survey), there was no hospital or clinic at Mfuom, only traditional health facilities could be traced.

Mfuom has two primary and two Junior High Schools. The only Senior High School within the vicinity is at Jukwa about 20km away. This may have implications for the literacy rate of the township. It has been suggested by Adeogun & Agbongiarhuoyi, (2009) that educated farmers are more likely to read labels of chemicals and adhere to regulations regarding their usage as well as adhere to other safety practices on the farm.

Field Preparation

A meeting with the traditional leaders of Mfuom as well as leaders of cocoa farmers in the community was first held to discuss the modalities for the study. After briefing the opinion leaders of the town, one of them, who heads the cocoa purchasing unit in the town was put in charge of compiling the list of cocoa farmers in the community. The community information centre was used to sensitize the cocoa farmers to avail themselves for the study. The chief cocoa farmer in the area was also put in charge of informing cocoa farmers who lived in cottages on farms around the community to enable them to participate in the project. Three different meetings were held later with the farmers who were identified to explain the procedure for the study and to seek their consent. Field workers were trained for three days on administration of questionnaires. A pre-test study was conducted on 10 cocoa farmers at Nyinsin near Jukwa.

Study design

A community based cross-sectional survey was carried out within the Mfuom community. A structured questionnaire was administered to the farmers to collect demographic data of participants and sought information about farming related issues and finally, a comprehensive eye examination was carried to ascertain the type and frequency of ocular and visual conditions among the farmers.

Inclusion criteria

The study adopted the definition of a cocoa farmer by the Ghana Cocoa Board. According to the Board, a cocoa farmer could be a "landowner farmer", "farm owner" or "producer". The farm owners are those who register with Cocoa Board and hold 'passbooks'. Some farm owners are absentee farmers who are not directly involved with cocoa farming activities. Most of the absentee landowner farmers live in townships in the cocoa growing areas or in big cities in other regions and may visit their farms occasionally. The second category of cocoa farmers who are directly involved with routine cocoa farming activities are called by various names including sharecroppers, caretakers or tenant farmers. They do not own the land they work on but enter into special relationships with land owners. These may include wages for daily living or future prospects of owning part of the cocoa farm.

A cocoa farmer for the purpose of this study is somebody (male or female) whose major occupation is cocoa farming and or who works on a cocoa farm for a living throughout the year or major periods of the year. They may be land owners, farm owners or producers. The survey included such cocoa farmers who are eighteen (18) years or above and have worked on a cocoa farm for a period of three years (the gestation period of a cocoa tree) or more. Farmers who are not actively engaged in activities on the farm but only make decisions on sales and purchases and other planning roles were excluded in the analysis because they did not meet the qualification to be called cocoa farmers as adopted for the study. In addition, persons who had retired or were not active for whatever reason were excluded from the study.

Selection of respondents

A census was conducted for all cocoa farmers who were enlisted in the community and this gave 230 farmers. Due to the small number, they were all encouraged to enrol for the study. A total of 205 farmers turned up for the study and were screened. Out of the total number screened, 185, representing 80.4%, qualified for inclusion.

Verification process

Cocoa farmers who participated in the study were asked to produce their passbooks from the cocoa marketing companies they dealt with. These books contained the number of cocoa bags they produce during each cocoa season. However, some farmers could not produced passbooks and these were mainly farmers who were either caretakers or those who worked on family cocoa farms (property). Such people were confirmed as cocoa farmers by the leaders of the "Cocoa Abrabopa" association (a group of cocoa farmers who meet from time to time to discuss matters of concern) since Mfuom is a small community.

Data collection

The first activity was the seeking of informed consent (appendix 1) from the participants followed by administration of structured questionnaires (appendix 6) which collected data on demographic variables, working conditions, type of ownership of farm, use of agrochemicals, personal report on ocular health, perception about eye diseases in the community, use of eye protection, and use of other personal protective equipment on the farm. The questionnaire further captured issues on ocular injuries and other injuries experienced on the farm and trainings received on how to protect the eye.

Questions were asked on what farmers perceive as stressors relating to their work, the extent to which these stressors affect their work, types of chemicals used in spraying their farms, methods used in spraying and frequency of application of chemicals, factors considered before spraying and challenges farmers faced in purchasing chemicals.

Under physical risk, farmers were asked about the type of activities they engaged in on the farm and whether they had experienced any eye and any other injuries in the course of working on their farms, the severity of the injury and type of treatment sought, if they did seek help.

Finally, participants were asked about their involvement in any eye safety practices, farm practices relating to eyes, their knowledge of the existence of any programme relating to their ocular health, and whether there has been any occupational health promotion activity in their community.

The questionnaire was administered by the principal researcher with assistance from fourth year Doctor of Optometry students at the University of Cape Coast.

Following administration of the questionnaire, a comprehensive eye examination was carried out on each participant and the right diagnosis made. The eye examination covered the following procedures:

Comprehensive history: A comprehensive case history including chief complaint if any, oculo-visual history, medical history as well as family history and cases of allergies, if any, were recorded.

Visual acuity: The distance visual acuity (VA) was measured using the Snellen E chart (illiterate) at a testing distance of 6m. Participants first read the chart with the right eye and then the left. For participants who wore glasses, their VA was taken with their glasses on (habitual). Pinhole acuity was taken for patients who read 6/9 line or worse to confirm a refractive error. Near visual acuity was also measured using the near visual acuity charts for each participant at a distance of 40 cm.

Binocular vision test: The cover test was performed to detect any phoria or tropia with a hand held occludder.

External eye examination: The ocular adnexae was examined with the aid of a pen light (hand held). The eyelids were examined for defects such as entropion, ectropion, trichiasis, ptosis, defective eyelid closure, blepharitis, etc. The cornea and conjunctiva were also examined. Pupillary function tests including direct, consensual and near puppillary tests were performed.

Internal eye examination: The posterior segments of the eye were examined for any abnormality with the aid of a monocular direct ophthalmoscope (hand held).

Intra-ocular pressure (IOP) measurement: A handheld Perkins tonometer was used to determine the intraocular pressure of patients who showed signs of glaucoma (cup-disc ratio of 0.5 and above)

Refraction: Both objective and subjective refraction were performed for all participants.

From these procedures, diagnosis were made and appropriate intervention such as medication, glasses or referrals for further examination were made. Doctors of Optometry (lecturers) and clinical students from the

Optometry Department of the University of Cape Coast assisted in the data collection. The role of the clinical students was limited to preliminary examination (case history, visual acuity, cover test, near point of convergence and pupillary examination).

Three hundred and seventy eyes of 185 persons were assessed for visual problems using the World Health Organization’s disability scale (WHO, 1973). This is the international standard and most reliable diagnostic classification for visual impairment. The disability scale grades “impairment” rather than “disability” although the word disability is the standard operational terminology for “impairment” in all general epidemiological and clinical use.

In this study, classification of visual impairment was based on visual acuity and is as provided by the International Statistical Classification of Diseases -10 (Revised 2010): normal vision, visual impairment (moderate and severe) and blindness. According to the classification, normal vision is defined as visual acuity (VA) of 6/18 or better in the worse eye, visual impairment is also defined as a visual acuity of < 6/18 to 6/60, while blindness is defined as visual acuity of <3/60 in the better eye (Pascolini & Mariotti, 2010). The following classification were also used to describe participants self reported vision; very good vision (6/4 to 6/6), good vision (>6/6 to 6/18), poor vision (>6/18 to 6/60) and very poor vision (>6/60). These definitions were applied in categorizing all measured habitual visual acuity of participants. Pinhole acuity was assessed in eyes with presenting VA less than 6/9. All subjects who read 6/4 in the Snellen letter chart had their VA assessed again with a +1.50 lens. The aim of this was to identify latent hyperopia. Previous eye examination and spectacle prescription were ascertained. Static retinoscopy without cycloplegia but with a fogging technique shown to have comparable results to cycloplegic refraction was performed on all participants as a starting point for subjective refraction. Refractive error was defined as measured spherical equivalent of +/-1.00D for hyperopia or myopia and -0.5D for astigmatism in the better eye.

Other pathological condition such as cataract was defined as a clouding of the lens of the eye which impedes the passage of light. Glaucoma was also defined as the presence of a pale cup disc ratio of 0.5 or above and an intraocular pressure of more than 20mmHg using a Perkins tonometer. Injury in this study was defined as any damage to any of the ocular tissues.

Ethical consideration

Farmers were educated on the nature, purpose and relevance of the study prior to data collection. Informed consent forms were signed or thumb printed by farmers to indicate their willingness to participate in the study. Throughout the study farmers were entitled to their privacy from the point of taking case history to the final destination of examination and diagnosis. The screening forms were coded to avoid having to use names and thereby compromising the confidentiality of the medical records of participants. As a way of enhancing confidentiality, only professional eyecare practitioners were allowed to make final diagnosis and discuss findings with participants. Eye medications and spectacles were provided to farmers who need them. Participants were also entitled to alternative forms of treatment if they did not find what was being provided adequate or if they needed further examination and continuous medication. As a result, some farmers were referred to some tertiary hospitals for further assessment. Farmers who needed further medical interventions were referred to appropriate centers to receive care. Additionally, participants who enrolled were entitled to withdraw at any point of the study if they found it necessary to do so.

Data Analysis

The Statistical Package for Social Sciences (SPSS) version 16 was used to analyze the data. Descriptive statistics were calculated for sample demographic characteristics, responses to eye symptoms, diseases and injury items. Bivariate analyses of ocular injury and diseases and other responses with demographic variables and farm characteristics were carried out. Logistic regression analysis was used to compute the odds of injury and relative risk of disease exposure with demographic variables, supported by literature. Consequently, relevant tables, charts and graphs were used to display the results.

Limitation

Injury and use of protective eyewear data were obtained by self-reports, and the respondents may have exaggerated these responses. The diagnosis of glaucoma in this study was based on two instead of three main signs. This may have influenced the outcome of prevalence of glaucoma among the cocoa farmers.

Strength

Undertaking a comprehensive eye examination is a major strength of this study as most agricultural health studies have concentrated either on hospital records or self reported eye injuries and symptoms through questionnaires (Quandt et al, 2001). Further, self-reported visual status was confirmed with an objective visual acuity measurement during the examination procedure.

Conclusion

The research methodology employed in this study is consistent with that used in other studies discussed in the review of literature section of this thesis. However, the protocol used in the data collection was designed to reduce the limitations reported in these studies. As a result, the data collected was an improvement on what has been reported in literature about the ocular health of agricultural workers.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter presents results from the surveys: using questionnaire and comprehensive eye examination. It covers the background characteristics of the cocoa farmers interviewed, their perceptions on their ocular status, their eye diseases and outbreaks of eye diseases in their community as well as ocular health seeking behaviour patterns, reported injury and use of personal protective equipment on the farm. The second part is the results from the eye examination of all participants.

Socio-demographic characteristics of cocoa farmers

The data on socio-demographic characteristics included variables such as age, sex, marital status, level of education, region of origin and family size. The total number of respondents for this study was 185 cocoa farmers out of which 125 (67.6%) were males and 60 (32.4%) were females. The male dominance of respondents in cocoa farming, (two out of every three) is consistent with the literature (Hill, 1963; Quandt et al, 2001) in that men are given priority in the purchase of farm land for cocoa farming and other cash crops while women dominate in the production of food crops.

As shown in Table 1, the ages of the respondents ranged between 19 and 70 years with a mean age of 52.7 (SD= 11.70). As observed elsewhere, the industry is dominated by older people (Asuming-Brempong et al, 2006; Teal, Zeitlin & Maamah, 2006, Vigneri, 2007) with about 87% between 40 and 79 years. As observed, only about four percent of respondents were under 30years (2.4% males and 6.7% females).

Educational attainment is another important demographic variable which has implications for choice of occupation and ability to use information. About half of the population, (48.6%) had attained Middle School or Junior Secondary/High School education (Table 1). Fifteen percent had had Secondary School education and seven percent of the farmers had attained Tertiary education. Among the farmers, 14% had no formal education, but the females without formal education were twice that of the males. Furthermore, the proportion of females obtaining tertiary (1.7%), education was markedly lower than that of their male counterparts (9.6%).

Table 1 also indicates that nearly two out of three (61.0%) of the respondents were married, with (15.7%) and (10.3%) living together and widowed respectively. The household size of respondents ranged from 1 to 15 with a mean size of 6.7. About forty-two percent of respondents were 7 – 9 people in households and about 10% were in households of 1-3 people (Table 2). The results are consistent with the fact that farmers tend to have large household sizes as family members constitute one of the main sources of labour on cocoa farms (Asuming-Brempong et al, 2006).

The study also collected data on region of origin of the cocoa farmers. This was particularly important because according to the Ghana Statistical Service, the Twifo Hemang Lower Denkyira district, where this study was conducted, is a net in-migrating area due to cocoa farming. The study found that 84.3% of cocoa farmers were from the Central Region with 72% from the district itself, 5.4% from the Volta Region and 4.9% from the

Table 1 : Background characteristics of respondents

Background Characteristics	Sex (%)		
	Male	Female	Total
	n = 125	n = 65	n = 185
Age			
< 30	2.4	6.7	3.7
30-39	6.4	15.0	9.2
40-49	25.6	21.7	24.3
50-59	29.6	35.0	31.4
60-69	23.2	21.7	22.7
70-79	12.8	0.0	8.7
Level of education			
Never attended any school	10.4	21.7	14.1
Primary	12.8	20.0	15.1
Middle/JSS/JHS	49.6	46.7	48.7
Secondary/SSS/SHS/Tec/Voc	17.6	10.0	15.1
Tertiary	9.6	1.7	7.0
Marital status			
Never married	2.4	0.0	1.6
Married	63.2	56.7	61.0
Living together	19.2	8.3	15.7
Divorced	8.8	10.0	9.2
Separated	0.8	5.0	2.2
Widowed	5.6	20.0	10.3

Table 1 continued.

Household size			
1-3	9.6	10.0	9.7
4-6	36.8	51.7	41.6
7-9	48.0	30.0	42.2
>9	5.6	8.3	6.5
Region			
Ashanti	2.4	1.7	2.2
Central	66.7	33.3	84.3
Brong Ahafo	0.0	1.7	0.5
Western	2.4	1.7	2.2
Eastern	7.2	1.7	5.4
Volta	4.8	5.0	4.9
West Africa	0.0	1.0	0.5

Source: Fieldwork, 2011

Eastern Region. There was one person from Cote' d'Ivoire. The overall inter-regional migration rate was 15.2%. The regional sex distribution (Table 5) revealed that males dominated in the inter-regional migration to the farming communities in the district.

Number of years spent in the industry, indicated in Table 2, shows that. 36.8% had spent 5 to 9 years in farming (females 46.7% and males 32.0%) and 12 percent for more than 30 years. After 5-9 years, the proportion of females engaged in cocoa farming activities decreases compared to the males.

Table 2: Farm characteristics of respondents

Farm Characteristics	Sex (%)		
	Male	Female	Total
	n =125	n = 65	n = 185
Duration of cocoa farming (years)			
<5	4.8	11.7	7.0
5-9	32.0	46.7	36.8
10-14	12.8	8.3	11.4
15-19	14.4	11.7	13.5
20-24	12.8	13.3	13.0
25-29	8.0	1.7	5.9
30+	15.2	6.7	12.4
Area under cultivation (acres)			
<5	64.0	86.7	71.4
5-9	27.2	10.0	21.6
10-14	4.0	0.0	2.7
15-19	0.8	3.3	1.6
20+	4.0	0.0	2.7

Source: Fieldwork, 2011 1 acre = 0.4 hectare

It has been reported that cocoa farm sizes in Ghana are relatively small ranging from 0.4 to 4.0 hectare with an estimated total cultivation area of about 1.45 million hectares (Anim-Kwapong & Frimpong 2004). In this study 71.4% reported cultivating less than 5 acres of cocoa farms with a mean farm size of 4.6 (SD=7.19), (Table 2). Only three percent had farms of more than 20 acres (see also Adeogun & Agbongiarhuoyi, 2009; Anim- Kwapong & Frimpong, 2004). Farmers who had cultivated more than 20 acres in this study were mainly farmers who had cut down their old cocoa trees due to disease and poor yield and had re-cultivated.

The mean bags produced was 7.8 (SD = 10.35). Nearly half of the farmers (48.1%) produced less than 5 bags of cocoa in the 2010/2011 season and 28.1% produced 5 to 9 bags and 6% produced more than 30 bags. While 13.6% of male produced more than 20 bags, only 1.7% of women produced more than 20 bags (Figure 2).

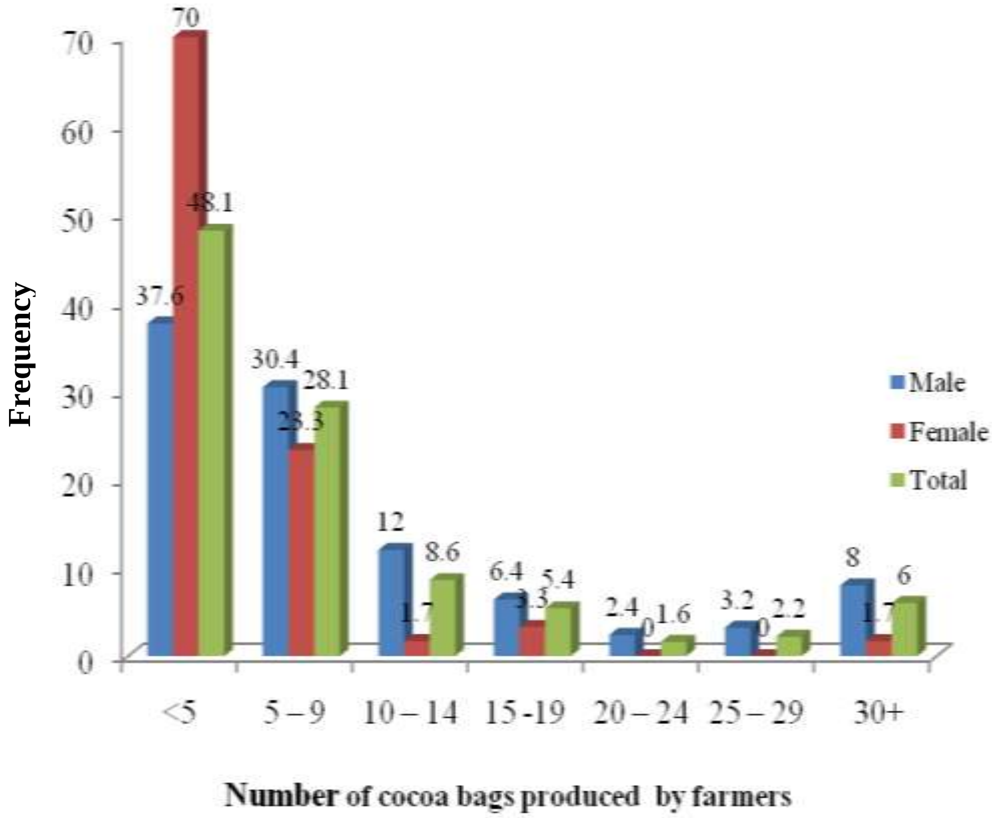

Figure 3: Bags of cocoa produced by farmers (1 bag of cocoa= 64kg)

Source: Fieldwork, 2011

The main arrangements for cocoa farming are outright ownership through purchase or use of family land, serving as a caretaker or sharecropping (Asuming-Brempong et al, 2006). The last two groups do not own the land but enter into special relationships with the land owners and may receive remittances for daily living or own part of the farm after an agreed period of time. From Figure 3, 86.4% of the farmers owned the land and farms in the community with no difference in sex distribution. This was expected since majority of the farmers were natives of Mfuom and therefore farming on their own or family lands. About 10.0% were sharecroppers and 4.0% were caretakers: more males (5.6%) than females (1.7%) were caretakers, but more females (13.3%) than males (8.0%) were sharecroppers (in percentage terms).

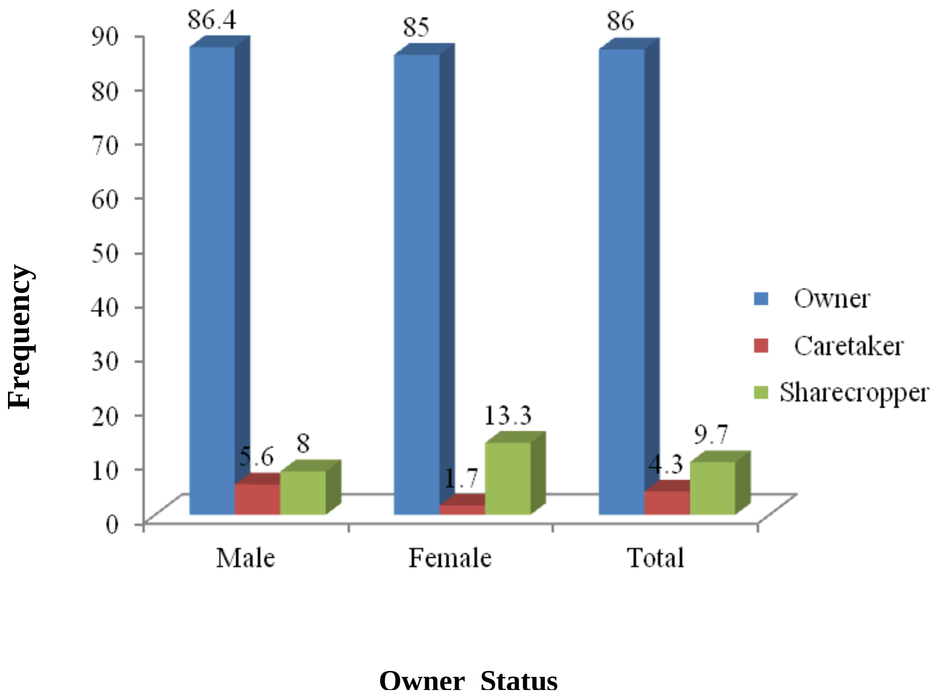

Figure 4: **Farmer status in farming arrangements**

Source: Fieldwork, 2011

Perception about vision and eye disease

In this study, respondents were asked to describe their ocular health status. This was deemed important because their perception could influence their health seeking behaviour as well as efforts to protect their eye. Table 3 indicates that 85% of the cocoa farmers perceived their vision to be very poor or poor: 86% males and 88% females. Only 14% of the population studied reported that their vision was either very good or good.

Table 3: Self reported vision by farmers

	Sex (%)		
	Male n = 125	Female n = 65	Total N = 185
Self reported vision			
Very good	4.0	3.3	3.8
Good	11.2	8.3	10.3
Poor	44.8	40.0	42.7
Very poor	40.8	48.3	43.2

Source: Fieldwork, 2011

There was no statistically significant difference between males and females in reported vision ($p = 1.056$, $X^2 = 0.788$, $df = 3$). However, there was a statistical significance between age and self reported vision ($p = 41.956$, $X^2 = 0.01$, $df = 15$). Older people reported very poor and poor vision as compared to younger people. For example, of the people aged 70 – 79 years, 68.8% reported very poor vision while only 14.3% of the people aged less that 30 years reported very poor vision (Table 4).

Table 4: Self reported vision versus age

Age	Self- Reported Vision				Total (%)
	Very good	Good	Poor	Very Poor	
	n = 7	n= 19	n= 79	n= 80	N=185
All	3.8	10.3	42.7	43.2	100.0
<30	28.6	14.3	42.9	14.3	100.0
30-39	17.6	17.6	52.9	11.8	100.0
40- 49	2.2	17.8	48.9	31.1	100.0
50-59	1.7	6.9	37.9	53.4	100.0
60-69	0.0	7.1	42.9	50.0	100.0
70-79	0.0	0.0	31.2	68.8	100.0

Source: Fieldwork, 2011

With the magnitude of poor vision reported, one would expect that cocoa farmers involved in this study would seek eye care regularly. On the contrary, only 26.5% of the respondents reported seeking eye care services within the last two years of this study: 24.8% males 30.0% females (Table 5). This finding may not be so different from those observed elsewhere, as the growing body of gender-specific studies highlights a trend of delayed help seeking by men when they become ill. Traditional masculine behaviour has been given as an explanation for delays in seeking help among men when they experience illness (Galdas, Cheater & Marshall, 2005). Of the numbers seeking eyecare, 79.6% visited hospitals and clinics, 4.1% visited herbalists or used traditional medicine and 16.3% visited chemical shops or self medicated. It appeared that herbalists and chemical sellers provide a substantive eye care along regular hospital services in the area (Ntim –Amponsah, Amoaku & Ofosu-Amaah, 2005). No female reported using traditional medicine or visiting a herbalist for eyecare. This variation by sex could be due to the small proportion of females in this study.

Table 5: Ocular health seeking behaviour

	Sex (%)		
	Male	Female	Total
Ever had eye examination (last 2 years)			
Yes	24.8	30.0	26.5
Place of examination			
Hospital	64.5	22.2	49.0
Clinic	22.6	44.4	30.6
Herbalist(Traditional medicine)	6.5	0.0	4.1
Others	6.5	33.3	16.3
Total	100.0	100.0	100.0
N	31	18	49

Source: Fieldwork, 2011

Outbreak of eye diseases in community

The study also explored outbreak of eye diseases in the community if any, and whether the outbreaks could be linked to cocoa farming activities in the community. Over one in four (28.1%) reported at least one outbreak of conjunctivitis in the community as indicated in Table 6. Of the number 19.2% attributed the outbreaks to cocoa farming activities but none of them could point out the specific cocoa farming activity which could bring about the outbreak. Eighty percent indicated that outbreak of eye diseases were normal as it occurred at various times in the year and also occurred in other towns. Since there was no evidence linking any activity of cocoa farming to eye disease in the area, one could not conclude that cocoa farming in the community could be linked to eye disease outbreaks.

Table 6: Perception on eye disease in the community

Outbreak of eye disease	Male	Female	Total
Yes	24.8	35.0	28.1
N	31	21	52
Reason of outbreak related to cocoa farming in community			
Yes	25.0	10.0	19.2
N	8	2	10

Source: Fieldwork, 2011

Interest in cocoa farming

Ghana's cocoa production level could be maintained and enhanced if the interest of farmers is sustained or their needs met. In the study, farmers were asked if they would want to quit their job if they had the opportunity. Figure 4 indicates that 11.4% of the population would quit cocoa farming if they had other alternatives because they felt that it was not lucrative enough or too strenuous. Female farmers were more likely to quit farming.

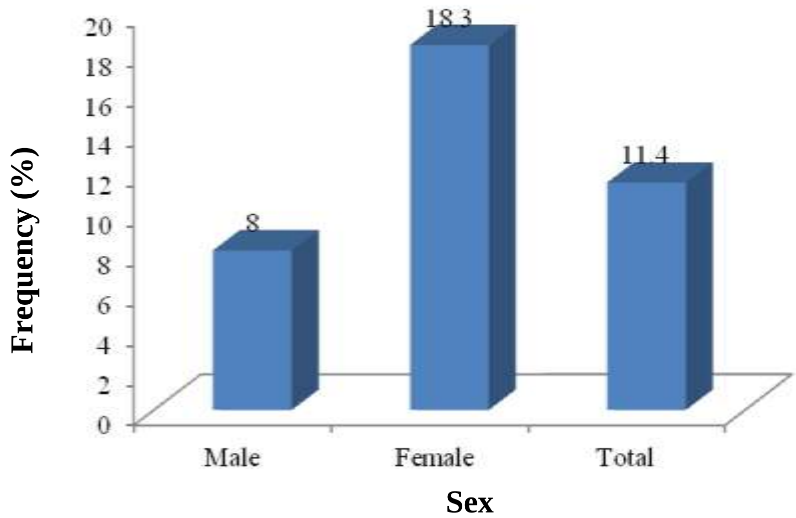

Figure 5: Farmers indicating possibility of quitting farming

Source: Fieldwork, 2011

Of those wanting to quit, 6.5% wanted to go into trading, 2.2% into government work while 2.5% wanted to go into teaching, auto mechanics, tailoring, welding and driving (Figure 5). The major reasons cited for these preferred jobs could be categorized into two: getting more money or a monthly salary and cocoa farming being difficult and stressful.

Nearly 90% of the farmers wanted to continue as cocoa farmer because they were satisfied with their job and that it is what had been handed over to them by their fore-bearers.

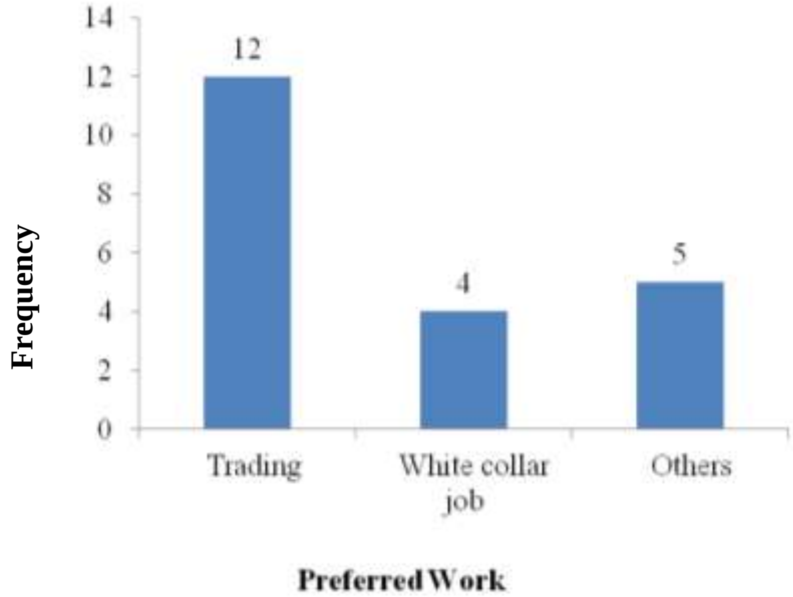

Figure 6: Preferred job of farmers indicating possibility of quitting farming

Source: Fieldwork, 2011

The model for this study recognizes that job demands, working hours and other stressors may influencer health outcomes on farms. As a result, this study sought to find out how farmers perceived conditions associated with farming, the life of farmers and the level to which the work contributed to health outcomes especially injury. Of the participants indicating that the statement presented was a stressor, Table 7 indicates that more than 50% of them believed that each of the working conditions or stressor presented had some level of influence on their health as well as injury outcomes on the farm.

Nearly 9 in ten (88.6%) of the farmers reported that poor pest control was a stressor which influenced accidents or injury and health outcomes. This was closely followed by high cost of chemicals (84.3%) and low prestige associated with farming (63.7%). Over 50% reported that long working hours impacted on their health outcomes.

Table 7: Conditions which may influence health outcomes

Condition	Low	Moderate	High	Total	N
Long hours of work	8.2	37.1	54.6	100.0	97
Exposure to the sun	9.5	18.9	71.6	100.0	148
Exposure to chemicals	6.8	33.1	60.2	100.0	118
Exposure to dangerous animals	14.5	28.2	57.3	100.0	117
Low prestige	2.5	28.0	69.5	100.0	118
Poverty	4.0	23.0	73.0	100.0	126
Hard work	5.3	34.7	60.0	100.0	150
Poor yield	4.1	17.2	78.6	100.0	145
High cost (chemicals)	3.8	21.8	74.4	100.0	156
Poor pest control	3.7	12.8	83.5	100.0	164

Source: Fieldwork, 2011

Ocular injuries among farmers

Cocoa farmers were involved in a number of activities which predispose them to a number of injuries. The activities range from weeding and planting of seeds to plucking and drying of seeds. From Figure 6, 40.5% reported injuries resulting from weeding and the least of 1.1% reported injuries from drying of seeds. Spraying recorded the second highest source of injury (10.8%) with pruning and plucking of cocoa pods following with 9.7% and 7.5% respectively.

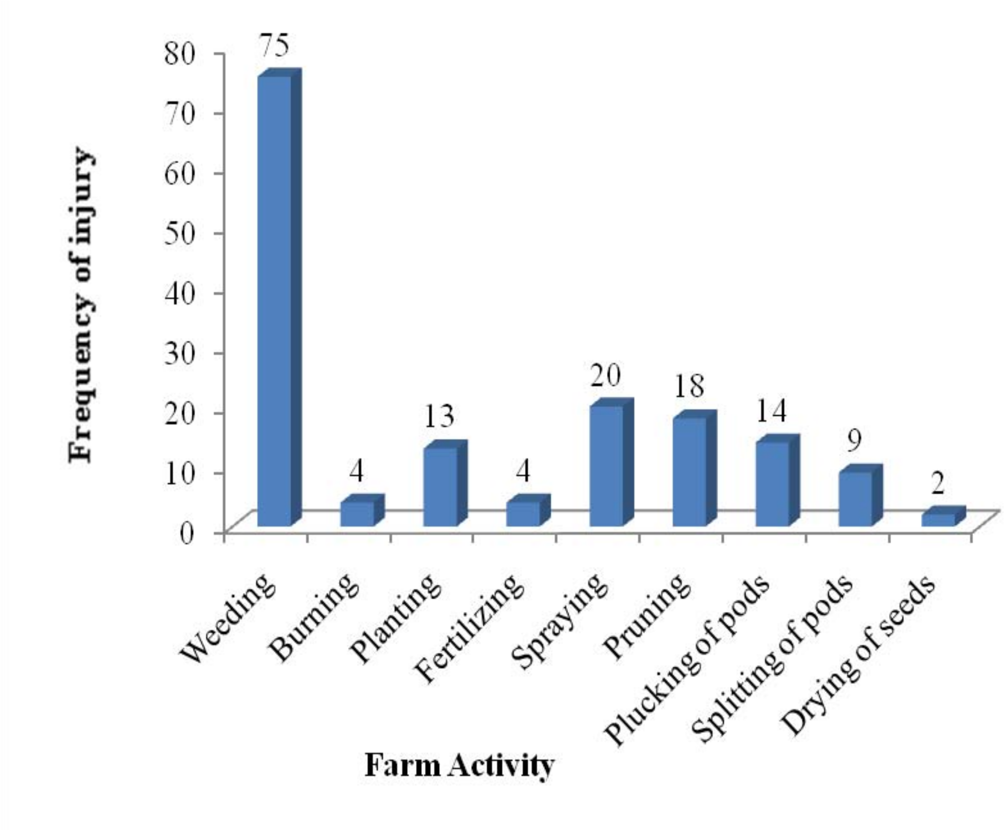

Figure 7: Self reported injury among farmers

Source: Fieldwork, 2011

At least 50% of the farmers reported injury from each of the farm activities under consideration and graded their injury as either severe or very severe. For instance, 37.3% and 34.7% reported severe and very severe injury during weeding respectively while 50% and 25% of the people reporting injury during spraying said the injury was either severe or very severe injury respectively as indicated in Table 8.

Table 8: Severity of injury among cocoa farmers

Activity	Very severe	Severe	Moderate Severe	Not Severe	N
Weeding	34.7	37.3	14.7	13.3	75
Burning	25.0	50.0	0.0	25.0	4
Planting	30.8	38.5	15.4	15.4	13
Fertilizing	25.0	50.0	0.0	25.0	4
Spraying	30.0	45.0	10.0	16.7	20
Pruning	33.3	27.8	22.2	16.7	18
Plucking of pods	35.7	42.9	14.3	7.1	14
Splitting of pods	33.3	44.4	22.2	0.0	9
Drying of seed	0.0	50.0	0.0	50.0	2

Source: Fieldwork, 2011

A quarter of the eye injuries reported (Figure 7) were as a result of projectiles (mainly flying stones and sand), followed by falling or hanging branches and leaves (20.2%) and foreign bodies (17.8%). Effect of chemicals on the eye accounted for 14.5% of injuries while stick and cocoa husk and pod accounted for 11.3% and 6.4% of injuries respectively. The frequencies for causes of injury as reported were lower than most studies and could be due to the type of farmers since most of the studies were open to both crop and animal farmers (e.g. Sprince et al, 2008)

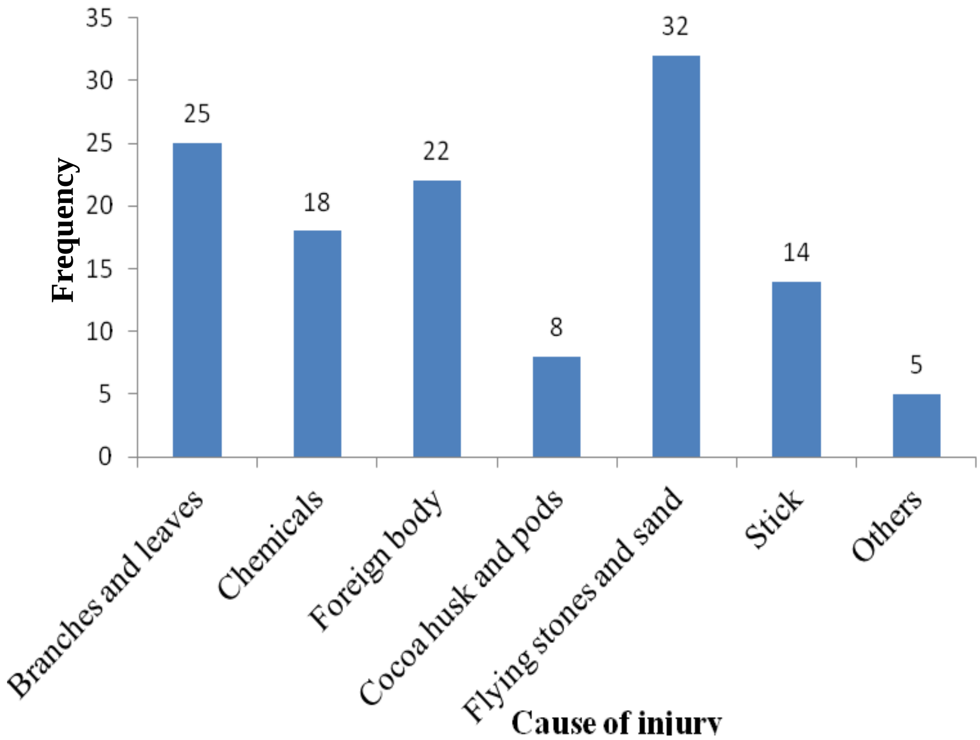

Figure 8: Frequency of reported causes of injury

Source: Fieldwork, 2011

The health seeking behaviour of cocoa farmers upon injury was ascertained for all injuries reported on the farm. From Table 9, about 50-75% who reported injuries neither sought treatment nor self medicated - injuries were left to heal on their own. Such an approach could lead to severe visual impairment, especially if the cornea was involved. Above 10% (5.6 -25%) with injuries reported visiting herbalists. Other farmers with injuries visited either a hospital (11.1%) or chemical shop (7.7%) for medical care.

Table 9: Action taken at time of injury

	Action taken at time of Injury Yes (%)					
Activity	Self Med	Trad Med	Chem Shop	Hospital	None	N
Weeding	21.3	6.7	14.0	24.0	33.3	75
Burning	25.0	25.0	0.0	25.0	25.0	4
Planting	23.1	15.4	7.7	15.4	38.5	13
Fertilizing	25.0	25.0	0.0	0.0	50.0	4
Spraying	10.0	15.0	15.0	20.0	40.0	20
Pruning	22.2	5.6	16.7	11.1	44.4	18
Plucking of pods	28.6	14.3	14.3	14.3	28.6	14
Splitting of pods	11.1	22.2	33.3	0.0	33.3	9
Drying of seed	50.0	0.0	0.0	0.0	50.0	2

Source: Fieldwork, 2011

Self med = Self medication (using conventional drugs).

Chem shop =Chemical shop, Trad Med = Traditional medicine

Logistic regression model

To ascertain the relationship between reported injury and socio-economic variables as well as farm characteristics, logistic regression was used. This model assumes that at least one characteristic of farming influences the probability that the farmer will suffer an injury. Logistic regression model helps to investigate the relationship between and among selected variables. In this particular study, it expresses the conditional probabilities that a farmer will suffer an injury as a linear function of a set of independent variables.

Independent variables

The independent variables used in the regression analysis are sex, age, education, number of years as a farmer and area under cultivation. These variables were selected based on the literature (Quandt et al, 2008; Sprince et al, 2008). The estimated coefficients for the variables selected for the logistic regression are shown in appendices 1- 4.

From the estimation of odds of injury for weeding (Table 10) on cocoa farms, male farmers were less likely to be injured during weeding than female farmers. This is similar to those reported by Ferguson et al, (2005). Those who had been involved in cocoa farming for 20 or more years had a higher likelihood (1.39) of sustaining injury and those who had 10 or more acres of farms had a higher (1.66) likelihood of sustaining injury. This may not be different from those reported elsewhere (Virtanen, Notkola, Luukkonen, Eskola & Kurppa, 2003; McCurdy & Carroll, 2000; Hoskin, Miller, Hanford & Landes, 1988). Those with primary and tertiary education had a higher likelihood of sustaining injury.

Table 10 : Odds of injury during weeding

Injury during weeding	Odds Ratio	P>|z|	[95% Conf. Interval]
Sex			
Female R	1.00	1.00	1.00
Male	0.60	0.19	0.28 - 1.28
Age			
<30 R	1.00	1.00	1.00
30-39	0.62	0.63	0.09 - 4.35
40-49	0.57	0.57	0.84 - 3.90
50-59	0.49	0.46	0.07 – 3.22
60-69	0.28	0.21	0.04 – 2.06
70+	0.40	0.42	0.04 – 3.71
Education			
None R	1.00	1.00	1.00
Primary	1.15	0.82	0.35 - 3.77
Middle/ JHS	0.25	0.009	0.09 - 0.71
Secondary/SHS	1.00	0.99	0.29 - 3.35
Tertiary	1.13	0.87	0.27 - 4.75
Duration as a farmer			
< 10 R	1.00	1.00	1.00
10-19	0.75	0.52	0.31 - 1.80
20+	1.39	0.47	0.57 - 3.39
Area under cultivation			
1-3 R	1.00	1.00	1.00
4-6	0.52	0.31	0.15 - 1.84
7-9	0.41	0.47	0.57 - 3.39
10+	1.66	0.58	0.27 - 10.09

Source: Fieldwork, 2011

R is reference point

According to the estimation of odds of injury for spraying of chemicals (Table 11), males have a higher (1.53) likelihood of sustaining injury than females and this may be similar to those reported by several studies (Maltias, 2007; Hagel, Dosman, Rennie, Ingram, & Senthilselvan, 2004; Stallones & Beseler, 2003; Virtanen et al., 2003; Hwang et al, 2001; McCurdy & Carroll, 2000; Ferguson et al., 2005). Farmers aged 60 - 69 were more likely (1.58) to sustain injury during spraying than other farmers. Age has been suggested to reduce reflex speed and may make older farmers more susceptible to injury (Etherton, Myers, Jensen, Russell & Braddee, 1991). Farmers with 7 -9 acres of farm size were more likely to sustain injury than other farmers.

From Table 12, estimation for injury during pruning indicates that males had a higher risk (2.44) of sustaining injury than females. Farmers with Tertiary education also had higher risk of sustaining injury. Farmers who cultivated 7–9 acres and 10 or more had a higher risk (3.78) and (4.60) respectively of sustaining injury.

The estimation of odds of injury for plucking of cocoa pods, one major source of injury to farmers indicated that males had a higher risk (5.01) of sustaining injury than females. Farmers who had been in the industry for 10 -19 years and 20 or more also had higher risk of sustaining injury (Table 13)

Table 11: Odds of injury during spraying

Injury during spraying	Odds Ratio	P>|z|	[95% Conf. Interval]
Sex			
Female [R]	1.00	1.00	1.00
Male	1.53	0.48	0.46 - 5.08
Age			
<30 [R]	1.00	1.00	1.00
30-39	0.50	0.67	0.02 - 11.41
40-49	0.30	0.44	0.01 - 6.21
50-59	1.02	0.98	0.06 - 15.93
60-69	1.58	0.75	0.09 - 27.31
70+	0.52	0.71	0.02 - 16.37
Education			
None [R]	1.00	1.00	1.00
Primary	0.67	0.70	0.09 - 5.04
Middle/ JHS	1.08	0.92	0.25 - 4.79
Secondary/SHS	0.74	0.75	0.12 - 4.72
Tertiary	0.64	0.73	0.05 - 7.94
Duration as a farmer			
< 10 [R]	1.00	1.00	1.00
10-19	0.44	0.28	0.10 - 1.87
20+	0.80	0.72	0.24 - 2.70
Area under cultivation			
1-3 [R]	1.00	1.00	1.00
4-6	0.85	0.88	0.11 - 6.43
7-9	1.46	0.71	0.19 - 11.04

Source: Fieldwork, 2011

R is reference point

Table 12: Odds of injury during pruning

Injury during pruning	Odds Ratio	P>|z|	[95% Conf. Interval]
Sex			
Female [R]	1.00	1.00	1.00
Male	2.44	0.24	0.56 - 10.57
Age			
<30 [R]	1.00	1.00	1.00
30-39	..		
40-49	0.56	0.73	0.02 - 15. 35
50-59	0.17	0.29	0.01 - 4.44
60-69	0.30	0.48	0.14 - 6.01
70+	..		
Education			
None [R]	1.00	1.00	1.00
Primary	0.93	0.94	0.14 - 6.01
Middle/ JHS	0.32	0.16	0.07 - 1.57
Secondary/SHS	0.47	0.45	0.63 - 3.42
Tertiary	1.67	0.62	0.22 - 12.09
Duration as a farmer			
< 10 [R]	1.00	1.00	1.00
10-19	3.78	0.11	0.74 - 19. 21
20+	4.60	0.05	0.96 - 22.00
Area under cultivation			
1-3 [R]	1.00	1.00	1.00
4-6	0.30	0.33	0.26 - 3.41
7-9	0.41	0.47	0.04 - 4.60

Source: Fieldwork, 2011 R is reference point

Table 13: Odds of injury during plucking

Injury during plucking	Odds Ratio	P>|z|	[95% Conf. Interval]
Sex			
Female [R]	1.00	1.00	1.00
Male	5.01	0.17	0.51 - 49.16
Age			
<30 [R]	1.00	1.00	1.00
30-39	0.07	0.16	0.00 -2.81
40-49	0.15	0.30	0.00 – 5.38
50-59	0.06	0.13	0.00 – 2.18
60-69	0.04	0.10	0.00 -1.90
70+	0.15	0.33	0.00 -6.86
Education			
None [R]	1.00	1.00	1.00
Primary	0.99	1.00	0.10 - 9.24
Middle/ JHS	0.47	0.46	0.07 - 3.45
Secondary/SHS	2.32	0.42	0.30 - 17. 95
Tertiary	1.51	0.72	0.16 - 14.78
Duration as a farmer			
< 10 [R]	1.00	1.00	1.00
10-19	4.27	0.12	0.68 - 26.71
20+	4.00	0.15	0.60 - 26.34
Area under cultivation			
1-3 [R]	1.00	1.00	1.00
4-6	0.568	0.67	0.04 - 7.83
7-9	0.74	0.82	0.04 - 11.21
10+	0.72	0.86	0.02 - 24.31

Source: Fieldwork, 2011

R is reference point

Exposure to chemicals

According to the model for this study, farmers can be exposed to chemicals through various activities on the farm such as spraying and fertilizer application. In this regard, farmers were asked if they were involved in chemical application on their farms. Table 14 indicates that 96.2% reported using chemicals, mainly pesticides. Of this proportion, 80.9% reported using blanket method in spraying while 16.3% reported using spot spraying. Method of spraying has implication for level of exposure to chemicals. Blanket spraying leads to higher exposure to chemicals because it involves spraying the entire farm than spot spraying which targets specific portions or infected plants (Adeogun & Agbongiarhuoyi, 2009). Equally, the number of times a farm is sprayed influences the level of exposure to chemicals. Nearly 80% sprayed their farms at least three times within a year (Table 14) which fell within the average number of spraying times recommended in a year (Bartel, 2010)

Table 14: Frequency of chemical use on farms and methods of spraying

Chemical Use on farm	Frequency	Percentage
Yes	178	96.2
Method of spraying		
Blanket	144	80.9
Spot	29	16.3
Others	5	2.8
Total	178	100.0
Number of spraying of farms per year		
One	7	3.9
Two	31	17.4
Three	69	38.3
Four	27	15.2
Five	10	5.6
Six	34	19.2
Total	178.0	100.0

Source: Fieldwork, 2011

Assessment of use of Personal Protective Equipment on cocoa farms

The use of protective and safety equipment on farms have been widely recommended in the literature (CDCP, 1995). These equipment may include goggles, protective clothing, rubber gloves, rubber boots, nose shields and ear plugs. These equipment offer various degrees of protection to farmers in their daily activities. For the purpose of this study, goggle use was of paramount interest due to the focus of the study. Participants were asked if they wore goggles on their farms when undertaking specific activities. As depicted in Figure 8, spraying of chemicals on farms recorded the highest percentage of goggle use (25.4%) followed by fertilizer application (2.2%) and pruning (1.6%). The use of goggles for other activities which had equal chances of potentially causing injury to the eye was very low, ranging from 0.5 to 1.6%. Apart from goggle use during weeding, the reported use of goggle compares with other activities favourably with that reported in literature. For example, Quandt et al (2008) reported that fewer than 1 in 10 wore eye protection among migrant farmworkers. Among Latino farmworkers, only 1.6% reported wearing glasses/goggles when working on the fields (Quandt et al, 2001).

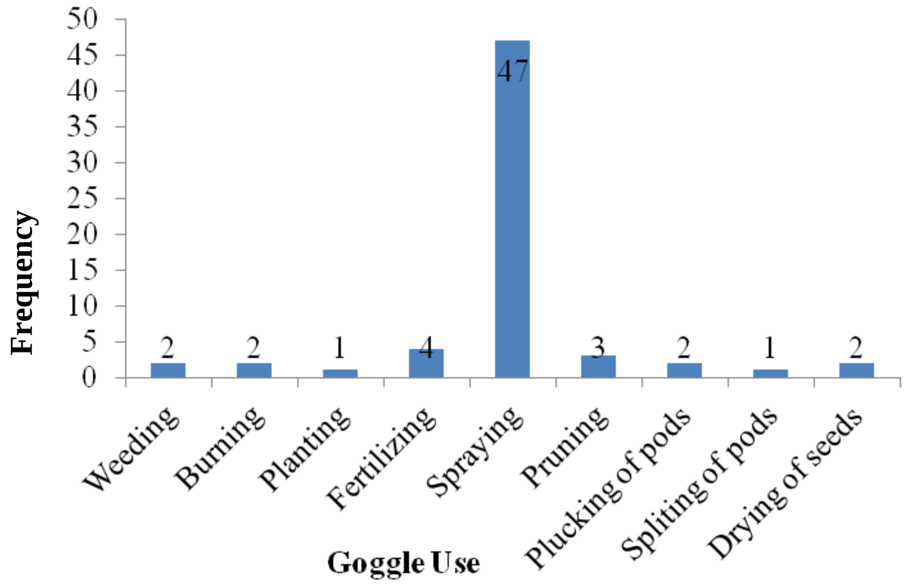

Figure 9: Frequency of goggle use according to farm activities

Source: Fieldwork, 2011

Several reasons were put forward as barriers to using goggles by the farmers. Among them were unavailability (34.5%), lack of adequate education (23.2%), and inability to purchase one (19.6%). Other reasons given for non-use were feeling uncomfortable with use, foggy vision upon use and high cost of goggles (Figure 9). Comparing these findings to that reported by Quandt et al, (2008), it is evident that farmers in this study are more worried about the economic cost of goggles and its unavailability as well as lack of education whereas farmers in the United State are more worried about the efficiency of the device upon use. For example Quandt et al, (2008) reported that 25.3% of farmers were uncomfortable with use. In this study only 7.0% of farmers reported same. Again whereas 35.3% reported that the device fogs when you sweat in Quandt, only 6.5% reported same in this study. None of the top three reasons given for non use of goggles in this study is reported by Quandt et al, (2008). However, the 34.5%of farmers citing unavailability of the device compared favourably with that reported by Quandt et al, (2001), where 37% of farmers in North Carolina reported a similar reason for not wearing goggles while working on the farm.

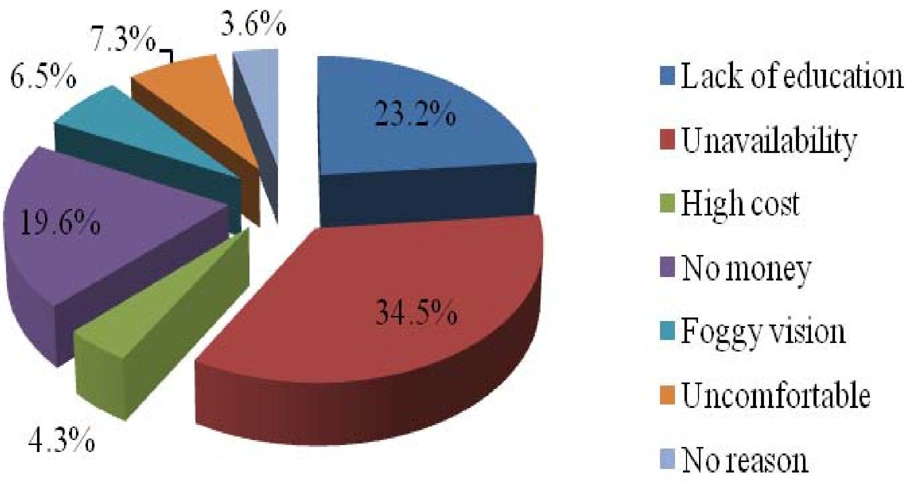

Figure 10: Reasons for not using goggles by farmers

Source: Fieldwork, 2011

The use of other protective equipment was also assessed. Farmers reported high use of other protective equipment such as rubber boots (48.6%), protective cloth (37.8%) and rubber gloves (29.7%). Four percent of the farmers reported using hats to protect themselves the sun (Figure 10). The use of hat in preventing radiation from the sun is more popular in the United States as Quandt et al, (2008) reported 57% of hat use among farmers.

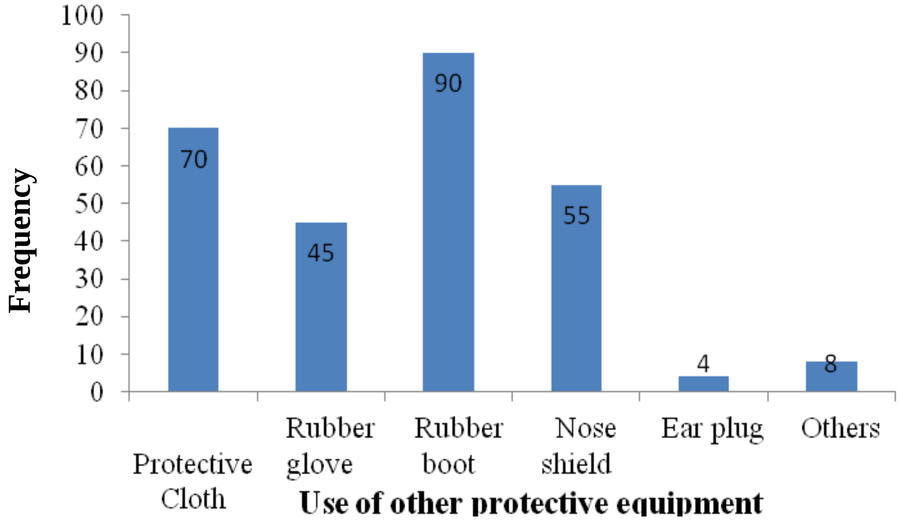

Figure 11: Frequency of use of other protective equipment

Source: Fieldwork, 2011

Safety training

Safety training forms an integral part of health promotion which underlines the model for this study. It is expected that effective training and health promotion will have a positive impact on ocular health outcome of farmers. This study therefore investigated the involvement of cocoa farmers in any ocular safety training relating to their work. As indicated in Table 15, 17.2% of respondents had ever been trained on proper ocular care during farm activities. These training were mainly organized by agricultural extension officers and medical teams on outreach programmes to the community. Nearly all the farmers who had undergone some level of training reported that the training were either beneficial or very beneficial. Only 3.1% reported that the training was not beneficial. For those reporting not beneficial, they intimated that the training was a waste of time because it was just a talk with no practical session to enable them adopt in their work on the farm.

The low percentage of farmers who had ever had any safety training is reflected in the low percentage of farmers using goggles in their activities on the farm. The finding suggests the need for more education and training about the scope of eye hazards on cocoa farm to help reduce disease and injury outcomes among cocoa farmers. The low percentage of farmers reporting that they had ever received training is consistent with the findings of Verma et al, (2011) where about 70% of farmers reported they are not well trained in preventing eye injuries on the farm.

Table 15: Safety and Training

	Sex (%)		
Safety training	Male	Female	Total
Yes	20.0	11.7	17.2
N	25.0	7.0	32.0
Assessment of safety training			
Very beneficial	80.4	85.7	84.4
Beneficial	12.6	14.3	12.5
Not Beneficial	4.0	0.0	3.1
N	25.0	7.0	32.0

Source: Fieldwork, 2011

Lifestyle of cocoa farmers

Throughout the literature, there have been consistent reports that alcohol intake (at doses producing blood alcohol levels near the legal limits for driving) and smoking play a significant role in several eye diseases. For example, Hiratsuka & Li (2001) reported that chronic alcohol intake is associated with a significantly increased risk of cataract, keratitis, colour vision deficiencies and corneal arcus. There is also a strong association between smoking and a number of common eye diseases, which include Graves' ophthalmopathy, age-related macular degeneration, glaucoma, and cataract (Cheng et al, 2000). From Figure 10, out of the total number of respondents of this study, 45.9% reported either smoking or taking alcohol as part of their daily living. No female reported smoking while 4.7% males reported smoking. Of the number reporting alcohol intake, 82.7% were males while 17.3% were females.

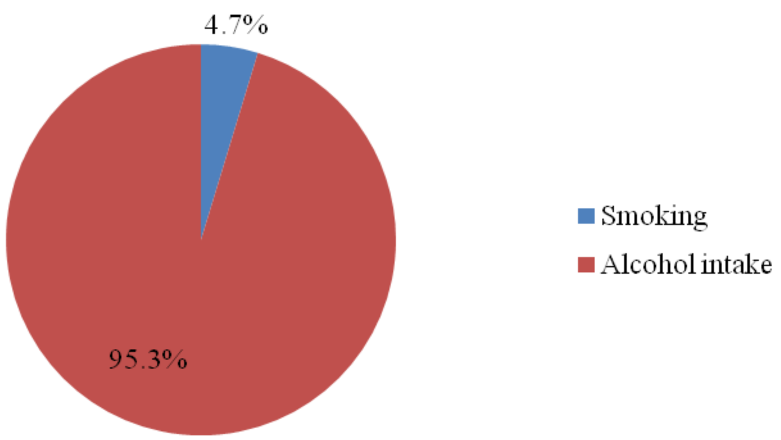

Figure 12: Frequency of alcohol intake and smoking among cocoa farmers

Source: Fieldwork, 2011

Assessment of eyes of cocoa farmers

As a routine clinical practice, a comprehensive case history of each farmer was taken. The major complaints of the farmers presented in Table 16 were poor distance vision (37.8%) and poor near vision (22.2) (see also Quandt et al, 2008; Mittal et al, (2008). Others were itching (17.8%) and ocular pain (5.4%).

Table 16: Major complaints of cocoa farmers

Major complaint	Frequency	Percentage
Poor distance vision	70	37.8
Poor near vision	41	22.2
Foreign body sensation	5	2.7
Itching	33	17.8
Ocular pain	10	5.4
Photophobia	4	2.2
Tearing	8	4.3
Trauma	5	2.7
Others	9	4.7
Total	185	100.0

Source: Fieldwork, 2011

The habitual visual acuity of farmers was assessed. Only 4.8% of them reported using glasses and their visual acuity taken with their spectacles on. The visual acuity (Table 18) indicates that 9.7% were blind in the right eye and 10.4% were blind in the left eye. Twenty- six percent were visually impaired in both eyes. A paired t- test result for Table 17, VA-OD (M=4.7243, SD=3.04043), VA-OS (M=4.7081, SD=2.95826), t (0.085) = p > 0.0005, indicated that there was no significant difference between the visual acuity of the right eye and the left eye. As a result, one eye was used for categorization of the visual acuity of cocoa farmers.

Table 17: Distance Visual acuity (VA) of cocoa farmers

Visual acuity	OD Frequency	(%)	OS Frequency	(%)	BCDVA Frequency	(%)
6/4	7	3.8	7	3.8	7	3.8
6/5	47	25.4	39	21.1	52	28.1
6/6	35	18.9	36	19.5	42	22.7
6/9	19	10.3	32	17.3	47	25.4
6/12	18	9.7	18	9.7	6	3.2
6/18-	15	8.1	11	5.9	10	5.4
6/24	10	5.4	10	5.4	7	3.8
6/36	7	3.8	6	3.2	3	1.6
6/60	9	4.9	10	5.4	5	2.7
3/60	3	1.6	1	0.5	-	-
CF@3m	10	5.4	10	5.4	6	3.2
HM	2	1.1	-	-	-	-
LP	1	0.5	4	4.0	-	-
NLP	2	1.1	1	0.5	-	-

OS=Left eye, OD= Right eye, BCDVA = Best corrected distance visual acuity

Classifying the vision of the right eye of the farmers from the presenting VA, it is evident from Table 17 that 29.2% of the cocoa farmers had very good vision with another 38.9% having good vision. Again 22.2% had poor vision with 9.7% having very poor vision. Comparing this with the self reported vision of farmers as indicated in Table 3, it became apparent that the cocoa farmers had a very poor perception of their vision. As depicted in Figure 12, whereas 3.8 of farmers reported that they had good vision, the actual habitual vision revealed that 29.2% of the farmers had very good vision while 10.8% reported good vision, 38.9% rather had good vision.

While 42.7% reported that they had poor vision, 22.2% had poor vision when tested and while 43.2% reported having very poor vision when tested; only 9.7% of them really had very poor vision. Using the WHO classification with best visual acuity (BCVA), 83.2% had normal vision while 16.7 % had visual impairments with 3.2% being legally blind in one eye.

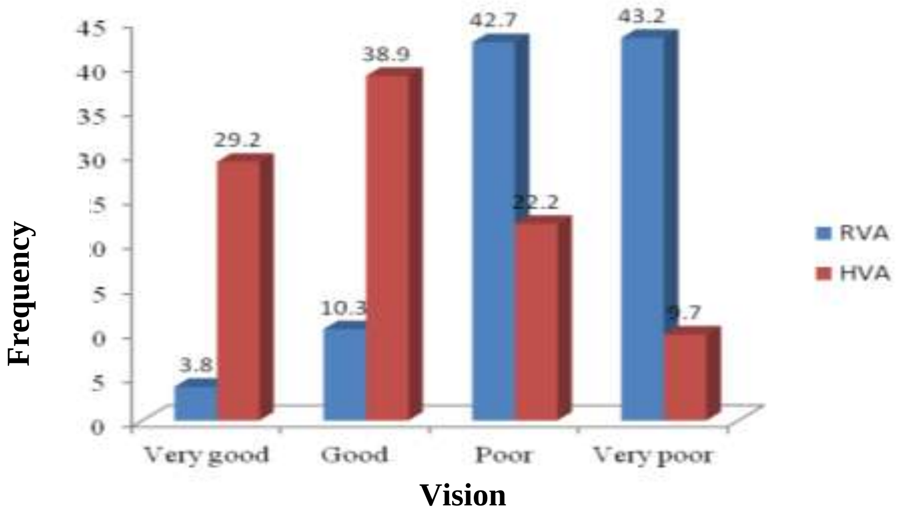

Figure 13: Self reported vision verses actual vision

RVA- Reported Visual Acuity, HVA- Habitual Visual Acuity

Preliminary and Internal Examination

Preliminary examinations such as cover test, both far and near as well as near point of convergence, were carried out on the farmers. One percent had esotropia and another 1.1% had exotropia at near while 5.9% had esophoria and 0.5% exophoria at near. For esotropia and exotropia at far the proportions were 0.5% each. Convergence insufficiency (CI) was a problem in 5.4% of the population studied.

External eye examinations revealed that 10.3% had eyelid anomalies mainly Ptosis, Entropion and poliosis. Sixty percent of the population seen had various degrees of conjunctival anomalies while 14.6% had some form of corneal disorders mainly corneal arcus and other opacities. Nineteen percent of the population had irregular pupils.

Internal examination revealed that 27.0% had various degrees of lens opacities. Five percent of the population either had problems with their vitreous or could not be assessed with 9.2% having various degrees of fundus anomalies. A cup to disc (C/D) ratio of less than 0.5 was seen in 81.6% and 80% in the right eyes and left eyes respectively. Borderline C/D ratio of 0.5 was observed in 7.0% and 6.5% in right and left eyes of participants respectively. CD radio of greater than 0.5 was observed in 8.2% and 9.7% in the right and left eyes of participants respectively. CD ratio of 3.2% and 3.8% of the right and left eyes of participants could not be examined due to lens opacities. Total optic atrophy was seen in at least one eye of two individuals.

Prevalence of ocular conditions

According to the WHO disability scale (WHO, 1973) eyes rather than people are assessed which implies that 370 eyes were examined in the study. Each of the eyes examined had at least one eye condition diagnosed.

From Table 18, 21 eye conditions were identified with a frequency of 416 among the farmers. Dominant among the conditions was presbyopia (23.5%), followed by refractive error, cataract and pterygium and pinguecula combined with 20.5%, 10.7% and 11.8% respectively. The prevalence of cataract compared favourably with that reported by Mittal et al, (2008) and Okoye and Umeh (2002) for industrial workers in India and Nigeria respectively. The prevalence of acute conjunctivitis was (10.2%) with allergic conjunctivitis and glaucoma following in that order with (10.0%) and (7.7%) respectively. The prevalence of cornea opacities resulting mainly from farm injury was 1.8%. Hypertensive retinopathy was present among 1.8% of the farmers.

Table 18: Ocular conditions in the 370 eyes examined

Condition	Frequency	Percentage
No abnormality	1	0.3
Refractive error	80	20.5
Presbyopia	92	23.5
Amblyopia	2	0.5
Cornea opacity	7	1.8
Conjunctivitis(allergic)	39	10.0
Conjunctivitis(acute)	44	10.2
Pinguecula	21	5.4
Pterygium	25	6.4
Entropion	2	0.5
Ptosis	2	0.5
Traumatic esotropia	1	0.3
Uveitis (anterior)	1	0.3
Glaucoma	30	7.7
Cataract	42	10.7
Retinitis pigmentosa	2	0.5
Diabetic retinopathy	4	1.0
Hypertensive retinopathy	7	1.8
Pseudophakia	5	1.3
Chorioretinopathy	5	1.3
Optic atrophy	2	0.5
Total blind eye	2	0.5
Total	416*	100.0

Source: Fieldwork, 2011 * Multiple response

Major eye diseases

The major eye diseases diagnosed are presented in Table 19. Of the population studied, no major disease condition or abnormalities was seen in 41.6% of the respondents. Anterior segment eye diseases were mainly conjunctivitis (13%), pterygium (2.7%), cornea opacity (2.2%) and pinguecula (1.1%). In an industrial eye health study by Okoye and Umeh (2002), pterygium and pinguecula(e) were seen in (27.7%) of the population studied as against a combined 3.8% in this study. The wide variation in prevalence between the two studies could be due to the fact that this study analysis was based on major findings while other studies reported all conditions identified. Further, it may be due to differences in level of exposure to radiations and chemicals in these two populations.

Major posterior segment diseases diagnosed were mainly cataract (20.0%), glaucoma (11.7%) and hypertensive retinopathy (2.7%). Chorioretinopathy and Retinitis pigmentosa were diagnosed in 1.1% each with 0.5% complete atrophy and 1.1% total blind eye in at least one eye. The prevalence of cataract as reported by Okoye and Umeh (2002) was 12.2% as against 20.0% in this study. The difference could be due to differences in age structure of participants in each of the studies.

To aid effective statistical computations in testing the hypothesis, the major diseases were re-categorised into disease of the lid and muscles, conjunctiva, cornea, lens and retina. There was no statistically significant relationship between sex and major disease conditions (p=2.392, X^2 = 0.302, df = 2). Equally, there was no statistically significant difference between level of education and major disease conditions (p= 4.550, X^2= 0.337, df = 4).

However, there was a statistically significant relationship between age and major disease conditions (p=26.965, X^2= 0.001, df = 2) and number of years as a farmer (p = 6.223, X^2= 0.045, df = 2) at a confidence interval of 95%. There was however, no statistically significant relationship between farm size and major diseases (X^2 = 0.276, p = 0.572, df= 2). These findings imply that as one grows older vision deteriorates and it is important to seek regular health care. Farmers must do so even regularly due to the numerous hazards they are exposed to in the farm.

Table 19: Major diagnosis (disease)

Disease condition	Frequency	Percentage
NAD	77	41.6
Conjunctivitis	24	13.0
Pterygium	5	2.7
Pinguecula	2	1.1
Cornea opacity/scar	4	2.2
Cataract	37	20.0
Glaucoma	22	11.9
Retinitis pigmentosa	2	1.1
Diabetic retinopathy	1	.5
Hypertensive retinopathy	5	2.7
Chorioretinopathy	3	1.6
Optic atrophy	1	.5
Blind eye	2	1.1
Total	185	100.0

Source: Fieldwork, 2011

Predicting diseases

In order to assess which of the demographic variables and farm characteristics could better predict disease outcome, a multinomial logistic regression analysis was conducted. From Table 20, using conjunctiva as base outcome, pathologies of the lens and retina were significant at a p value of (0.000 and 0.007) respectively with a relative risk ratio (RRR) of developing a lens or retina disease of 1.25 and 1.1 respectively with increasing age. As a result, only age could significantly predict disease outcome though other factors such as environmental and biological factors which were outside the scope of this study could play a role (Kanski, 2009).

Table 20: Multinomial logistic regression for predicting disease outcome

Disease Location	RRR	Std. Err.	P>|z|	[95% Conf.Interval]
Lens				
Sex	0.919	0.649	0.905	0.230 - 3.671
Age	1.246	0.053	0.000**	1.146 - 1.355
Duration as a farmer	0.958	0.027	0.141	0 .906- 1.014
Retina				
Sex	0.573	0.344	0.353	0.177- 1.857
Age	1.083	0.032	0.007**	1.022 -1.147
Duration as a farmer	0.984	0.027	0.562	0 .933 -1.038

Base outcome = Conjunctiva

The relationship between lifestyle of farmers (as measured by reported alcohol intake and smoking) and diseases (as measured by major diagnosis), was investigated using Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure that there was no violation of the assumptions of normality, linearity and homoscedasticity. There was a weak, positive correlation between the two variables [$r = 0.008$, $n=57$, $p<.0005$], with low level of alcohol intake and smoking associated with major disease outcome. This is consistent with reports by Hiratsuka and Li (2001), that chronic alcoholism is associated with a significantly increased risk of cataract, keratitis, colour vision deficiencies and corneal arcus. A strong association between smoking and Graves' ophthalmopathy, age-related macular degeneration and cataract has also been reported elsewhere (Cheng et al, 2000). The weak association between alcohol intake and smoking and disease in this study is recommended for further investigation since there was no systematic assessment of alcohol and tobacco use in this study.

Refractive conditions

Of the major diagnosis made, refractive conditions were identified in 41.1% of the participants. Out of this number, 28.6% had refractive errors, 11.4% had presbyopia with 1.1% being amblyopic as presented in Figure 13. There was no statistically significant relationship between refractive errors and any of the demographic variables. The prevalence of refractive errors compared favourably with the 26.2% reported by Okoye and Umeh (2002) in an Eye health study of industrial workers in south eastern Nigeria. There was however, a wide difference between the prevalence of presbyopia of 31.4% reported in that same study and that of this study. The difference could be due to a number of factors including socio-demographic background and work environment.

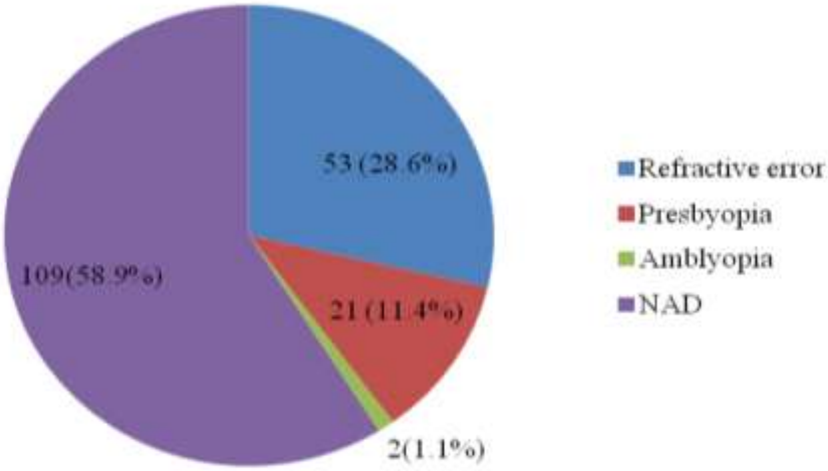

Figure 14: Refractive conditions among farmers

Source: Fieldwork, 2011

Visual impairment

Using BCVA (Table 21), 16.7% of the respondents had visual impairment and blindness. The main causes of visual impairment using best corrected VA were cataract (8.6%), refractive error (3.8%), glaucoma (2.2%) and cornea opacity (1.1%). There was no statistically significant difference between sex and visual impairment ($p = 0.691$, df=1). Duration as a farmer was equally not statistically associated with visual impairment ($p = 0.279$, df = 1). However, there was a statistically significant relationship between age and visual impairment ($p=0.049$, df = 1). Cocoa farmers who were aged 40 years and above were more likely to be visually impaired than those below 40years. The causes of visual impairments among this population are consistent with global reports on the leading causes of visual impairment which are mainly cataract, refractive errors and glaucoma (WHO, 2012). However, the prevalence of cataract in the normal Ghanaian population has been found to be as high as 53.9% in people 40 years and above (Guzek, Anyomi, Fiadoyor & Nyonator , 2005). The prevalence of refractive error among farmers as a cause of visual impairment has been reported to be high (Quandt et al, 2008, Quandt et al, 2001) but in most cases without figure. However, Verma, (2010), reported 1.4% prevalence of visual impairment in a farming population in North Carolina. The 3.8% prevalence of refractive error as a cause of visual impairment in this study could be due to farmers' inability to access eye health which may have contributed to a deterioration of refractive error faster than it normally would. Lee, Cha & Moon, (2010), also reported a low prevalence of cataract and glaucoma combined of about 0.5% among agricultural workers in Korea. The low prevalence reported could be due to the differences in methods used in both studies. However, Okoye and Umeh, (2002) reported a higher cataract prevalence of 12.2% in an industrial population in Delta State, Nigeria. This compared favourably with the 8.6% of cataract prevalence found in this study due to the use of similar methods of diagnosing the disease.

Table 21: Causes of visual impairment and blindness

Causes of visual impairment	Sex		Total Frequency	Percentage
	Male	Female		
Cataract	12	4	16	8.6
Refractive error	2	5	7	3.8
Glaucoma	3	1	4	2.2
Cornea opacity	2	0	2	1.1
Amblyopia	0	1	1	0.5
Optic Atrophy	1	0	1	0.5
N	21	11	31	16.7

Source: Fieldwork, 2011

Conclusion

Globally, the major causes of visual impairment are uncorrected refractive errors cataract and glaucoma (Byfields, 2011; Pascolini & Mariotti, 2010) in that order. In this study, the main causes of visual impairments were cataract, uncorrected refractive error and glaucoma. This reflects the global picture of visual impairments and reports by WHO that about half of all blindness and visual impairment in developing countries is caused by cataract, and a further 10 percent of blindness is caused by glaucoma. The findings of this study may not necessarily be attributed to farming activities. A further case control study may be needed to establish an association.

From Figure 11, it is evident that about 34% of farmers who reported very poor vision did not actually have it upon vision testing likewise 20.5% who reported poor vision. This is an indication that participants could not assess their vision properly. This could be attributed to the perception of the presence of a disease condition. However, the presence of a disease condition may not necessarily reflect in poor vision. Again from Table 4, about 96% of the farmers reporting very poor vision were 40 years and above while about 72% of farmers reporting very good vision were less than 40 years. The reporting of poor vision could be related to age. This is consistent with literature (Kanski, 2009). Both lens related and retinal diseases associated with age have the potential of causing visual impairment or blindness (Table 22).

Although people perceived their vision to be poor, they did not seek medical care. This was mainly attributed to socio-economic variables such as income and education. However, not seeking medical care when poor vision is perceived could lead to severe visual impairment. According to the WHO, visual impairment mostly caused by cataract, glaucoma and refractive error is the 6th largest cause of disability loss years (DALYs) globally. Visual impairment has a 3 percent share of global DALYs more than unhealthy diet (1-2%) and physical inactivity (2.1%), and only fractionally less than those resulting from cancer (5.1%), respiratory disease (3.9%), and harmful use of alcohol (4.5%) and tobacco use (3.7%) (WHO, 2003). It is therefore important that the ocular health of cocoa farmers is taken seriously by government agencies, as well as the companies in the private sector with interest in cocoa production such as the Produce Buying Companies. They need to institute health programmes that will help reduce the level of visual impairment and blindness among cocoa farmers so as to sustain production levels to enhance economic growth.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This part of the study reflects on the entire research on ocular health among cocoa farmers at Mfuom. In view of this a summary of the purpose of the study and the major findings have been presented. This is followed by conclusions drawn from the major findings and then recommendations of how to help remedy some of the findings and where researchers interested in carrying out further studies in this area of study may focus.

Summary

The study sought to evaluate the ocular health status, safety and working conditions among cocoa farmers. This was to help document major ocular conditions, incidence of injury, major causes of injury and use of personal protective equipment as well as perception of cocoa farmers on their visual status. The study involved administration of questionnaire and an evaluation of the visual status of the farmers through a comprehensive eye examination.

Of the 185 cocoa farmers at Mfuom who were involved in this study, 37.8% and 22.2% reported blur distance vision and poor near vision respectively while about 18 percent reported itching. Visual acuity assessment of the farmers revealed that 29.2% of the cocoa farmers had very good vision while 38.9% had good vision 32% had poor vision.

No major disease condition or abnormality was seen in 41.6% of the 185 respondents. Anterior segment eye diseases were mainly conjunctivitis

(13%), pterygium (2.7%), cornea opacity (2.2%) and pinguecula (1.1%). Major posterior segment diseases diagnosed were cataract (20.0%), glaucoma (11.7%) and hypertensive retinopathy (2.7%). Other major conditions identified were chorioretinopathy and retinitis pigmentosa (2.2%), total blindness in at least one eye (1.1%), and complete optic atrophy (0.5%). Refractive conditions were identified in 41.1% of the participants. Out of this, 28.6% had refractive error, 11.4% had presbyopia and 1.1% were amblyopic cases.

Demographic variables used to predict disease outcome included age, sex and duration as a farmer. Of the variables tested, only age could predict the occurrence of a disease involving the lens ($p = 0.001$) and retina ($p = 0.007$). The relative risk ratio for developing a lens related disease as one gets older was 1.25.

Reported incidence of injury varied among the various activities farmers are engaged in the farm. Weeding recorded the highest incidence (40.5%) of injury among the cocoa farmers with spraying and pruning recording the second and third highest injury incidence of 10.8% and 9.7% respectively while drying of seeds by farmers recording the least incidence of (1.0%)

Several hazards at the worksite were reported as causes of injury on farms. The main causes of injury recorded in this study were projectiles (mainly flying stones and sand) (25.8%) followed by falling branches and leaves (20.2%), foreign body (17.8%), chemicals (14.5%), stick (11.3%) and cocoa husk and pods (6.4%). Others such as cutlass wound, rope and insects represented (4.0%) of all causes of injury reported.

There were mixed findings on the odds of being injured. The odds for sustaining ocular injuries were higher for males than females during spraying (1.5), pruning (2.4) and plucking of cocoa pods. This may be attributed to the dominance of males in these activities in cocoa farms. The odd of sustaining injury during spraying among 60-69 year old farmers was 1.58. Apart from spraying, farmers who had been engaged in the industry for 10 years and above had higher risk of sustaining ocular injury (1.39 – 4.6) for weeding, pruning and plucking of cocoa pods. This could be explained against the backdrop that with increasing years of farming and continued engagement in farm activities, one was more likely to sustain injury in the absence of use of protective equipment. However, spraying of chemicals without using goggles, could lead to injury irrespective of the number of years on has been a farmer but farmers who worked on relatively large farms (more than 7 acres) had higher odds (1.46- 1.66) of sustaining ocular injury during spraying and weeding.

Though 93% of cocoa farmers were aware of the protective effect of goggles only 25.4% used them when spraying farms, 2.2% when applying fertilizer and 1.6% during pruning. The prevalence of goggle use for other farm activities such as splitting of pods and plucking which had equal chances of potentially causing injury to the eye was very low, ranging from 0.5 to 1.6%. The implication is that there is a gap between awareness of the protective effects and utilization of goggles. This situation must be addressed by policy makers in the health and agricultural sector.

The use of goggles can significantly reduce injury outcomes of farms. However, several reasons were advanced for the low use of goggles among the cocoa farmers. These included unavailability (34.5%), poor knowledge

(23.2%), and no money or non affordability (19.6%). Other reasons were uncomfortable with use, and foggy vision upon use of goggles.

Visual impairment and blindness in a population incapacitates people in the performance of their daily activities and limits their capacity to live a well meaningful life. The prevalence of visual impairment and blindness among the population studied was (16.7%). The main causes of visual impairment using best corrected VA were cataract (8.6%), refractive error (3.8%), glaucoma (2.2%) and cornea opacity (1.1%).

Finally, on the perception of cocoa farmers on their visual, only 3.8% of farmers reported that they had very good vision. However, the clinically measured visual acuity revealed that 29.2% of the farmers rather had very good vision. Again, while only 10.8% of respondents reported good vision, 38.9% rather had good vision most probably unknown to them and therefore likely not to take steps to maintain good vision. While about 42.7% reported that they had poor vision, only 22.2%, approximately half of this population really had poor vision and while 43.2% reported having very poor vision; only 9.7% of them really had very poor vision upon testing.

Conclusions

The ocular health of cocoa farmers is vital to their productivity and individual well-being. It also has implications for the level of cocoa production which has the potential of influencing the economic fortunes of Ghana. From the summary, the following conclusions may be made from the study.

The data in this study suggest that cocoa farmers had several eye conditions and yet had high level of unmet needs for both routine preventive eye care and treatment or correction of their vision problems.

The highest levels of injuries were reported during weeding, spraying of chemicals, pruning and plucking of cocoa pods. The major causes of injury reported were projectiles (mainly flying stones and sand) followed by branches and leaves, foreign body, chemicals, stick and cocoa husk and pods. Minor causes included cutlass wound, rope and insects.

Despite the recorded injury levels, only a quarter of farmers in this study used goggle during spraying of chemicals on farms. Other activities on the farm which could potentially cause damage to the eye such as plucking and splitting of pods recorded very low frequencies of goggle use on the farm. Barriers to wearing goggles among the cocoa farmers included unavailability, lack of education, and lack of money. Other reasons were uncomfortable with use, high cost and foggy vision upon use of goggles.

Visual impairment is an impediment to task performance among populations. The prevalence of visual impairment and blindness recorded among the farmers may have negative implications for cocoa production in Ghana since visual performance relates directly to productivity. The main causes of visual impairment recorded among the population studied were cataract, refractive error, glaucoma and cornea opacity. The magnitude of these diseases among cocoa farmers is of great concern.

Finally data in this study revealed that cocoa farmers had a very poor perception of their visual status since 85.4% of them reported either poor or very poor vision as against the measured 31.9% of poor or very poor vision.

Recommendations

From the conclusions and the entire study, the following recommendations are made.

1. The Ghana Cocoa Board in collaboration with the Ministry of Health shall initiate a comprehensive eye care programme to provide eyecare services to cocoa farmers, being key in provision of foreign exchange for the country, to enable them find remedy to the various ocular conditions identified among them.
2. Health workers and agricultural extension officers may help educate cocoa farmers on the possible causes of ocular injury on farms and the advantages of eye protection when working in the farm. Education about eyewear may also have to confront barriers to the use of eyewear. Greater promotion of eye safety practices is needed and highly encouraged.
3. Future studies in this subject area by occupational health experts and students must cover larger participants to allow for reasonable conclusions on the topic and for wider policy application. The study could also find out the mechanism farmers consider as best mode to help them change their behaviour on ocular health. Colour vision assessment, which was not part of this study, could be incorporated in future studies among cocoa farmers.

REFERENCES

Adeogun, S. O., & Agbongiarhuoyi, A. E. (2009). Assessment of Cocoa Farmers Chemical Usage Pattern in Pest and DiseaseManagement in Ondo State. *J. Innov. Dev. Strategy, 3*(2), 27-34.

Alfers, L. (2010). *Occupational health and safety for informal workers in Ghana: A case study of market and street workers in Accra* (Doctoral thesis,University of Kwazulu – Natal, South Africa). Retrieved from http://erd.eui.eu/media/2010/Alfers-201006.pdf on January 10, 2011.

Allingham, R. R. (2008). Assessment of Visual Status of the AETA, a Hunter-Gatherer Population of the Philippines (An AOS Thesis) *Trans Am Ophthalmol Soc*, *106*, 240–251.

Anang, T.B. (2011). Market Structure and Competition in the Ghanaian Cocoa Sector after Partial Liberalization. *Current Research Journal of Social Sciences 3*(6), 465-470.

Anim-Kwapong, G.J., & Frimpong, E.B. (2004). *Vulnerability of agriculture to climate change – impact of climate change on cocoa production*: Cocoa Research Institute of Ghana, New-Tafo Akim.

Annan, B.,T., Adusei, K., & Mintah, E. (2011). Farmers assessment of Benefits and constraints of Ghana Cocoa Sector reforms. *Current Research Journal of Social Sciences, 3*(4), 358-363.

Arcury, T.A., & Quandt, S.A. (2007). Delivery of health services to migrant and seasonal farmworkers. *Ann Rev Publ Health*, *28*, 345–363.

Asamoah, M., & Baah, F. (2003, October). *Improving Research-Farmer linkages*: The role of CRIG. A paper submitted at the fourth international seminar on Cocoa Pests and Diseases (NECOPED)

Accra, Ghana.

Asuming-Brempong, S., Sarpong, D.B., Asenso-Okyere, K., & Amoo P.(2006). Labour practices in cocoa production in Ghana (pilot survey). Retrieved from http://www.aktiv-gegen-kinderarbeit.de on July 3, 2011.

Baker, E., Israel, B. A., & Schurman, S. (1996). The integrated model: Implications for worksite health promotion and occupational health and safety practice. *Health Education Quarterly, 23*(2), 175-190.

Barber, B. (2007). *Occupational health dealing with the issues*: A Trade Union Congress Workbook. London: Union learn Congress House.

Bartel, P. (2010). An overview of cocoa production in Ghana and Cote d'Ivoire Retrieved from http://www.scn.org/rdi/kw-coc.htm on June 3, 2011.

Bateman, R. (2010). *Pesticides use in cocoa*: A guide for training administrative and research staff. 1st Ed. Retrieved from http://www.cocoafederation.com/Manual_ICCO_2ndEd_final[1].pdf Retrieved on March 4, 2011.

Benach, J., Muntaner, C., & Santana, V. (2007). *Employment conditions and health inequalities.* Employment Conditions Knowledge Network, Final Report to WHO Commission on Social Determinants of Health, 2007. Retrieved from http://www.who.int/social_determinants/themes/employment conditions/en/ on May 8, 2011.

Bird, F. E., & Germain, G. L. (1997). *The property damage accident: The* *neglected part of safety*. Loganville, GA: Institute Publishing, Inc.

Bøås, M., & Huser, A. (2006). Child labor and cocoa production in West Africa: The case of Cote d'Ivoire and Ghana. *Fafo Report 522. Research Programme on Trafficking and Child Labour*. Retrieved from: www.fafo.no/pub/rapp/522/522.pdf on June 1, 2011.

Breisinger, C., Diao, X., Kolavalli, S., & Thurlow, J. (2008). *The Role of Cocoa in Ghana's Future Development.* Ghana Strategy Support programme. International Food Policy Research Institute.

Breslin, C.F., Day, D., Tompa, E., Irvin, E., Bhattacharyya, S., & Clarke, W., A.(2006). *Systematic review for risk factors for injuries among youth: summary.* Institute for Work and Health. Retrieved from http://www.iwh.on.ca/sbe/systematic-review-ofrisk-factors-for-injury-among-youth-summary on May 24, 2010.

Brison, R.J., & Pickett, C.W. (1991). Nonfatal farm injuries in eastern Ontario: a retrospective study. *Accid Anal Prev, 23*(6):585-594.

Bromley,W.D., & Segerson, K. (1992). *The Social Response to Environmental Risk*: Policy Formulation in an Age of uncertainty, p.197

BulíÍ, A. (2003). Can price incentive to smuggle explain the contraction of the cocoa supply in Ghana? *J. Afr. Econ*., *11*(3), 413-439.

Burton, J. (2010). *WHO Healthy Workplace Framework and Model*: Background Document and Supporting Literature and Practices. Geneva, Switzerland. Retrieved from http://www.whoindia.org/LinkFiles/Health_Promotion_Health_Promotion_Powering_India%27s_Growth pdf on May 29, 2011.

Byfield, S. (2011). *IAPB briefing Paper*: Blindness and NCDs .Retrieved from http://www.who.int/mediacentre/factsheets/fs282/en/index.html on January 2, 2012.

Carson, H. G. (2009). *Environmental and Occupational Optometry*. London: Butterworth Heinemann Publications.

Casali, J. G. (1990). Multiple factors affect speech communication in the workplace. *Occupational Health and Safety, 58*, 32-42.

Centre for Disease Control and Prevention.(1995).Eye injuries to agricultural workers - Minnesota, 1992–1993. *MMWR Morb Mortal Wkly Rep*. *44*, 364–366.

Cheng, A.C.K., Pang, C.P., Leung, A.T.S., Chua, J.K.H., Fan, D.S.P., & Lam, D.S.C.(2000). The association between cigarette smoking and ocular diseases. *HKMJ, 6*(2), 195-202.

Clarke, E. (2005). *Do occupational health services really exist in Ghana?.* In: S. Lehtinen, J. Rantanen, K. Elgstrand, J. Liesivuori, and Peurala, M. (eds,), Challenges of Occupational Health Services in the Regions. The National and International Responses, Proceedings of a WHO/ICOH/ILO Workshop, 24 January, Finnish Institute of Occupational Health, Helsinki, pp. 16-25. Retrieved from: http://www.rics.org/site/download_feed.aspx?fileID=8099&fileExtens on June 12, 2011.

COCOBOD (2000). *Ghana Cocoa Board Handbook.* 8th ed. Accra: Jamieson's Cambridge Faxbooks Ltd. p 62.

COCOBOD (2002). *Socio-Economic Study*. Final Report. Accra: Cocoa Board, Ghana.

Cox, T., Griffiths, A., & Rial- González, E. (2000). *Research on work-related* *stress*, Luxembourg: Publications Office of the European Union. Retreieved from http://osha.europa.eu/en/publications/reports/203 on July 2, 2011.

Diamantopoulou, A. (2003). *Gender issues in safety and health at work* – A review. European Agency for Safety and Health at Work, Belgium. Retrieved from http://europa.eu.int on August 20, 2011.

Dormon, E.N.A., Van-Huis, A., Leeuwis, C., Obeng- Ofori, D., & Sakyi-Dawson, O. (2004). Causes of low productivity of cocoa in Ghana: farmers' perspectives and insights from research and the socio-political establishment. *NJAS Wageningen J. Life Sci*, *11*(3/4), 237-259.

Driscoll. T., Takala, J., Steenland, K., Corvalan, C., & Fingerhut, M. (2005). Review of estimates of the global burden of injury and illness due to occupational exposures. *American Journal of Industrial Medicine, 48,* 491-502.

Drummond, A. (2007). *A Review of the Occupational Diseases Reporting System in the Republic of Ireland*. University College of Dublin, Health and Safety Authority (HSA). Retrieved from http://hdl.handle.net/10147/76879 on May 12, 2011.

Enos,D.M., Kehrhahn,T.M., & Bell, A. (2003) Informal Learning and the Transfer of Learning: How Managers Develop Proficiency *Human Resource Development Quarterly*, *14*(4), 369-387.

Etherton, J.R., Myers J.R., Jensen, R.C., Russell, J.C., & Braddee R.W. (1991). Agricultural machine-related deaths. *American Journal Public Health 81*(6), 766-768.

European Agency for Safety and Health at Work (2003), *Gender issues in* *safety and health at work - A review*. Luxembourg: Office for Official Publications of the European Communities

Ferguson C. K., Gerberich, S.G., Church, T.R., Ryan, A.D., Alexander, B.H., Mongin, S.J., Renier, C.M., Zhang, L.R., French, X., & Masten, A. (2005). Tractor-Related Injuries: A Population-Based Study of a Five-State Region in the Midwest. *American Journal of Industrial Medicine, 47*(3):254-64.

Fichtenberg, C.M., & Glantz, S.A.(2002). Effect of smoke-free workplaces on smoking behaviour: a systematic review. *British Medical Journal*, 325:188.

Forst L, Noth IM, Lacey S, Bauer S, Skinner S, Petrea R., & Zanoni, J.(2006). Barriers and benefits of protective eyewear use by Latino farm workers. *J Agromedicine.11*(2), 11-7.

Galdas, P. M., Cheater, F., & Marshall, P. (2005), Men and health help-seeking behaviour: literature review. *Journal of Advanced Nursing*, *49*, 616–623. doi: 10.1111/j.1365-2648.2004.03331.

Geigle, S. (2000). Safety supervision and leadership – OSHAcademy course 712 study guide. Geigle Safety Group Inc. Retrieved from: http://www.oshatrain.org/courses/studyguides/712studyguide.pdf on May 3, 2012

Geller, E. S.(1996). *The psychology of safety:* How to improve behaviours and attitudes on the job. Boca Raton, FL: CRC Press.

Geller, E. S. (1998a). *Applications of behaviour analysis to prevent injuries from vehicle crashes*, (2nd Ed). Cambridge, MA: Cambridge Center for Behavioural Studies.

Geller, E. S. (1998b). *Beyond safety accountability*: How to increase personal responsibility. Neenah, WI: J.J. Keller & Associates, Inc.

Ghana Cocoa Board. (2011). *Cocobod Hits One Miillion Tonnes Target*. Retrieved from http://www.cocobod.gh/news_details2.php on November 3, 2011.

Ghana Districts, (2006). A repository of all districts in the Republic of Ghana. Retrieved from http://www.ghanadistricts.com on July 5, 2011.

Ghana Statistical Service, GSS (2009). *Key Social, Economic and Demographic Indicators*. Retrieved from http://www.statsghana.gov.gh/KeySocial.html on June 21, 2011.

Ghana Statistical Service, GSS (2010). *Population and housing census*. Retrieved from http://www.statsghana.gov.gh/docfiles/2010phc/Census2010_Summary_report_of_final_results.pdf on June 2, 2012.

Glanz, K., Lewis, F. M., & Rimer, B. K. (1997). *Health behaviour and health education*, (2nd ed). San Francisco, CA: Jossey-Bass.

Gochman, D. S.(1997). *Handbook of health behaviour research: Vol. 1 Personal and social determinants.* New York, NY: Plenum Publishing Corporation.

Goldenhar, L. M., & Schulte, P. A. (1994). Intervention research in occupational health and safety. *Journal of Occupational Medicine, 36*, 763-775.

Goldstein, I. L. (1975). Training. In B. L. Margolis & W. H. Kroes (Eds.), *The human side of accident prevention: Psychological concepts and principles which bear on industrial safety.* Springfield, IL: Charles C

Thomas Publisher.

Good, G. W. (2001). *Occupational vision manual*-American Optometric Association. Retrieved from www.aoa.org on September 22, 2008

Grether, C. B. (1975). Engineering psychology. In B. L. Margolis &. Kroes, W. H (Eds.), *The human side of accident prevention: Psychological concepts and principles which bear on industrial safety.* Springfield, IL: Charles C Thomas Publisher.

Grossman-Greene, S., & Bayer, C. (2009). *A Brief History of Cocoa in Ghana and Côte d'Ivoire.* Payson Centre for International Development, Tulane University.

Guastello, S. J. (1993). Do we really know how well our occupational accident prevention programs work? *Safety Science, 16,* 445-463.

Guzek, J. P., Anyomi, F. K., Fiadoyor, S., & Nyonator, F. (2005). Prevalence of Blindness in People Over 40 Years in the Volta Region of Ghana. *Ghana Med J, 39*(2): 55–62.

Gyasi, M.E., Amoaku, W.M.K., & Adjuik, M.A. (2007). Epidemiology of hospitalized ocular injuries in the Upper East Region of Ghana. *Ghana Medical Journal, 41*(4), 171-175.

Hagel, L.M., Dosman, J.A., Rennie, D.C., Ingram, M.W., & Senthilselvan, A. (2004). Effect of Age on Hospitalized Machine-Related Farm Injuries Among the Saskatchewan Farm Population. *Journal of Agricultural Safety and Health 10*(3), 155-162.

Harms-Ringdahl, L. (1993). *Safety analysis: Principles and practice in occupational safety.* New York, NY: Elsevier Science Publishers LTD

Heinrich, H. W., Petersen, D., & Roos, N. (1980). *Industrial accident prevention: A safety management approach* (5th Ed). New York, NY: McGraw-Hill

Heintz, J. (2005). Employment, Poverty, and Gender in Ghana'. *Working Paper Series No 92*. University of Massachusetts Amherst: Political Economy Research Institute.

Herbert, R., & Landrigan, P.J. (2000). Work-Related Death: A Continuing Epidemic. *American Journal of Public Health*. *90* (4), 541- 545.

Hill, P. (1963). *The Migrant Cocoa Farmers of Southern Ghana. A Study in Rural Capitalism*. Cambridge, UK:University Press.

Hiratsuka, Y., & Li, G. (2001). Evidence for the associations of alcohol consumption with eye diseases was gathered. *Journal of Studies on Alcohol Epidemiologic, 62*(3):397-402.

Hoskin, A. F., Miller, T. A., Hanford, W. D., & Landes, S. R. (1988). *Occupational injuries in agriculture*: a 35-state summary. Chicago, IL: National Safety Council.

Hoyos, C. G., & Ruppert, F. (1995). Safety diagnosis in industrial work settings: The Safety Diagnosis Questionnaire. *Journal of Safety Research, 26*, 107-117.

Hwang, S., Gomez, M., Sobotova, L., Stark, A.D., May, J.J., & Hallman, E.M. (2001). Predictors of Hearing Loss in New York Farmers. *American Journal of Industrial Medicine, 40*, 23-31.

ICCO, (2012). Quarterly Bulletin of Cocoa Statistics, Production of cocoa beans Vol. XXXVIII, No. 2, Cocoa year 2011/12, 2012

Institute of Medicine, (1988). *The future of public health*. Division of Health

Care Services, Committee for the Study of the Future of Public Health.Washington, DC: National Academy Press.

International Labour Organisation, (2002). *Recording and notification of occupational accidents and diseases and ILO list of occupational diseases. International Labour Conference. Papers from 90th Session, Geneva, June 2002*. Geneva: International Labour Office. http://www.ilo.org/public/english/standards/relm/ilc/ilc90/rep-v-1.htm#Introduction#Introduction on November 12, 2011

International Labour Organization, (2003). *Safety in numbers, pointers for global safety culture at work*, Geneva. Retrieved from http://www.ilo.org/public/english/region/eurpro/moscow/areas/safety/docs/safety_in_numbers_en.pdf on July 20, 2011.

International Labour Office, (2004). *Global strategy on occupational safety and health*: conclusions adopted by the International Labour Conference and its 91st session, 2003. Geneva.

International Labour Organization, (2004). Facts on Safe work. Retrieved from http://www.ilo.org/legacy/english/protection/safework/worldday/products04/factsheet04_eng.pdf on May 10, 2011.

International Labour Organisation, (2005). *World Day for Safety and Health at Work: A Background Paper.* Geneva: International Labour Office http://www.ilo.org/public/english/bureau/inf/download/sh_background.pdf on November 10, 2011.

International labour Organization, (2009). *Identification and recognition of occupational diseases:* Criteria for incorporating diseases in the ILO list of occupational diseases. Meeting of Expert on the Revision of the List of Occupational Diseases (Recommendation No. 194), ILO - Geneva.

Islam, S.S., Doyle, E.J., Velilla, A., Martin, C.J., & Ducatman, A.M.(2000). Epidemiology of compensable work related ocular injuries and illnesses: incidence and risk factors. *J Occup Environ Med, 42*,575–581.

Jewell, L. N. (1998). *Contemporary industrial/organizational psychology.* Pacific Grove, CA: Brooks/Cole Publishing Company.

Johnson, D. (1996). *Trends in industrial safety and health*. Keynote presentation at the First Annual Behavior-Based Safety Users Conference for Safety Performance Solutions, Inc. Coco Beach, Florida. June 6, 2012.

Kaleta, D., & Jegier, A. (2005). Occupational energy expenditure and leisure-time physical activity. *International Journal of Occupational Medicine & Environmental Health, 18* (4), 151-156.

Kanski, J.J. (2009). *Clinical Ophthalmology*-a synopsis. London: Butterworth Heinemann Elsevier limited, 2nd Ed.

Kasl, S. V., & Cobb, S. (1966a). Health behaviour, illness behaviour, and sick-role behaviour. I. Health and illness behaviour. *Archives of Environmental Health, 12,* 246-266.

Kasl, S. V., & Cobb, S. (1966b). Health behaviour, illness behaviour, and sick-role behaviour. II. Sick-role behaviour. *Archives of Environmental*

Health, *12*, 531-541.

Kendall, N. (2005). *International Review of Methods and Systems used to Measure and Monitor Occupational Disease and Injury. NOHSAC Technical Report 3.* Wellington: National Occupational Health and Safety Advisory Committee.

Kerr, J., Griffiths, A., & Cox, T. (1996). *Workplace health: Employee fitness and exercise.* Bristol, PA: Taylor & Francis.

Kroemer, K. H. E., & Grandjean, E. (1997). *Fitting the task to the human: A textbook of occupational ergonomics* (5th Ed). Bristol, PA: Taylor & Francis Inc.

Lacey, S.E., Forst, L.S., Petrea, R.E., & Conroy, L.M. (2007). Eye injury in migrant farm workers and suggested hazard controls. *J Agric Saf Health*, *13*(3):259-274.

Lee, J.W., Cha, S.E., & Moon,K,E.,(2010). Disease Prevalence and Mortality among Agricultural Workers in Korea, *J Korean Med Sci, 25: S112-118.* doi: 10.3346/jkms.2010.25.S.S112

Leigh, J., Macaskill, P., Kousma, E., & Mandryk, J. (1999). Global Burden of Disease. *Epidemiology 10* (5), 627-631.

Lucas, O. A., & Gilles, H.M. (2003). *Short textbook of public health medicine for the tropics*. London: Bookpower Publication, 4th Ed

Maltais, V. (2007). Risk Factors Associated with Farm Injuries in Canada 1991 - 2001 *Statistics Canada – Agicultural Division*- Catalogue no. 21-601-MIE

McAfee, R. B., & Winn, A. R. (1989). The use of incentives/feedback to enhance workplace safety: A critique of the literature. *Journal of*

Safety Research, *20*, 7-19.

McCurdy, S.A., & Carroll, D.J. (2000). Agricultural Injury. *American Journal of Industrial Medicine*, *38*, 463-480.

McKenzie, F. J., Pinger, R. R., & Kotecki, E. J. (2008). *An Introduction to Community Health*. NY: Jones and Bartellet Pub. 6^{th} Ed, p 567

McSween, T. E. (1995). *The values-based safety process: Improving your safety culture with a behavioral approach.* New York, NY: Van Nostrand Reinhold.

Menendez, C. C., Amick, B.C., Robertson, M., Bazzani, L., DeRango, K., Rooney, T., & Moore, A. (2012). A replicated field intervention study evaluating the impact of a highly adjustable chair and office ergonomics training on visual symptoms. *Appl Ergon, 43*(4), 639-644.

Ministry of Finance and Economic Planning (2011) Infrastructural Development for Accelerated Growth and Job Creation – 2012 Budget, Accra: MOFEP. Retrieved from http://www.ghana.gov.gh/documents/2012full.pdf on February 8, 2012.

Mitchell, S.O., Blitzstein, S. D., Gordon, M., & Mazo, F.J. (2003). *Benefits for the Workplace of the Future.* Philadelphia: University of Pennsylvanian Press.

Mittal, S., Apoorva, M., & Ramakrishnan, R. (2008). Ocular manifestations in bidi industry workers: Possible consequences of occupational exposure to tobacco dust *Indian J Ophthalmol*, *56*(4), 319-322.

Mock, C., Adjei, S., Acheampong, F., Deroo, L., & Simpson, K. (2005).Occupational Injuries in Ghana. *International Journal of*

Environmental Health, 11, 238-245.

Ntim –Amponsah, C. T., Amoaku, W.M.K., & Ofosu-Amaah, S. (2005). Alternate eye care services in a Ghanaian district. *Ghana Medical Journal, 39* (1), 19-23.

Okoye, O.I., & Umeh, R.E. (2002). Eye health of industrial workers in Southeastern Nigeria. *West Afr J Med*, *21*(2), 132-7.

Omoti, A.E., Edema, A.T., Akinsola, F.B., & Aigbotsua, P. (2009). Non-traumatic Ocular findings in industrial technical workers in Delta State, Nigeria, *Middle East African Journal of Ophthalmology*, *16*(1), 25-8.

Opatz, J. P. (1994). *Economic impact of worksite health promotion.* Champaign, IL: Human Kinetics Publishers.

Osotimehin, B. (2011). State of world population. People and possibilities in a world of 7 billion. UNFPA. Retrieved from http://foweb.unfpa.org/SWP2011/reports/EN-SWOP2011-FINAL.pdf on April 10, 2011.

Pantry, S. (1995). *Occupational health*. London: Chapman and Hall Inc, p. 295

Pascolini, D., & Mariotti, S.P. (2010).Global estimates of visual impairment. *Br J Ophthalmol, 96* (5), 614-8. Retrieved from http://www.vision2020.org/mediaFiles/downloads/40788738/bjophthalmol_2011_300539_full.pdf on December 5, 2011

Pease, E. S. (1985). *Occupational safety and health: A source book.* New York, NY: Garland Publishing, Inc.

Peate, W.F. (2007). Work-related eye injuries and illnesses. *Am Fam Physician*, *75*(7), 1017-22.

Petersen, D. (1996). *Safety by objectives: What gets measured gets done*. New York, NY: Van Nostrand Reinhold.

Pettinger, B.C. (2000). Improving occupational safety & health interventions: A comparison of safety self-efficacy & safety stages of change. Retrieved from: http://scholar.lib.vt.edu/theses/available/etd-04282000 15310049/unrestricted/dissertation_new.pdf on June 20, 2011.

Pirani, M., & Reynolds, J. (1976). Gearing up for safety. *Personnel Management, 19*, 25-29.

Pitts, G, D., & Klieinstein, N. R. (1993). *Environmental vision*; *interactions of the eye, vision and the environment*. London: Butterworth-Heinemann Publications.

Quandt, A.S., Feldman, R.S., Vallejos, M.Q., Schulz, R.M., Verma, A., Fleischer, B.A., & Arcury, A.T. (2008). Vision Problems, Eye Care History, and Ocular Protection among Migrant Farmworkers. *Archives of Environmental & Occupational Health*, *63*(1), 13- 6.

Quandt, S.A., Arcury, T.A., Rao, P., Mellen, B.G., Camann, D.E., Doran, A.M., ... Jackson, D.S. (2004). Agricultural and residential pesticides in wipe samples from farmworker family residences in North Carolina. *Environ Health Perspect*, *112*:382-387

Quandt, S.A., Elmore, R.C., Arcury, T.A., & Norton, D. (2001). Eye Symptoms and eye protection use by seasonal and migrant farmworkers. *South Med J*, *94*(6), 603-7.

Ramazzini, B. (1713). *De Morbis Artificum.* Translated by Wright, W. C. (1964). Diseases of workers. London: Hafner Publishing.

Raouf, A., & Dhillon, B. S. (1994). *Safety assessment: A quantitative approach.* Boca Raton, FL: Lewis Publisher.

Retzlaff, C., & Hopewell, J. (1996). *Puntos de Vista: Primary Eye Care in Migrant Health - Eye Care Needs Assessment* [MCN Monograph Series]. Austin, TX: Migrant Clinicians Network.

Roughton, J. E. (1996). *Ergonomic problems in the workplace.* Rockville, MD: Government Institutes, Inc.

Roy, S., & Dasgupta, A. (2008). A study on health status of women engaged In a home-based "Papad-making" industry in a slum area of Kolkata. *Indian J Occup Environ Med*, *12*(1), 33–36.

Saha, K. T., Dasgupta, A., Butt, A., & Chattaopadhyay, B. (2010). Health Status of Workers Engaged in the Small-scale Garment Industry: How Healthy are They*? Indian J Community Med. 35*(1), 179–182

Schmid-Kubista, K.E., Kellner, L., Maier, H., Felke, S., Wanka, A.**,** El Modeir, A., ... Binder, S.(2010). Effect of work-related ultraviolet exposure and ophthalmic changes in Austrian farmers: the SVB-UV study. *Ophthalmic Res*, *43*(4), 201-7.

Smith, A. T. (1999). What's wrong with behaviour-based safety? *Professional Safety,* 9(3), 1- 8.

Sprince N.L., Zwerling, C., Lynch, C.F., Whitten, P.S., Thu, K. Logsden-Sackett, N., ... Alavanja. M.C.R. (2003). Risk Factors for Agricultural Injury: A Case-Control Analysis of Iowa Farmers in the Agricultural Health Study. *Journal of Agricultural Safety and Health, 9* (1), 5-18.

Sprince, N. L., Zwerling, C., Whitten, P.S., Lynch, C. F., Burmeister, L.F., Gillette, P. P., ... Alavanja, M. C. R.(2008). Farm Activities

Associated with Eye Injuries in the Agricultural Health Study, *Journal of Agromedicine*, *13*(1), 17 – 22

Stallones, L., & Beseler, C. (2003). Farm work practices and farm injuries in Colorado. *Injury Prevention, 9*, 241-244.

Stuart, L. (2008). Managing Chronic Conditions Optimizing Health throughout Life, *Family Health International, 8 (12), 1-44.*

Taylor, S.L., Coates, M.L., Vallejos, Q., Feldman, S.R., Schulz, M.R., Quandt, S.A., ... Arcury, T.A. (2006). Pterygium among Latino migrant farmworkers in North Carolina. *Arch Occup Environ Health*, *61*(1):27-32.

Tayyari, F., & Smith, J. L. (1997). *Occupational ergonomics: Principles and applications.* New York, NY: Chapman & Hall.

Teal, F., Zeitlin, A., & Maamah, H. (2006). *Ghana Cocoa Farmers Survey 2004: Report to Ghana Cocoa Board*. Centre for the Study of African Economics, University of Oxford, Oxford, United Kingdom

Tesfaye, A., & Bejiga, A. (2008). Ocular injuries in a rural Ethiopian community, *East Afr Med J*, *85* (12),593-6.

Threlfall, T.J., & English, D.R. (1999). Sun exposure and pterygium of the eye: a dose–response curve. *Am J Ophthalmol*, *128*,280–287.

Trabelsi, A. (2006).Blindness in North Africa - A look at the Nadi Al Bassar System and an overview of the state of ocular health in North Africa. *Cataract & Refractive Surgery Today.*

Tutu, K. (2011). Trade for Sustainable Development: The Story of Cocoa, Gold and Timber Exports in Ghana. Roundtable discussion organized by the Institute of Economic Affairs (IEA), Accra, 2011. *Bus & Financ Times, 12*(9), 1-3

Verma,A., Schulz, R.M., Quandt, S.A., Robinson, N. E., Grzywacz,G.J., Chen, H., & Arcury, A.T. (2011). Eye Health and Safety among Latino Farmworkers. *J Agromedicine*. *16*(2): 143

Verma, A. (2010). Visual Impairment and Eye Health and Safety among Latino Farmworkers. University of North Carolina at Greensboro, dissertation. Retrieved from http://libres.uncg.edu/ir/uncg/f/Verma_uncg_0154D_1079.pdf on November 23, 2012

Vigneri, M. (2007). Drivers of cocoa production growth in Ghana, [ODI Briefing No 4], Overseas Development Institute.

Vigneri, M., & Santos, P. (2007). Ghana and the cocoa marketing dilemma: What has liberalization without price competition achieved? ODI Project Briefing, No 3.

Villarejo, D., & Baron, S.L. (1999). The occupational health status of hired farm workers. *Occup Med: State of the Art Reviews, 14*, 613–635.

Virtanen, S.V., Notkola, V., Luukkonen, R., Eskola, E., & Kurppa, K., (2003). Work Injuries among Finnish Farmers: A National Register Linkage Study 1996-1997.*American Journal of Industrial Medicine, 43*, 314-325.

Viscusi, W. K. (1983). *Risk by choice.* Cambridge, MA: Harvard University Press.

Wilde, G. J. S. (1998). The concept of target risk and its implications for accident prevention strategies. In A. M. Feyer & A. Williamson (Eds.) *Occupational injury: Risk, prevention and intervention.* Bristol, PA: Taylor & Francis Inc.

Wilson, J.D., Takahashi, K., Smith, R.D., Yoshino, M., Tanaka, G., & Takala, J. (2006) Recent Trends in ILO Conventions Related to Occupational Safety and Health, *International Journal of Occupational Safety and Ergonomics* (*JOSE*), *12*(3), 255–266.

Winett, R. A. (1998). A framework for health promotion and disease prevention programs. *American Psychologist*, *50*(5), 341-350.

World Health Organization, (1948). Preamble to the Constitution of the World Health Organization. No. 2, p. 100. Geneva: World Health Organization.

World Health Organization, (1973). *WHO Study Group on the Prevention of Blindness:* Technical Report Series No 518, Geneva: World Health Organization.

World Health Organization, (1997). *Health and Environment in sustainable development*. Geneva: World Health Organization. Retrieved from http://www.who.int/peh/Occupational_health/occupational_health2.htm on May 10, 2011.

World Health Organization, (2003). *Global Status Report on Non Communicable Diseases.* Geneva: World Health Organization.

World Health Organization, (2003). *The World Health Report.Geneva:*

World Health Organization. Retrieved from http://www.who.int/occupational_health/en/ on August 12, 2011.

World Health Organization, (2009).*Occupational health*. Geneva: World Health Organization. Retrieved from http://www.who.int/occupatioal_health/en/ on February 2, 2011.

World Health Organization, (2010). *International Statistical Classification of Disease and Health Related Problems*. 10th Revision. Instructional Manual, 2010 Ed. Retrieved from http://www.who.int/classifications/icd/ICD10Volume2_en_2010.pdf on July 2, 2011.

World Health Organization, (1994). *Declaration on occupational health for all* WHO/OCH/94. Retrieved from: http://www.who.int/occupational_health/publications/declaration/en/ on April 4, 2011.

World Health Organization, (2012) .Global data on visual impairment, 2010. WHO/NMH/PBD/12.01. Retrieved from http://www.who.int/blindness/GLOBALDATAFINALforweb.pdf on February 5, 2013

Ylikoski, M., Lehtinen, S., Kaadu, T., & Rantanen, J.(2006). *Health in the world of work: workplace health promotion as a tool for improving and extending work life.* (Reports of the Ministry of Social Affairs and Health), *62,* 3-4. Helsinki: Finnish Institute of Occupational Health.

APPENDICES

Appendix 1

INFORMED CONSENT FORM

Title: **OCULAR HEALTH AMONG COCOA FARMERS AT MFUOM IN THE CENTRAL REGION OF GHANA**

Principal Investigator: SAMUEL BERT BOADI-KUSI

Address: DEPARTMENT OF POPULATION AND HEALTH- FACULTY OF SOCIAL SCIENCES UNIVERSITY OF CAPE COAST

General Information about Research

Dear Participant,

You are being invited to consider participating in a study titled "Ocular health among cocoa farmers at Mfuom". The goal of this study is to assess the ocular health status, safety and working conditions of cocoa farmers at Mfuom. The research will involve other cocoa farmers within your community who are 18years and above. You will be required to answer a structured interview and also avail yourself for a comprehensive ocular health examination by a team of eye care professional lead by the principal researcher from the Optometry Department of the University of Cape Coast

Procedures

You will be required to provide information on cocoa farming activities which you are involved in as well as safety practices on the farm through a structured interview. If you do not wish to answer any of the questions posed during the interview, you may say so and the interviewer will move on to the next question. The information recorded is considered confidential, and no one else except the principal researcher and his team as well as his supervisor will have access to the information documented during your interview.

You will also be required to avail yourself for a comprehensive eye examination during which some personal information will be asked as part of the case history and other procedures carried out. If you do not wish to subject yourself to any of the procedures in the comprehensive eye examination, you may skip them and opt out since a partial completion of procedures may be irrelevant to the study. The information recorded is considered confidential, and no one else except the principal researcher and his team as well as his supervisor will have access to your survey. All procedures in the examination are non-invasive.

The expected duration of the interview is about 30minutes and the comprehensive eye examination is between 45- 60 minutes.

Possible Risks and Discomforts

It is important to note that some of the examination procedures may be stressful but not harmful to your health. Disclosure of some ocular conditions diagnosed, may have some psychological effect on you but will be essential to your health. However, measures are in place to ensure that such psychological effects are minimized.

Possible Benefits

Ocular conditions of participants which hitherto were not known will be made known to enable you take precautions to ensure good ocular health. At the end of the examination, medications and spectacles will be provided for those who may require them according to our standards. Participants who may require surgery will be referred to appropriate facilities. Finally counselling services will be offered to participants to equip them to maintain optimum ocular safety standards on their farms.

Alternatives to Participation

You are entitled to other appropriate options of treatment other than what the researcher provides depending on your ability to fund such alternative options of treatment. However, the researcher will as much as possible give the best form of treatment available.

Confidentiality

You are assured that this study is purely an academic exercise. We will protect information about you to the best of our ability. You will not be named in any reports. However, the principal researcher and the staff from the Optometry Department as well as the Population and Health Departments of the University of Cape Coast may sometimes have a look at our research records.

Compensation

You will be given eye medications and spectacles based on the outcome of the comprehensive eye examinations.

Additional Cost

Participants who will be referred for surgery but not on the National Health Insurance Scheme may have to bear the cost of the surgery.

Voluntary Participation and Right to Leave the Research

The research is voluntary and may withdraw without any penalty at any point of this research. However, such a decision must be communicated to the principal researcher.

Termination of Participation by the Researcher

If in the course of the examination you are found to be extremely nervous or incorporative, your participation may be terminated by the investigator without regard to the participant's consent.

Contacts for Additional Information

In case you will need any information or answers to pertinent questions about the research or in case of research-related injury, contact the following:

Samuel Bert Boadi - Kusi (OD)

Department of Population and Health

University of Cape Coast

020-8752876

Prof. K. Awusabo-Asare

Department of Population and Health

University of Cape Coast

0244-704605

VOLUNTEER AGREEMENT

The above document describing the benefits, risks and procedures for the research title **OCULAR HEALTH AMONG COCOA FARMERS AT MFUOM IN THE CENTRAL REGION OF GHANA,** has been read and explained to me. I have been given an opportunity to ask any questions about the research answered to my satisfaction. I agree to participate as a volunteer.

______________________ ________________________________

Date Name and signature or mark of volunteer

If volunteers cannot read the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research

______________________ ________________________________

Date Name and signature of witness

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

______________________ ________________________________

Date Name Signature of Person Who Obtained Consent

Appendix 2: Logistic regression for injury during weeding

Injury during weeding	Odds	Std. Err.	Z	P>|z|	[95% Conf. Interval]	
Sex	1.479006	0.511881	1.13	0.258	.7505343	2.914533
Age	0.9808606	0.0145195	-1.31	0.192	.9528118	1.009735
Education	0.8909629	0.1378036	-0.75	0.455	.6579697	1.206461
Farming duration	0.9990442	0.015959	-0.06	0.952	.9682497	1.030818
Area under cultivation	0.9865036	0.0233816	-0.57	0.566	.9417247	1.033412

Number of obs = 185, LR chi^2 (5) = 6.06, Prob > chi^2 = 0.3005, Pseudo R^2 = 0.0243,

Log likelihood = -121.87196

Appendix 3: Logistic regression for injury during spraying

Injury during spraying	Odds	Std. Err.	Z	P>|z|	[95% Conf. Interval]
Sex	0.1712314	0.137424	-2.20	0.028*	.0355173 -.8255179
Age	0.9419116	0.0226198	-2.49	0.013*	.8986049 -.9873054
Education	1.196743	0.3056501	0.70	0.482	.7254416 -1.974236
Farming duration	1.013677	0.0278173	0.50	0.621	.9605963 -1.069691
Area under cultivation	1.014744	0.0251456	0.59	0.555	.9666371 -1.065245

*Significant

Number of obs = 185, LR chi^2 (5) = 14.48, Prob > chi^2 = 0.0129, Pseudo R^2 = 0.1142

Log likelihood = -56.132376

Appendix 4: Logistic regression for injury during pruning

Injury during Pruning	Odds	Std. Err.	Z	P>|z|	[95% Conf. Interval]	
Sex	0.3657947	.2540667	-1.45	0.148	.0937618	1.427081
Age	0.9679928	.0240826	-1.31	0.191	.9219242	1.016364
Education	0.9869104	.2508617	-0.05	0.959	.5996691	1.624216
Farming duration	1.047092	.0254096	1.90	0.058	.9984562	1.098097
Area under cultivation	0.9488197	.058093	-0.86	0.391	.8415259	1.069793

Number of obs = 185, LR chi^2 (5) = 7.30, Prob > chi^2 = 0.1993, Pseudo R^2 = 0.0618,

Log likelihood = -55.384592

Appendix 5: Logistic regression for injury during plucking

Injury during Plucking	Odds	Std. Err.	Z	P>|z|	[95% Conf. Interval]	
Sex	0.1811062	0.199343	-1.55	0.121	.020942	1.566203
Age	0.934269	0.0285568	-2.22	0.026*	.8799423	.9919497
Education	1.44621	0.4217502	1.27	0.206	.8165829	2.561312
Farming duration	1.091732	0.0327312	2.93	0.003*	1.029429	1.157807
Area under cultivation	1.008779	0.028488	0.31	0.757	.9544607	1.066189

Number of obs =185, LR chi^2 (5) =16.24, Prob > chi^2 = 0.0062, Pseudo R^2= 0.1637,

Log likelihood = -41.476222

Appendix 6: Questionnaire

UNIVERSITY OF CAPE COAST

FACULTY OF SOCIAL SCIENCES

DEPARTMENT OF POPULATION AND HEALTH

QUESTIONAIRE

TOPIC: OCULAR HEALTH OF COCOA FARMERS AT MFUOM, CENTRAL REGION

Questionnaire No..

Interviewer's Code.. **Time (GMT): [ ] [ ]**

Participant's Code.. **Date of interview: [ ] [ ] [ ]**

SECTION A: SOCIO-DEMOGRAPHIC VARIABLES

Kindly tick [✓] the appropriate box provided for the necessary information

1. SEX: M [ ] F [ ]
2. Date of Birth: Day................../Month................../Year........................
3. Place of birth.. District...Region..
4. Marital status: [ ] Never married [ ] Married [ ]Living together [ ] Divorced [ ] Separated [ ] Widowed
5. What is your highest level of formal Education [ ] None [ ] Primary [ ]Middle/JHS [ ] Secondary [ ] Tertiary (specify)..

SECTION B: WORKING CONDITIONS

6. How many years have you been engaged in cocoa farming? ....
7. What size of farm (acres) did you cultivate (a) this year... (b) Last year..
8. How many bags of cocoa did you produce (a) this year... (b) Last year..
9. What is your status as a farmer? [ ] Owner [ ] Absentee [ ] Caretaker [ ] Sharecropper [ ] Others (specify)..
10. Which farm methods do you employ on your farm? [ ] Modern [ ] Traditional [ ]Mixed

Kindly tick [✓] the appropriate box/answer

11. Do you agree that the following are stressor related to cocoa farming?			12. If 11 is YES, indicate your level of agreement to the stressor associated with farming		
STATEMENT	**YES**	**NO**	**Low**	**Moderate**	**High**
a. Long hours of work	[ ]	[ ]			
b. Exposure to sun radiations	[ ]	[ ]			
c. Exposure to chemicals	[ ]	[ ]			
d. Exposure to dangerous animals	[ ]	[ ]			
e. Low prestige	[ ]	[ ]			
f. Poverty associated with farming	[ ]	[ ]			
g. Extreme hard work on farm	[ ]	[ ]			
h. Poor yield of cocoa farms	[ ]	[ ]			
i. High cost of labour	[ ]	[ ]			
j. Inability to deal with pests and diseases	[ ]	[ ]			

13. Given the opportunity, would you quit cocoa farming? [ ] Yes [ ] No **If NO, go to 16**

14. If YES in 13, what job would you want to get into?...

15. Why would you want to do such a job instead of cocoa farming?...

SECTION C: CHEMICAL USAGE

16. Do you spray your farm with chemicals? [ ] Yes [ ] No **If NO, go to 21**

17. If you spray your farm with chemicals, which chemicals do you use? [ ] Copper sulphate [ ] Gammalin 20 [ ] Basudin 600 EC [ ] Perenox [ ] Aldrin/Dieldrin or Aldrex 40 [ ] Carbamate [ ] others (specify)...

18. How often do you spray your farm in a year? [ ] Once [ ] Twice [ ] Thrice [ ] others (specify)...

19. What method do you use in spraying? [ ] Blanket spraying [ ] Spot Spraying [ ] others (specify)..

20. For the last spraying, who did it? [ ] Myself [ ] Caretaker [ ] Hired person [ ] Government [ ]others (specify)..

21. Where do you purchase your chemicals? [ ] Open market [ ] Cocoa Marketing Company [ ] MFAA/Government [ ] others (specify)................................

22. How do you obtain a sprayer? [ ] Own one [ ] Rent [ ] Government Sprayers [ ] others (specify)...

23. Do you benefit from the mass spraying exercise by government? [ ] Yes [ ] No. **If NO, go to 25**

24. If Yes in 24, how often is it done yearly? [ ] Once [ ] Twice [ ] Thrice [ ] Others (Specify)...

25. Do you think the mass spraying exercise is adequate? [ ] Yes [ ] No. **If NO, go to 27**

26. If Yes in 25, how often would you wish the mass spraying exercise is done? [ ] Once [ ] Twice [ ] Thrice [ ] Others (Specify)...

27. How do you consider the following before spraying your farm? Kindly tick [✓] the appropriate box/answer

Factors	**Not at all**	**Rarely**	**Often**	**Very often**
Time of day				
Weather				
Direction of wind				
Personal health (sprayer)				
Health of consumers				
Spray based on recommendation				
Spray when appropriate				
Spray with appropriate equipment				
Spray with recommended chemical				
Profit (for high yield)				

Kindly tick [✓] the appropriate box/answer

28. Do you consider the following as constrains to purchasing chemicals?			29. If 29 is YES how will you rate this constraint?		
Constraint	**YES**	**NO**	**Mild**	**Moderate**	**Severe**
High cost	[ ]	[ ]			
Unavailability of chemicals	[ ]	[ ]			
Weak extension links	[ ]	[ ]			
Inadequate government support/policies	[ ]	[ ]			
Probability of adulterated chemicals	[ ]	[ ]			

SECTION D: OCULAR HEALTH

30. How will you rate your visual status? [ ] Very good [ ] Good [ ] Fairly Good [ ] Poor [ ] Very Poor

31. Have you ever had an eye examination before? [ ] YES [ ] No. **If NO, go to 34**

32. If YES in 31, when was your last examination? Day............... Month................. Year...............

33. Where was the examination done? [ ] Hospital [ ] Clinic [ ] Traditional centre [ ] Others (specify)..

SECTION E: PERCEPTIONS ABOUT EYE DISEASES

34. Have you ever had an eye disease? [ ] Yes [ ] No. **If NO, go to 45**
35. If YES in 34, when was the last time you had an eye disease? Day......Month...........Year................
36. What was the problem?...
37. What did you attribute the problem to?...
38. Why did you attribute the problem to that?...
39. How did you solve the problem? [ ] Hospital [ ] Traditional healer [ ] Self healing [ ] Others (specify)...
40. How did you assess the severity of the disease? [ ] Very severe [ ] Severe [ ] moderately severe [ ] Not severe
41. Did the disease affect your work on the farm? [ ] Yes [ ] No
42. If (41) is Yes, how did it affect your work?...
43. How long did the eye diseases last? ....days ....weeks.............................months............................years
44. How many hours/ days did you loose at work due to this disease?...
45. Has there ever been an outbreak of eye diseases in this community? [ ] Yes [ ] No. **If NO, go to 48**

ACTIVITY	46. specific work engaged in		49 A. USE OF PROTECTION										
			49 A USE OF GOGGLES					**49 C** OTHER PROTECTION USED					
			Yes	No	FREQUENCY								
	Yes	No			Very often	Often	Not often	Protective Clothing	Rubber gloves	Rubber boots	Nose Shields	Ear gloves	others
Weeding	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Burning of Bush	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Planting	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Fertilizer Application	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Spraying	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Pruning	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Plucking of Pods	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Splitting of Pods	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Drying of Seeds	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Others (Specify)													

47. If YES in 45, when did this happen? Day............... Month................. Year...............

48. If YES in 45, do you think the outbreak is due to the dominance of cocoa farming activities in this community? [ ] Yes [ ]No

49. If yes, what is your reason?...

50. Do you think that eye wear provides adequate protection? [ ] Yes [ ] No

51. If you do not use any protective eye wear do you have any reason?...

Mod=moderate, Self Med= self medication, Trad: Traditional, Chem shop=Chemical shop, Non= No treatment

52. EYE INJURY

ACTIVITY	EVER HAD EYE INJURY Yes	No	LAST EYE INJURY	CAUSE OF INJURY	SEVERITY OF INJURY Very severe	Severe	Mod	Not severe	USE OF EYE PROECTION AT TIME OF INJURY Yes	No	ACTION TAKEN Self med	Trad	Chem Shop	Hosp	Non	TIME LOSS ON FARM
Weeding	[ ]	[ ]	[ ] [ ] [ ]	....	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	....
Burning Of Bush	[ ]	[ ]	[ ] [ ] [ ]	....	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	....
Planting	[ ]	[ ]	[ ] [ ] [ ]	....	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	....
Fertilizer Applica	[ ]	[ ]	[ ] [ ] [ ]	....	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	....
Spraying	[ ]	[ ]	[ ] [ ] [ ]	....	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	....
Prunning	[ ]	[ ]	[ ] [ ] [ ]	....	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	....
Plucking of Pods	[ ]	[ ]	[ ] [ ] [ ]	....	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	....
Spliting of Pods	[ ]	[ ]	[ ] [ ] [ ]	....	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	....
drying of Seeds	[ ]	[ ]	[ ] [ ] [ ]	....	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	....
Others (Specify)																

Mod=moderate, Self Med= self medication, Trad: Traditional, Chem shop=Chemical shop, Non= No treatment

53. OTHER INJURY													
ACTIVITY	ANY OTHER INJURY		NATURE OF INJURY (PART OF BODY)/CAUSE	SEVERITY OF INJURY				ACTION TAKEN					TIME LOSS ON FARM
	Yes	No		Very severe	Severe	Mod	Not severe	Self med	Trad	Chem Shop	Hospital	Non	
Weeding	[ ]	[ ]	....	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	....
Burning of Bush	[ ]	[ ]	....	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	....
Planting	[ ]	[ ]	....	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	....
Fertilizer Application	[ ]	[ ]	....	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	....
Spraying	[ ]	[ ]	....	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	....
Pruning	[ ]	[ ]	....	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	....
Plucking of Pods	[ ]	[ ]	....	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	....
Splitting of Pods	[ ]	[ ]	....	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	....
Drying of Seeds	[ ]	[ ]	....	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	....
Others (Specify)													

SECTION F (SAFETY TRAINING)

54. Have you ever had any training on protection of the eye as a farmer? [ ] Yes [ ] No. **If NO go to 59**
55. If YES in 54, when was your last training? Day...........Month ....Year................................
56. Who organised the training?..
57. Where was it organised?..
58. How did you assess the training? [ ] Very beneficial [ ] Beneficial [ ] Not Beneficial
59. Are you aware of any National Eye Safety intervention programme being implemented in your community among cocoa farmers? [ ] Yes [ ]No
60. If YES in 59, what intervention programme is it?...

SECTION G (LIFESTYLE)

61.Which of the following habits are you engaged in? [ ] Smoking [ ] Alcohol intake [ ] None [ ] Others (specify)...

ANY COMMENTS/ISSUES PARTICIPANTS MAY RAISE

....

THANK YOU

THAHOUSEHOLD RELATION

HOUSE ID:...

No	Name	Relation to index person	Age	Sex	Level of education	Occupation
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

APPENDIX 7: SCREENING FORM

OCULAR HEALTH EXAMINATION FORM

Section A: History

History: ---

Section B: Visual Assessment

B1: Visual Acuity (VA) habitual (tick) [ ] with glasses [ ] without glasses

VA	@6M	@.4M	PH	+1.00
OD				
OS				
OU				

B2: Visual Acuity cannot be determined (reason)

Section C: Binocular Motor Vision Assessment

C1: Cover test at 40 cm fixation □

Unilateral…………………………… Alternate…………………………

0 None 1 Esotropia 2 Esophoria 3 Exotropia

4 Exophoria 5 Vertical 6 undetermined

C2: Cover test at 6m cm fixation □

0 None 1 Esotropia 2 Esophoria 3 Exotropia

4 Exophoria 5 Vertical 6 undetermined

C3: Near point of convergence

NPC………………………… AOA(optional) OD……………………….

OS………………………

Section D: External / Anterior Segment Examination

0 Normal 1 Abnormal 6 Undetermined

D1: Eyelids

OD If Abnormal

OS If Abnormal

D2: Conjunctiva

OD If Abnormal

OS If Abnormal

D3: Cornea

OD If Abnormal

OS If Abnormal

D4: Pupil

OD If Abnormal

OS If Abnormal

D5: Other anterior segment (s)

OD If Abnormal

OS If Abnormal

Section E: Interior segment (Lens, Vitreous and Fundus)

1 Normal 1 Abnormal 6 Undetermined

E1: Intra ocular lens (IOL)

OD If Abnormal

OS If Abnormal

E2: Vitreous

OD If Abnormal

OS If Abnormal

E3: Fundus

OD If Abnormal

OS If Abnormal

E3: Disc

OD If Abnormal

OS If Abnormal

Section F: Final Diagnosis

0 No impairment (UCVA ≥ 6/6)

1 Refractive error (UCVA ≤ 6/9 and pinhole/ + 150 ≥ 6/9)

2 Amblyopia (only if pinhole≤ 6/12)

3 Corneal opacity/ scar

4 Cataract

5 Glaucoma suspect

6 Toxoplasmosis

7 Macular scar

8 Chronic conjunctivitis

9 Acute conjunctivitis

10 Conjunctivitis (Trauma)

11 Pterygium

12 Pingueculae

13 Squint

14 Presbyopia

15 Undetermined cause

 If other (specify)--

Section G: Action taken

0 None indicated

1 on-site medical treatment given

2 Referred for specialist attention

3 Other/ Multiple actions (specify) ---

Section H

Refraction

G1: Objective Refraction

OD... VA..........................

OS..VA..........................

G2: Subjective Refraction

OD..VA............................

OS..VA............................

Indicate type of refractive error

0. Myopia

1. Hyperopia

3. Astigmatism