ADDIS ABABA UNIVERSITY

FACULTY OF MEDICINE

DEPARTMENT OF COMMUNITY HEALTH

ASSESSMENT OF OCCUPATIONAL INJURIES IN TENDAHO AGRICULTURAL DEVELOPMENT S.C, AFAR REGIONAL STATE.

By

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A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER IN PUBLIC HEALTH

March 2007,
Addis Ababa

DECLARATION

I, the undersigned, declare that this thesis is my original work, has not been presented for a degree in this or any other University and that all sources of materials used for this thesis has been duly acknowledged.

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Date of submission :_____

This thesis has been submitted for examination with my approval as a University advisor.

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Acknowledgment

I would like to thank Addis Ababa University, Faculty of Medicine, Community Health Department for funding this study. My deepest gratitude goes to Dr.Abera Kumie for his continuous, unreserved and valuable advice from the conception to the completion of the study.

My sincere thanks also goes to Tendaho Agricultural Development S.C main office, Dubti State Farm, Dubti Ginning Factory and Detbahri State Farm management staffs, who helped me a lot in the process of data collection. I also extend my thanks to Ato Esmail Seid, Detbahri State Farm manager, for facilitating the field work.

My grateful thank also goes to my best friend Melkamu Fenta, for his encouragement and offering me a computer throughout the study time. I would like also to thank my friends and colleagues (Olana Gelano, Genet Ali, Mulu Tefera, Abewa Getnet, Ashebir Seid, Sr.Fantaye Ahmed, Adem Muzemil, Mulu Tesemma, Shewaye Kiros and Seada Mohammed) for printing the survey questionnaire and material help.

My heart felt gratitude also goes to my wife Sr. Sofia Seid and our child Khalid, for their encouragement throughout my study. Finally, it is also my pleasure to acknowledge the study team and all study participants for their willingness to participate in the study.

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Abstract

Background: Occupational injuries pose a major public health and development problem. At present the problem of occupational injuries in work place is increasing in many developing countries including Ethiopia, mainly caused by unsafe work environments or human factors.

Objectives: This study was aimed to determine the magnitude of occupational injuries and identifying factors related to this injury among workers.

Methods: Cross-sectional study design was employed to assess occupational injuries among Tendaho Agricultural Development S.C workers, Afar Regional State. The enterprise was first stratified by working departments and working sections. A total of 810 workers were involved in the study based on proportional allocation to size. Study subjects were selected using simple random sampling technique. Data collection was made using pre-tested questionnaire. Work environment observation, physical examination, and reviewing injury records were also employed to complement self reported information.

Results: The overall occupational injury prevalence rate was 783 per1000 exposed workers per year. Seventy (11%) injured workers were hospitalized. Most (90%) of hospitalization was more than 24 hours. One death was also reported in the last 12 months. A total of 6153 work days were lost, being 11.4 days lost on average per an injured worker. Working more than 48 hours per week [AOR: 8.27, 95% CI:(4.96-13.79)], absence of health and safety training [AOR: 2.87, 95% CI: (1.02-8.06)], sleeping disorder [AOR: 1.64, 95% CI: (1.12-2.41)], alcohol drink [AOR: 1.72, 95% CI: (1.06-2.80)], job dissatisfaction [OR: 1.83, 95% CI: (1.30-2.58)] and absence of protective devices [OR: 3.18, (1.40-7.23)] were significant factors to occupational injuries.

Conclusion: Working more than 48 hours per week, absence of health and safety training, sleeping disorder, alcohol drink, job dissatisfaction and absence of protective devices increases the risk of occupational injuries. Ongoing health and safety information and/or training, periodic supervision, and occupational health and safety services above all should be emphasized to promote health and safety conditions of the worker.

Key words: *Occupational injuries; magnitude; determinants; severity; Tendaho Agricultural Development S.C.; Dubti State Farm; Dubti Ginning Factory; and Detbahri State Farm.*

1. Introduction

1.1. Background

Occupational injuries pose a major public health and development problem which could be prevented using appropriate occupational safety and health services. Of the total 3 billion workers in the world over 85% work and live without having access to occupational safety and health services (1-4). The number of occupational injuries is increasing in many developing countries. It is estimated that 250 million occupational injuries, 160 million work-related diseases and 2 million workers deaths occur in each year resulting a loss of roughly 4% of the world gross national product due to workers' compensation, loss of workdays, interruption of production, retraining, and medical expenses and so on (5, 6).

Agriculture is one of the most hazardous sectors in both developing and industrialized countries. Compared to workers in other sectors, agricultural workers are under-protected. They suffer markedly higher rates of accidents and fatal injuries than workers found in industries. The most vulnerable groups are daily laborers in plantations, seasonal workers, and temporary workers (7).

At present the rapid changes in working life are affecting both the health of the workers and the environment particularly in African region where the introduction of new technologies, new chemical substances and materials have led to new occupational injuries and diseases, while the traditional hazards such as high dust, noise and heat have not been dealt with adequately (5, 8).

Farm injuries are usually high in developing countries where an estimated 63% of the populations are involved with agricultural activities. Farm related activities are recognized to be

multi factorial. Therefore, any preventive measures to deal with farm related accidents should accept this premise (9). Although comprehensive and harmonized data are poorly developed, the magnitude of the problem of occupational injury is grave in Ethiopia (10).

There are various reasons for the poor occupational safety situation in developing countries, including use of out dated machinery, poor maintenance and little safety guarding of machinery, inadequate training of workers; poor design of equipment and workstations; and lack of personal protective equipment, which, even when available, may be difficult to wear because of working conditions (11). Most work place injuries are basically caused by unsafe work environments or human factors such as young age, sex, lack of experience, job dissatisfaction, sleep disorders, smoking habit, excess alcohol use, and lack of physical activity (12-14).

According to the labour proclamation No 377/2003, the Federal Ministry of Labour and Social Affairs of Ethiopia is responsible for the national occupational safety and health services (15). Despite this, epidemiology of occupational injuries is under reported or not reported both at local and national level and there are only few studies done to assess the magnitude of occupational injuries and its factor related to injury among large scale industrial workers (16-18).

Tendaho Agricultural Development S.C is one of the oldest government owned agricultural enterprise mainly producing lint cotton. The working environment in such factory is commonly characterized by unsafe building, old and unguarded machinery, absence of warning signs, poor lighting and ventilation, excessive noise, excessive heat, dust, and absence of personal protective devices.

1.2. Rationale of the study

At present many people are working under unsafe conditions, particularly in developing countries, that pose injury and death. In addition, the economic costs of occupational injuries are also responsible for more lost time from work, reduce productivity and decrease working years of life.

Information on occupational health and safety services is helpful in raising awareness at all level and making the problem of injuries more visible to policy makers and managers. However, in Ethiopia there is no systematized recording and reporting of occupational injuries. Data on injury at national level is also inadequate.

In general the assessment made on occupational injuries among workers is useful in the development of injury prevention strategy so that morbidity, disability and death among workers due to occupational injury are minimized and promote production opportunity. Besides, it can also serve as base line information to under take studies on similar settings.

2. Literature review

2.1. Occupational safety and health

Occupational safety and health is the discipline with the preserving and protecting human and facility resources in the work place. The duties of the national health services in occupational health, especially in developing countries, may include setting health standards and norms; providing day-to-day preventive health services at work places in collaboration with employers; monitoring exposures to environmental hazards at work, arranging for the ambulatory treatment of workers; training personnel; providing health education for employers and workers; carrying out field investigations and research; and under taking evaluation and follow up activities, together with requisite statistical work (3,19).

Occupational health and safety issue becomes more important world wide due to high risk of occupations in both agricultural and industrial sectors**.** The ILO estimated about 80% of occupational injuries and deaths could be prevented if all ILO member States would use the best accident prevention strategies and practices that are already in place and easily available (20, 21). In countries that are still industrializing, priority should be given to improve safety and health practices in primary industries such as farming, fishing and logging, preventing industrial accidents, including fires and exposure to hazardous substances and preventing traditional accidents and diseases, including those in informal workshops and home based industries (21).

Despite the undisputed impacts of injury burden, limited attention has been paid to occupational injury as a public health problem particularly in low-income countries where many industries give emphasis largely on treatment than prevention and safety services (2, 3). According to the

assessment made by Department of Environmental Health, Ministry of Health, in seventeen selected factories in Ethiopia, the value of promotive and preventive occupational safety and health services in work places are underestimated (18).

Ethiopia has been a member state of ILO since 1923. However, the national occupational safety and health policy is not issued though it is required by the country as a result of ratifying occupational safety and health convention No. 155/1981(22). Although, agriculture is the main stay of the economy and the sector that generates employment opportunities for 85% the country's population, the occupational safety and health services have not yet developed programs to address problems that accounts for occupational safety and health impairment (22). In general, due to the existing low level of development of occupational safety and health services in Ethiopia, there are no worth mentioning programs on prevention, advocacy, awareness creation and capacity building (22).

2.2. Magnitude and burden of occupational injuries

Occupational accidents, work related injuries and fatalities resulting from multiple causes, affect different segments of the working population, and occur in a myriad of occupations and industrial settings (23). Information on the magnitude of injury as a major public concern is invaluable in raising awareness, for making the problem more visible to policy makers and for lobbying governments, donors and other key factors to initiate programme for occupational injury prevention and trauma care (3). In countries at all levels of development a large proportion of deaths and injuries by workers can be attributed to inadequate safety and health information (20, 21).

Risk factors make a major contribution to global occupational injuries that account for 37% of back pain, 16% of hearing loss and 10% of injuries (24, 25). Hundreds of millions of people throughout the world are working today under circumstances that foster ill health and/or are unsafe (26, 27). As a result a particular heavy toll of death and injured occurred in developing countries (21, 26).

Farming has been recognized as one of the most dangerous occupations in Canada with respect to work-related injury. Each year, approximately 120 Canadians die and an additional 1200 require hospitalization due to farming injuries. Deaths to farmers and farm workers represent 13% of all occupational fatalities in Canada (28). A study made in the construction industry, Egypt, revealed that an incident rate of 18.4 per 100 full-time employees in year 2002 (29).

In Ethiopia there is no systematized recording and reporting on occupational injuries that is organized at the national level. If there is, then few manufacturing industries provide some information to the Ministry of Labour and Social Affairs (30). Moreover, there are only few studies conducted to determine the magnitude of occupational injuries among large scale industrial workers. Study done among 4,462 exposed industrial workers in eleven factories, Addis Ababa, was with injury rate of 80 per 1000 workers per year (16). Study done among 3,100 Akaki textile factory workers revealed injury rate of 200 per 1000 workers per year (17). Study conducted among small and medium scale industrial workers in Gondar Woreda indicated that overall annual work-related injury rate of 335 per 1000 workers per year (31). Study on 105 manufacturing industries in Ethiopia revealed an over all work-related injury rate of 178 per 1000 workers per year (10, 32).

At present, the economic costs of occupational injuries are rapidly increasing and are responsible for more lost time from work, productivity, and working years of life than any other health conditions that continue to claim the lives, damage the physical and psychological well-being and consume the resources of workers and their families (23, 24). In general, occupational injuries are costly to the individuals, families, their organizations and the nation as a whole in which many of the injured could be left with disabling sequel, and in some cases, permanent ones (3, 5).

2.3. Common occupational injuries, causes and parts of the body affected

Musculoskeletal injuries are the predominant form of reported non-fatal occupational injuries. Fractures, bruises, lacerations, contusions, penetration by foreign bodies and sprains or strains are the most frequent occupational injury types (24, 33). Laceration (28%), was the most common type of injury in a study made on farm related injuries and fatalities in Alberta (9). Assessment made among Akaki textile factory workers, Addis Ababa, showed that prick (32.9%), laceration (30.8%), and bruise (16.8%) were common occupational injuries (17). Assessment made on small and medium scale industries in Gondar indicated that abrasions (23.2%), cuts (19%), eye injury (18.8%), puncture (14.4%) and dislocation (6.5%) were common types of work-related injuries (31).

In agricultural workplaces; falls and machinery are among the most common causes of occupational injuries (23). Study made on farm related injuries and fatalities in Alberta showed that machinery accounted for 55% of all injury accidents per year (9). Study made among workers in the construction industry in Egypt revealed that falling from a height, struck by/

against an object, hit by falling objects, and falling at ground level were common causes (29). Assessment done by Department of Environmental Health, Ministry of Health, the most common agent stated as a cause of injury was stepping or striking (25%), falling (12.8%) and flying objects from the machines (8.5%) (18). Assessment made on small and medium scale industries in Gondar woreda indicated that machinery (23.9%), splinters (21.7%) and hand tools (16.6%) were common causes (31). Study done among Akaki textile factory workers, Addis Ababa, showed that machinery or electric (29.4%) and hit by/against objects (20.3%) were frequent causes of injury (17).

Occupational injuries most often affect; fingers, hands, eyes, feet, arms and legs of the body. Study made on farm related injuries and fatalities in Alberta showed that fingers (40%) and hands (13%) accounted for more than a half of all injuries (9). Study among Egyptian workers in construction industry reported that head (23.7%), Upper limb (15.1%), lower limb and trunk (13.8%) each and eyes (14.6%) were the parts of the body commonly affected (11, 23). Among workers in eleven urban factories, Addis Ababa, fingers (37.3%) and hands (11.6%) were most common part of the body affected (16). A study in Akaki textile factory, Addis Ababa, showed fingers (42%), lower leg (18.9%), and hands were common parts of the body affected by occupational injuries (17). In general, fingers are common parts of the body affected by occupational injuries (9, 16, 17).

2.4. Factors related to occupational injuries

Occupational injuries are mainly caused by environmental, personal, mechanical and combination of these factors (5). Work places in developing countries like Ethiopia are

characterized by unsafe buildings, old machinery, poor ventilation, excessive noise, heat and with limited education, skill and training and limited financial resources (32).

Most studies suggest that young age, inexperience, job dissatisfaction, sleep disorders, smoking habit, excess alcohol use, and lack of physical activity increase the risk of occupational injuries and their influence differs according to the job (12,13). A study made to assess the associations of job and some individual factors with occupational injuries among employed people in north-eastern France indicated job category (60.8%), sex (16.2%), regular psychotropic drug use (8.5%), age groups (7.5%), and presence of a disease (7.0%) were significant contributing factors for occupational injuries (13).

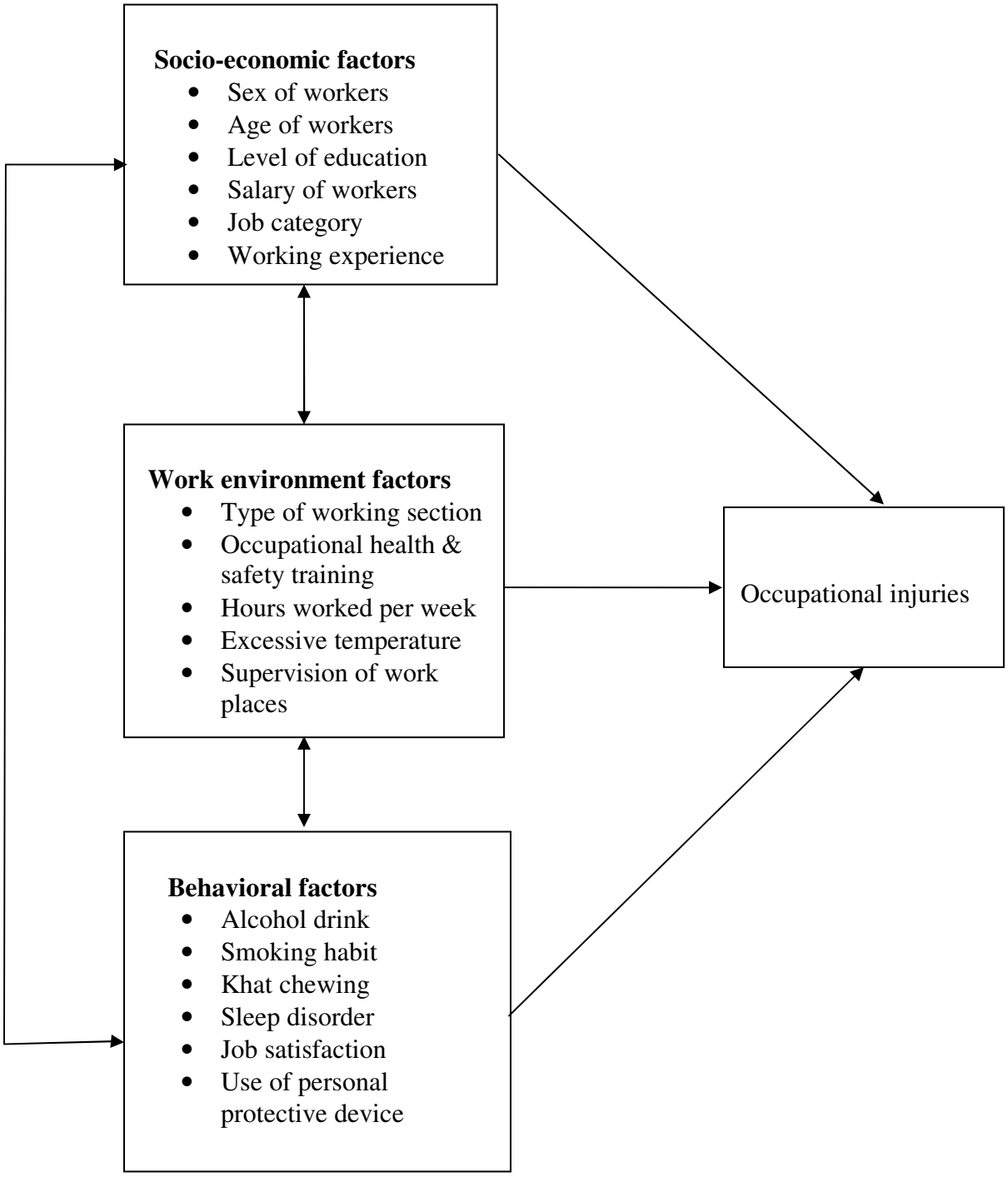
Study on injuries at work in US adult population revealed more work-related injury rate for male than women (33, 34). Assessment made by Environmental Health Department, Ministry of Health, indicated more sex specific injury rate in males than females (18).Young age is commonly associated with a lack of experience that predisposes to the occurrence of injuries (12, 24, 25). Work accidents in Elsavador were found to be frequent in the age group of 16-20 years old (35). In eleven urban factories, Addis Ababa, the highest occupational injuries were seen among 15-19 years age group (16). Study done in small and medium scale industries in Gondar and Akaki textile factory, Addis Ababa, revealed that young age (<30 years) were significant contributing factors for work-related injuries (17, 31). Assessment done by Department of Environmental Health, Ministry of Health, majority of occupational injuries (24%) were in the age group of 26-30 (18). Ministry of Labour and Social Affairs of Ethiopia also reported most occupational injuries occur at the age of 25-29 years (36).

Reports on income as a contributing factor for occupational injuries revealed low-income countries have higher rate of death for causes that are typically work-related. Regarding alcohol and drug use; it has been estimated that alcohol contributes to 57% of all occupational injuries in the US. In a study; drug- using employees were found to suffer on job injuries four times as frequent as the overall working population (19, 33).

More occupational injuries occurred in Monday and Thursdays, between 9 am to 10 am. These peaks in incident frequency for a particular time of day may simply reflect a higher number of persons working at those times rather than changing incidence during the day. The peaks in incident times could also be the result of different operations being performed at different times of the day, or might be due to changes in worker behavior (23). A study made on African American, Hispanic, and non-Hispanic white workers showed that night shift work increase significantly one's risk of an occupational injury (34). Study among eleven urban factories, Akaki textile factory, Addis Ababa, and in small and medium scale industries in Gondar woreda revealed that the highest occupational injuries occur on Monday (16, 17, 31).

In general better understanding of the magnitude and characteristics of occupational injuries is essential in the design of effective injury prevention strategy so that the overall occupational health and safety services can be improved and injuries could be ultimately minimized and promote production opportunity.

Figure1. Conceptual framework for the study of the magnitude and factors related to occupational injuries.



3. Objectives of the study

3.1. General objective:

To assess occupational injuries in Tendaho Agricultural Development S.C, Afar Regional State.

3.2. Specific objectives:

- To determine the magnitude of occupational injuries.
- To find out factors related to occupational injuries.

4. Methodology

4.1. Study design:

Institution based cross-sectional study design was employed to assess occupational injuries among Tendaho Agricultural Development S.C workers, Afar Regional State, August, 2006.

4.2. Study area:

This study was carried out in Tendaho Agricultural Development S.C owned by government and located at Dubti Woreda, one of the 29 woredas in Afar Regional State, which is 580 k.m away and north-east of Addis Ababa. This plant was established in Nov. 1960 by Mitchell Cotts P.L.C UK. Tendaho Agricultural Development S.C constitutes Dubti State Farm, Detbahri State Farm and Dubti Ginning Factory. Unit farms, Farm mechanizations, Pest controls, Workshops, Power supply, Ginning and Cotton seed preparation are common working sections. The company mainly grows cotton and produce lint cotton for textile factories and cotton seed for oil factories. In addition, the company provides ginning service for out growers. The main by-products are linter usually used for mattress and floater for cattle feed. Tendaho Agricultural Development S.C has a total of 4930 employees, of which 712 permanent and 4218 temporary. The company had one satellite clinic in Dubti town and one clinic at Detbahri state farm. The company also refers to Dubti Hospital owned by Afar Regional Health Bureau located in Dubti town. Injury recording was managed by both two clinics and administrative office within 24 hours after the incident occurred.

4.3. Study population:

All employees who are involved in the production process, Tendaho Agricultural Development S.C. except seasonal workers who are mainly doing cotton- picking activities were included in the study.

4.4. Sample size determination:

The sample size was determined using single population proportion formula:

$$n_i = \frac{(Z\alpha/_2)^2 P(1-P)}{d^2} \qquad n_i = \frac{(1.96)^2\ 0.5(1-0.5)}{(0.03)^2} = 1067$$

$$n_f = \frac{n_i}{1 + (n_i/N)} \qquad n_f = \frac{1067}{1+(1067/2553)} = 753 + 10\% \text{ non-response rate}$$

$$n_f = 828 \text{ workers}$$

Where:

n_i : Sample size calculated from infinite population.

n_f : Total sample size to be studied.

N : Source population (2553 workers).

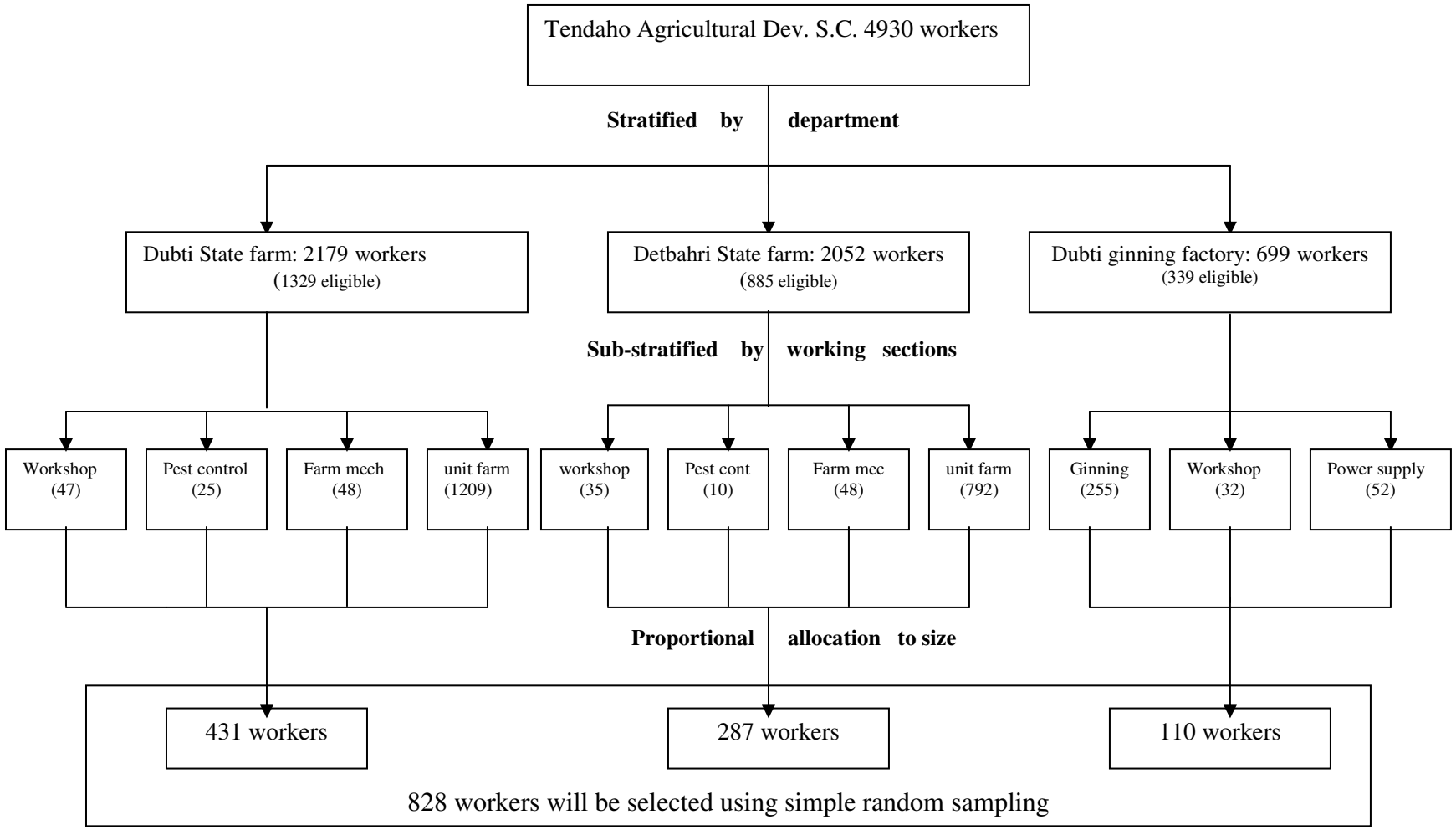
$Z_{\alpha/2}$: A standard Z score 1.96 corresponding to 95% confidence level.

Assumptions: No local or national data on the prevalence of occupational injuries in agro - industrial setting. Hence prevalence of 50% and marginal error (d) of 0.03 was used to maximize sample size.

4.5. Sampling procedure:

Based on the inclusion criteria the enterprise was first stratified in to three departments, namely Dubti state farm, Detbahri state farm and Dubti ginning factory, assuming that occupational injuries vary with the nature of the work and working area. Again each department was sub-stratified by working sections that had the required sample size based on proportional allocation to size. Sampling frame was list of all employees of working sections that was found from the payroll of the enterprise. Finally, the study subjects were selected using simple random sampling technique from each selected sections (Figure 2).

Figure 2. Schematic presentation of sampling procedure



4.6. Data collection

Data were collected using structured and pre-tested questionnaire developed based on the related studies and a checklist for the observation of working environment. Injury registration form was also reviewed to minimize recall bias (under report or over report of injury events). Data collection was administered by eight Nurses. One Environmental health technician and one public health professional who had experience in research work supervised the data collection process. Training for data collectors and supervisors was also given for three days.

The questionnaire was pre-tested to identify potential problem areas; unanticipated interpretations and cultural objections to any of questions. Hence, 5 % of sample population was pre tested in Dubti state farm that was excluded in the study. Training for data collectors and supervisors, counter checking of daily filled questionnaire and regular supervision was made by principal investigator.

4.7. Operational definitions

- Excessive heat: heat is recorded as excessive if a worker is found sweating when naked or with light clothing; if the investigator feels a sudden heat wave when entering to the work place (10).
- Excessive noise: noise that makes it difficult to communicate among neighbor workers with out shouting at a distance of about one meter.
- Occupational injury: any personal injury, disease or death resulting from an accident in the course of work.
- Severity of injury: characterized by death, hospitalization more than 24 hours and absence from work over 3 days in the last one year (31).

- Unsafe building: building with defects commonly on walling, floor, roofing and other fixtures that likely to pose injury.

4.8. Variables of the study

Dependent Variable : Occupational injuries of individual workers

Independent Variables:

- Socio-economic/ human factors – sex, age, religion, level of education, marital status, job category, income, working experience.
- Work Environment Variables – hours worked per week, working sections, work place supervision, health and safety training, excessive temperature.
- Behavioral Variables – alcohol drink, smoking habit, khat chewing, sleep disorder, job satisfaction, use of personal protective device.

4.9. Data quality

The questionnaire was prepared originally in English and translated to Amharic and back to English to keep the consistency of the questions. Training of data collectors & supervisors and pre testing of questionnaire was made to ensure the quality of data. Principal investigator and supervisors made spot-checking and reviewing the completed questionnaires on daily bases to ensure completeness and consistency of the information collected. Re entry of 5% of the data was made to keep consistency and maintaining data quality. Guideline prepared for this study was also used to improve the quality of data.

4.10. Data processing and analysis

Collected data were entered and cleaned using Epi Info version 6.04 and analyzed using SPSS version 11 statistical package. Frequency distribution and percentage calculation was made to

describe socio-demographic characteristics and to determine the magnitude of occupational injuries. Crude and adjusted odds ratio was done to determine whether any association exists with a confidence interval of 95%. Logistic regression analysis was also made to see the relative effects of independent variables on the dependent variable (occupational injuries) by controlling the effect of confounding factors.

4.11. Ethical consideration

This study was carried out after getting ethical clearance from Addis Ababa University, Medical Faculty, ethical clearance committee, and permission to conduct this study was secured from Tendaho Agricultural Development S.C. Informed consent from each study subjects was first obtained after clear explanation on the purpose of the study. To this end, the right of each respondent to refuse, answer for few or all questions were respected. Omitting names of the study subjects from the questionnaire help to assure confidentiality of the information and maximum effort was made to maintain privacy of the respondent during the interview. If there was incident that results injury to the worker while interviewing, an immediate referral to their satellite clinic was arranged prior to data collection. However, there was no incident that results injury. Study participants were informed on common causes and methods of preventing occupational injuries by the interviewer after completing interview.

4.12. Dissemination of findings

A detailed report of this study which consists of the main findings will be disseminated to Tendaho Agricultural Development S.C, Afar Regional Labour and Social Affair Bureau,

Afar Regional Health Bureau, Department of Hygiene and Environmental Health, Ministry of Health, and Ministry of Labour and Social Affair. In addition effort will be exerted to publish the study findings on local/ international journal.

5. Results

5.1. Characteristics of the study population

From the total sample size of 828 workers to be studied, 18 workers refused to participate that made response rate of 97.8 % (810). Absence of intervention and failure to communicate

findings of previous health related studies made in the same area were common reasons given not to participate in the study.

Socio-economic characteristics

Majority of study participants, 630(77.8%) were male and 180(22.2%) were female. The mean age of survey respondents was found to be 31.7±11.1 (SD) years and median age of 28 years. The minimum and maximum age was 17 and 65 years respectively. Five hundred eighty two respondents (71.8%) identified themselves as Muslim followed by 228(28.2%) of Christians. Most respondents, 753(93.0%), were Amhara by ethnicity. Four hundred thirty two (53.3%) respondents were married, 297(36.7%) single, 59(7.3%) divorced and 22(2.7%) were widowed.

Regarding educational level, 407(50.2%) were illiterate, 78(9.6%) able to read and write only, 252(31.1%) primary education (1-8 grade), and 73(9.1%) were secondary education and above. Most study participants 723(89.3%) were daily laborer and 87(10.7%) were technical workers. Four hundred eighty seven (60.1%) respondents had six years and above service duration and 323(39.9%) were with five years and below of working experience. Most, 702(86.7%), respondents had monthly payment of Birr 150.00 based on collective agreement of the company by considering free accommodation, health service and insurance (Table1).

Table1. Socio-economic characteristics of respondents, Tendaho Agricultural Development S.C,
Afar Regional State, August 2006.

Characteristics	**DubSF(n=425)**	**DGF(n=99)**	**DetSF(n=286)**	**Total(n=810)**
	Number (%)	**Number (%)**	**Number (%)**	**Number (%)**

Sex				
Male	340(80.0)	98(99.0)	192(67.1)	630(77.8)
Female	85(20.0)	1(1.0)	94(32.9)	180(22.2)
Age				
15-29	292(68.7)	28(28.3)	107(37.4)	427(52.7)
30-44	89(20.9)	28(28.3)	133(46.5)	250(30.9)
45-59	39(9.2)	39(39.4)	43(15.0)	121(14.9)
60+	5(1.2)	4(4.0)	3(1.1)	12(1.5)
Educational level				
Illiterate	190(44.7)	35(35.4)	182(63.6)	407(50.2)
Read & write	30(7.1)	7 (7.1)	41(14.3)	78(9.6)
Primary (1-8)	164(38.6)	34(34.3)	54(18.9)	252(31.1)
Secondary & above	41(9.6)	23(23.2)	9(3.2)	73(9.1)
Religion				
Christian	99(23.3)	42(42.4)	87(30.4)	228(28.2)
Muslim	326(76.7)	57(57.6)	199(69.6)	582(71.8)
Marital status				
Married	197(46.3)	61(61.6)	174(60.8)	432(53.3)
Single	187(44.0)	27(27.3)	83(29.0)	297(36.7)
Divorced	33(7.8)	8(8.1)	18(6.3)	59(7.3)
Widowed	8(1.9)	3(3.0)	11(3.9)	22(2.7)
Work experience				
≤5 years	207(48.7)	39(39.4)	77(26.9)	323(39.9)
6+ years	218(51.3)	60(60.6)	209(73.1)	487(60.1)
Monthly salary (Birr)				
150	389 (91.5)	54(54.5)	259(90.6)	702(86.7)
151-300	11(2.6)	18(18.2)	5(1.7)	34(4.2)
301-600	11(2.6)	6(6.1)	10(3.5)	27(3.3)
600+	14(3.3)	21(21.2)	12(4.2)	47(5.8)

Note: DubSF=Dubti state farm; DGF=Dubti ginning factory; DetSF=Detbahri state farm

Occupational injury characteristics

Majority, 634(78.3%), of study participants had incident at job that resulted occupational injury in the last 12 months with overall occupational injury prevalence rate of 783 per 1000 exposed workers per year. Eighty one (10.0%) respondents were also injured at job in the last

two weeks period. Regarding frequency of injury occurrence in the last 12 months, 194(30.6%) had once, 177(27.9%) twice, 99(15.6%) three times and 164(25.9%) more than 3 times, which made 3.7 injuries per worker per year. Of those who had incidence of injury in the last two weeks, majority, 62(76.5%), injured once and 19(23.5%) more than once with a total of 1.3 injuries per worker per 2 weeks time (Table 2).

Finger 306(32.0%), lower leg 195(20.4%), eyes 117(12.2%), toes 104(10.9%), and lower arm 100(10.4%) were predominantly affected parts of the body. Laceration 370(36.9%), cuts 116(11.6%), puncture 109(10.8%), eye injury 109(10.8%), crushing 103(10.2%) and heat strain 60(6.0%) were commonly seen injury type. Regarding causes of injury, majority, 457(53.6%), of injuries were caused by hand tools, 95(11.2%) by splinting /splashing objects, 77(9.0%) were falling accident, 68(8.0%) were hit by falling objects and 44(5.2%) were by lifting heavy objects (Table 3 & 4).

Table 2. Distribution of occupational injuries in the last 12 months among respondents, Tendaho Agricultural Development S.C, Afar Regional State, August 2006.

Characteristics	**DubSF(n=425)** **Number (%)**	**DGF(n=99)** **Number (%)**	**DetSF(n=286)** **Number (%)**	**Total(n=810)** **Number (%)**
Occupational injuries in the last 12 months				

Yes	292(68.7)	77(77.8)	265(92.7)	634(78.3)
No	133(31.3)	22(22.2)	21(7.3)	176(21.7)
Number of occurrence				
Once	103(35.3)	36(46.7)	55(20.8)	194(30.6)
Twice	55(18.8)	13(16.9)	109(41.1)	177(27.9)
Three times	34(11.6)	3(3.9)	62(23.4)	99(15.6)
More than three	100(34.3)	25(32.5)	39(14.7)	164(25.9)
Occupational injuries in the last 2 weeks				
Yes	69(16.2)	9(9.1)	3(1.0)	81(10.0)
No	356(83.8)	90(90.9)	283(99.0)	729(90.0)
Number of occurrence				
Once	57(82.6)	2(22.2)	3(100)	62(76.5)
More than once	12(17.4)	7(77.8)	0	19(23.5)

Note: DubSF=Dubti state farm; DGF=Dubti ginning factory; DetSF=Detbahri state farm

Table 3. Distribution of occupational injuries by type and parts of the body affected in the last 12 months among 634 injured respondents, Tendaho Agricultural Development S.C, Afar Regional State, August 2006.

Characteristics	Number	Percent (%)
Parts of the body affected		
Finger	306	32.0
Lower leg	195	20.4
Eyes	117	12.2
Toes	104	10.9

Lower arm	100	10.4
Back	39	4.1
Upper arm	34	3.5
Knee	13	1.4
Head	9	0.9
Upper leg	6	0.6
Multiple	24	2.5
Others	11	1.1
Total	958	100.0
Types of injury		
Laceration	370	36.9
Cuts	116	11.6
Eye injury	109	10.8
Puncture	109	10.8
Crushing	103	10.2
Heat strain	60	6.0
Back pain	45	4.5
Dislocation	22	2.2
Suffocation	21	2.1
Fracture	11	1.1
Ear injury	9	0.9
Snake bite	7	0.7
Others	22	2.2
Total	1004	100.0

Table 4. Distribution of occupational injuries in the last 12 months by causes among 634 injured respondents, Tendaho Agricultural Development S.C, Afar Regional State, August 2006.

Characteristics	Number	Percent (%)
Causes of injury		
Hand tools	457	53.6
Splinting/Splashing objects	95	11.2
Falling accident	77	9.0

Hit by falling objects	68	8.0
Lifting heavy objects	44	5.2
Machinery	25	2.9
Cotton stem	24	2.8
Pesticides	22	2.6
Struck by/ against an object	11	1.3
Fire	9	1.1
Electricity	9	1.0
Snake bite	7	0.8
Others	4	0.5
Total	852	100.0

Of those injured respondents, 359(56.6%) workers were injured while cultivating, 94(14.8%) during slashing, 62(9.8%) in canal and bud maintenance, 38(6.0%) at irrigation, 38(6.0%) while loading/unloading, and 27(4.3%) were doing mechanical work. Among injured workers 567(89.4%) were non-technical (mainly involved on cultivation, slashing, canal & bud maintenance, irrigation and loading/unloading activities and 67(10.6%) were technical workers (mechanic, tractor operator, motor operator, electrician, and welder). Regarding possible causes of injury, most participants, 600(94.6%), responded due to absence of

protective devices, 215(33.9%) due to absence of safety education, 46(7.3%) due to improper hand working instruments, 16(2.5%) due to disorder of normal operation, 14(2.25) due to misuse of protective devices and 14(2.1%) were also mentioned absence / inadequate machine safeguards for the causes of injury.

Three hundred seventy eight (58.1%) respondents did not remember actual days of injury, 140(21.5%) injured on Monday, 44(6.7%) on Tuesday, 25(3.8%) on Wednesday, 16(2.5%) on Thursday, 19(2.9%) on Friday, 15(2.3%) on Saturday and 14(2.2%) were on Sunday. It was also indicated that, 329(50.5%) were injured in the morning working time, 149(22.9%) in the afternoon, 23(3.5%) in evening / mid-night working time and 151(23.1%) did not remember the actual time of injury (Table 5).

Table 5. Distribution of occupational injuries by perceived days and time among 634 injured respondents, Tendaho Agricultural Development S.C, Afar Regional State, August 2006.

Characteristics	Number	Percent (%)
Day of injury		
Monday	140	21.5
Tuesday	44	6.7
Wednesday	25	3.8
Thursday	16	2.5
Friday	19	2.9

Saturday	15	2.3
Sunday	14	2.2
Do not remember	379	58.1
Total	652	100.0
Time of injury		
In the morning	329	50.5
In the afternoon	149	22.9
In the evening	8	1.2
In the mid-night	15	2.3
Do not remember	151	23.1
Total	652	100.0

Severity of occupational injuries

Out of 634 injured respondents, 70(11.0%) were hospitalized. Regarding length of hospitalization, 7(10.0%) were for 1 day, 25(35.7%) were between 24 hours and 4 days, 25(35.7%) were 5-10 days, and 13(18.6%) were admitted for more than 10 days. One death was also reported while working in the last 12 months. A total of 6153 work days were lost among 634 injured respondents, being 11.4 days lost on average per an injured worker.

Working environment characteristics

Majority, 709(87.5%), of study participants were at work for more than 48 hours per week, mainly due to double working time in some cases to increase their monthly payment, and 101(12.5%) work 48 hours and less per day. All study participants 810(100%) revealed that work place supervision had never been made in the last 12 months. Most, 789(97.4%), of respondents had never been engaged on occupational health and safety training (Table 6).

Behavioral characteristics

The data showed that 188(23.2%), 216(26.7%), and 86(10.6%) of participants were used to drink alcohol, chew khat and smoke cigarette respectively. The data also showed that 493(60.9%) respondents had sleeping disorder at work place which was mainly due to work burden 449(91.1%) and evening or mid-night work time 163(33.1%). Five hundred thirty two (65.7%) of the respondents were not satisfied with their current job. Similarly, most study participants 786(97.0%) did not use personal protective devices at work places (Table 6). The main reason given for not using personal protective devices was absence of protective devices 773(98.3%) and absence of health and safety training 246(31.3%).

Table 6. Reported work environment and behavioral characteristics of respondents, Tendaho Agricultural Development S.C, Afar Regional State, August 2006.

Characteristics	DubSF(n=425) Number (%)	DGF(n=99) Number (%)	DetSF(n=286) Number (%)	Total(n=810) Number (%)
Hours worked/week				
≤48	51(12.0)	27(27.3)	23(8.0)	101(12.5)
48+	374 (88.0)	72(72.7)	263(92.0)	709(87.5)
Work place supervision				
Yes	0	0	0	0
No	425 (100)	99(100)	286 (100)	810 (100)
Safety training				
Yes	14(3.3)	1(1.0)	6(2.1)	21(2.6)
No	411(96.7)	98(99.0)	280(97.9)	789(97.4)
Drink alcohol				

Yes	68(16.0)	22(22.2)	98(34.3)	188(23.2)
No	357(84.0)	77(77.8)	188(65.7)	622(76.8)
Chew khat				
Yes	89(20.9)	41(41.4)	86(30.1)	216(26.7)
No	336(79.1)	58(58.6)	200(69.9)	594(73.3)
Smoke cigarette				
Yes	26(6.1)	13(13.1)	47(16.4)	86(10.6)
No	399(93.9)	86(86.9)	239(83.6)	724(89.4)
Sleeping disorder				
Yes	243(57.2)	47(47.5)	203(71.0)	493(60.9)
No	182(42.8)	52(52.5)	83(29.0)	317(39.1)
Job satisfaction				
Yes	154(36.2)	30(30.3)	94(32.9)	278(34.3)
No	271(63.8)	69(69.7)	192(67.1)	532(65.7)
Use of PPD				
Yes	1(0.2)	22(22.2)	1(0.3)	24 (3.0)
No	424(99.8)	77(77.8)	285(99.7)	786(97.0)

Note: DubSF=Dubti state farm; DGF=Dubti ginning factory; DetSF=Detbahri state farm
PPD= Personal protective devices

Work environment observation

The observation revealed that most working sections were with unsafe building, excessive heat, dust, noise, unguarded machine, exposed electric wires, organic solvents like naphtha and acids (Table 7). Despite there is curative health services in the enterprise, there was no safety division and personnel that help in promoting health and safety conditions at work places. Warning signs and health and safety instructions or procedures did not exist in all working sections. Similarly, all working sections had not first aid equipment except they had satellite clinic at central level.

Occupational safety and health committees were not yet established in Dubti state farm, Detbahri state farm and Dubti ginning factory. Regular visits and inspection on health and safety conditions of work places were not made at all levels. In addition, programs on prevention, advocacy, awareness creation and capacity building were not undertaken. Based on the observation made most workers did not use personal protective devices at work places, most daily laborers use their own hand tools in the field which were not of the standard, and most production equipments lack appropriate protective arrangement. No meeting was held in the last six months with employees to discuss health and safety issues. Moreover, training needs in connection with new employment, equipment, or other changes were not considered accordingly.

In general, although the company has a collective agreement; the value of occupational health and safety services is being undermined.

Table7. Occupational health and safety hazards identified in working sections, Tendaho Agricultural Development S.C, Afar Regional State, August 2006.

Working section	Hazards identified
Workshop / Garage	Unsafe building, excessive heat, sharps, naphtha, gasoline, solvents, sulfuric acid and exposed electric wires.
Farm mechanization	Excessive heat, excessive dust, excessive noise, sharps, organic solvents (naphtha), gasoline and sulfuric acid.
Pest control	Unsafe building, pesticides and chemicals.
Cotton ginning & Seed preparation	Unsafe building, excessive heat, excessive dust, excessive noise , poor ventilation, unguarded machines, exposed electric wires, sharps and acids for de-lint.
Power house	Unsafe building, excessive noise, excessive heat, unguarded machines, exposed electric wires, burnt oil, organic solvents (naphtha) and gasoline.
Unit farm	Excessive heat and dust.

5.2. Bivariate analysis for socio economic, environmental and behavioral factors

5.2.1. Socio economic factors

Table 8 presents selected socio economic characteristics of workers in relation to occupational injuries. Among selected socio economic factors: sex, educational level, job category, and monthly salary did not show significant association with occupational injuries of individual worker.

The age of the worker was significantly associated with occupational injuries. Workers who were between 17 to 29 age group were prevented from occupational injuries nearly by half compared to those who were 30 years old and above [OR: 0.66, 95% CI: (0.47-0.92)].

Work experience of the worker was also significantly associated with occupational injuries. Workers who had 5 years and less working experience were less likely injured compared to those who had 6 years & above working experience [OR: 0.70, 95% CI: (0.50-0.98)](Table 8).

Table 8. Selected socio-economic determinants of occupational injuries, Tendaho Agricultural Development S.C, Afar Regional State, August 2006. (n=810)

Characteristics	Injured		Crude OR 95% CI
	Yes	No	
Sex			
Male	487(77.3)	143(22.7)	0.76(0.50-1.16)
Female	147(81.7)	33(18.3)	1.00
Age group			
17-29 years	320(74.9)	107(25.1)	0.66(0.47-0.92)*
≥30 years	314(82.0)	69(18.0)	1.00
Educational level			
Illiterate	327(80.3)	80(19.7)	1.27(0.91-1.79)
Literate	307(76.2)	96(23.8)	1.00
Job category			
Daily laborer	567(78.4)	156(21.6)	1.08(0.64-1.84)
Technical workers	67(77.0)	20(23.0)	1.00
Work experience			
≤5 years	241(74.6)	82(25.4)	0.70(0.50-0.98)*
6+ years	393(80.7)	94(19.3)	1.00
Monthly salary			
≤ 200 Birr	556(78.6)	151(21.4)	1.18(0.73-1.92)
201+	78(75.7)	25(24.3)	1.00

* Significant at $p<0.05$

5.2.2. Environmental factors

The selected work environment variables, both hours worked per week, health and safety training, and working department (area) were significantly associated with occupational

injuries (Table 9). Study participants who were used to work more than 48 hours per week were more than 8 times more likely to be injured compared to those who were engaged 48 hours and less [OR: 8.74, 95% CI: (5.57-13.71)]. Similarly, workers with out health and safety training were about 6 times more likely injured than those who had training [OR: 6.24, 95% CI: (2.54-15.31)]. Workers involved in Dubti state farm [OR: 0.18, 95% CI: (0.11-0.28)] and Dubti ginning factory [OR: 0.28, 95% CI: (0.15-0.53)] were less likely to be injured compared to Detbahri state farm workers (Table 9).

5.2.3. Behavioral factors

Among selected behavioral factors, drink alcohol, sleeping disorder, job satisfaction and use of personal protective devices showed significant association with injuries in crude analysis (Table 9). However, chew khat and smoke cigarette did not show statistical significance.

Workers who were used to drink alcohol were more than one and half times more likely to be injured than those who do not consume alcohol [OR: 1.62, 95% CI: (1.05-2.48)]. Similarly, those who had sleeping disorder were about 2 times more likely to be injured than those who had not sleeping disorder [OR: 2.31, 95%CI: (1.65-3.24)]. Study participants who were not satisfied with their assigned job were also more likely to be injured than those satisfied [OR: 1.83, 95% CI: (1.30-2.58)]. Similarly, workers who were not used to wear personal protective devices were about 3 fold more likely injured in crude odds ratio [OR: 3.18, 95% CI: (1.40-7.23)] (Table 9).

Table 9. Selected work environment and behavioral factors related to occupational injuries, Tendaho Agricultural Development S.C, Afar Regional State, August 2006. (n=810)

	Injured		
Characteristics	**Yes**	**No**	**Crude OR**

			95% CI
Drink alcohol			
Yes	158(84.0)	30(16.0)	1.62(1.05-2.48)*
No	476(76.5)	146(23.5)	1.00
Chew khat			
Yes	170(78.7)	46(21.3)	1.04(0.71-1.51)
No	464(78.1)	130(21.9)	1.00
Smoke cigarette			
Yes	70(81.4)	16(18.6)	1.24(0.70-2.19)
No	564(77.9)	160(22.1)	1.00
Sleeping disorder			
Yes	414(84.0)	79(16.0)	2.31(1.65-3.24)***
No	220(69.4)	97(30.6)	1.00
Job satisfaction			
Yes	198(71.2)	80(28.8)	1.00
No	436(82.0)	96(18.0)	1.83(1.30-2.58)***
Use of PPD			
Yes	13(54.2)	11(45.8)	1.00
No	621(79.0)	165(21.0)	3.18(1.40-7.23)**
Hours worked per week			
≤48	38(37.6)	63(62.4)	1.00
48+	596(84.1)	113(15.9)	8.74(5.57-13.71)***
Health & Safety training			
Yes	8(38.1)	13(61.9)	1.00
No	626(79.3)	163(20.7)	6.24(2.54-15.31)***
Work department			
Dubti state farm	292(68.7)	133(31.3)	0.18(0.11-0.28) ***
Dubti ginning factory	77(77.8)	22(22.2)	0.28(0.15-0.53) ***
Detbahri state farm	265(92.7)	21(7.3)	1.00

***significant at p<0.001,**significant at p<0.01,*significant at p<0.05, PPD: Personal Protective Device

5. 3. Multivariate analysis

The multivariate analysis was done based on the conceptual frame work illustrated in Figure1.

Logistic regression technique by Enter or standard SPSS method was used hierarchically to assess the relative effect of socio-economic, environmental and behavioral factors on the out come factor (occupational injuries).To avoid many variables and unstable estimates in the subsequent model, only variables reached a p-value less than 0.3 at the bivariate analysis were kept in the subsequent analysis (37).

First, the effect of selected socio-economic factors on the magnitude of occupational injuries was assessed. In the second step of analysis, environmental factors were included, and their effect was seen in the presence of socio-economic factors. Finally, behavioral factors were added to see the effect of selected behavioral factors in the presence of socio-economic and environmental factors.

All selected socio-economic factors including sex, age, educational level and work experience of the worker entered in the first step of analysis were not significantly associated in all level of analysis except that age of the worker showed significant association with occupational injuries in the second [AOR: 0.45, 95% CI: (0.30-0.66)] and last [AOR: 0.46, 95% CI: (0.31-0.69)] level of analysis, respectively.

Both hours worked per week and health & safety training of selected environmental factors added in the second step of analysis were remained significant in the final model. Hence, workers who were used to work more than 48 hours per week were highly injured compared to those spend 48 hours and less in the second [AOR: 9.45, 95% CI: (5.84-15.29)] and final [AOR: 8.27, 95% CI: (4.96-13.79)] model of analysis, respectively. Similarly, workers with out health and safety training were also more likely to be injured than those who had training

in the second [AOR: 3.31, 95% CI: (1.18-9.30)] and final [AOR: 2.87, 95% CI: (1.02-8.06) level of analysis, respectively.

Although job satisfaction and use of personal protective devices showed significant association with occupational injuries in bivariate analysis, their significance disappeared in the final step of multivariate analysis [AOR: 1.10, 95% CI: (0.73-1.64)], and [AOR: 1.68, 95% CI: (0.61-4.62)], respectively. However, drink alcohol [AOR: 1.72, 95% CI: (1.06-2.80)] and sleeping disorder [AOR: 1.64, 95% CI: (1.12-2.41)] remained significant in the final model of analysis (Table 10).

In general summary of the logistic regression analysis in this study showed that age of the worker, working more than 48 hours per week, workers without health and safety training, drink alcohol and workers with sleeping disorder were remain significant in the final model / condensed model of analysis (Table 10).

Table10. Summary of the hierarchical logistic regression analysis of the relative effect of socio-economic, environmental and behavioral factors on the magnitude of occupational injuries, Tendaho Agricultural Development S.C, Afar Regional State, August 2006.

Characteristics	**Crude OR**	**Adjusted OR (95% CI)**

	(95% CI)	Model 1	Model 2	Final Model
Model 1 (Socio economic variables)#				
Sex				
(Male Vs Female†)	0.76(0.50-1.16)	0.88(0.55-1.39)		
Age group in years				
(17-29 Vs 30+†)	0.66(0.47-0.92)*	0.71(0.49-1.09)	0.45(0.30-0.66)**	0.46(0.31-0.69)**
Educational level				
(Illiterate Vs Literat†)	1.27(0.91-1.79)	1.17(0.81-1.67)		
Work experience				
(≤ 5 Vs 6+ years†)	0.70(0.50-0.98)*	0.91(0.59-1.40)		
Model 2 (Socio economic + Work environment variables)#				
Hours worked per week				
(< 48† Vs 48+)	8.74(5.57-13.71)**		9.45(5.84-15.29)**	8.27(4.96-13.79)**
Health & safety training				
(Yes† Vs No)	6.24(2.54-15.31)**		3.31(1.18-9.30)*	2.87(1.02-8.06)*
Model 3 (Socio economic + Work environment variables + Behavioral variables)#				
Drink alcohol				
(Yes Vs No†)	1.62(1.05-2.48)*			1.72(1.06-2.80)*
Sleeping disorder				
(Yes Vs No†)	2.31(1.65-3.24)**			1.64(1.12-2.41)*
Job satisfaction				
(Yes† Vs No)	1.83(1.30-2.58)**			1.10(0.73-1.64)
Use of PPD				
(Yes† Vs No)	3.18(1.40-7.23)**			1.68(0.61-4.62)

#: Only variables reached p-value less than 0.3 were kept in the subsequent analysis, and displayed in the table

†: Reference group * Significant at p<0.05 ** Significant at p<0.01 PPD: Personal Protective Devices

6. Discussion

Magnitude of occupational injuries

Determining the magnitude of occupational injuries and identifying associated factors are important in the development of injury prevention strategy at work places. The over all

prevalence rate of occupational injury, 783 per 1000 exposed workers in the last 12 months, was high in this study. Literatures also stated that agricultural workers suffer markedly high rates of injuries than other workers particularly in developing countries (7, 9). In addition, daily laborer in plantation and temporary workers are among the most vulnerable groups in agricultural work places (7).

This study also showed that high rate of injury compared to study made on industrial workers (16,17,29,31,32). This could be due to poor promotive and preventive occupational health and safety measures at work places such as absence of work place supervision 0(0%), health & safety training 21(2.6%), use of personal protective devices 24(3.0%), more than 48 hours working time per a week 709(87.5%) and being most, 723 (89.3%), of workers were temporary and daily laborer may contribute to high rate of injury in this study.

Common occupational injuries, causes and parts of the body affected

The data indicated that laceration, cuts, puncture, eye injury, crushing and heat strain were common injury type. A study made on farm related injuries and fatalities in Alberta, North America also showed that laceration (28%) was the most common type of injury (9). Study done among Akaki textile factory workers and assessment made on small and medium scale industries in Gondar were also consistent to this finding (17, 31). In addition, literatures also revealed that the stated findings are common occupational injury type (24, 33).

Study made on farm related injuries and fatalities in Alberta showed that machinery accounted for 55% of all injury accidents per year (9). Other studies carried out among industrial settings also showed that machinery, falling, hand tools, splinters, struck by /

against an object, and hit by falling objects are common causes of occupational injuries (17,18,29,31).This study also revealed that hand tools 457(53.6%), splinting / splashing 95(11.2%), falling 77(9.0%), hit by falling object 68(8.0%) and lifting heavy objects 44(5.2%) are common causes of injury.

The difference in this study is that hand tools is the most 457(53.6%), and machinery is among the least 25(2.9%) causes of occupational injuries. This could be possibly explained that most study participants, 723 (89.3%), in this study were temporary and daily laborers involved on intensive manually implemented activities that could expose them to injuries caused by hand tools than machinery. In addition, these agricultural workers were without health and safety training (97.4%), lack skills and without protective devices (97%).

Study made on farm related injuries and fatalities in Alberta showed that fingers (40%) and hands (13%) accounted for more than half of all injuries (9). Study done among Egyptian workers in construction industry, workers among eleven urban factories and among textile factory in Addis Ababa revealed that fingers, hands, lower leg, lower limb and eyes are common parts of the body affected. This study also revealed finger 306(32.0%), lower leg 195(20.4%), eyes 117(12.2%), toes 104(10.9%), and lower arm 100(10.4%) were common parts of the body affected, which is consistent to the stated study results (16,17, 29,31).

Factors related to occupational injuries

Observation made revealed that most working sections were with unsafe building, old and unguarded machineries, poor ventilation, excessive heat, dust, without safety & warning

signs, and absence of health and safety instructions. These are similar characteristics of work places in developing countries including Ethiopia as different studies revealed (16-18, 31, 32).

Study done among eleven urban factories and Akaki textile factory workers, Addis Ababa, assessment done by Department of Environmental Health, Ministry of Health, and report made by Ministry of Labour and Social Affair of Ethiopia revealed that young age,15-29 years, were significant contributing factors for work related injuries(16-18, 36). However, this study finding showed young age between 17 to 29 years were less likely to be injured compared to those who were 30 years and above before adjusting [OR: 0.66, 95% CI: (0.47-0.92)] and in the final model of analysis but not significant after adjusting for other socio-demographic factors which is different from the stated study results. This could be mainly due to majority of study participants in this study are agricultural workers (daily laborers) that may not require special experience or expertise. In addition, workers who are engaged in such routine activities for long period of time with poor working environment may hinder good working performance; create job dissatisfaction which could expose workers for occupational injuries.

Studies done regarding sex specific injury rate (18, 34) showed that more injury rates in males than females. However, in this study sex has no significant association which could be mainly due to both males and females worker were performing the same duty. As to income, low income countries including Ethiopia have faced higher rate of occupational injuries (19). Similarly, this study also showed that high rate of injury, 738workers per 1000 exposed workers per year.

Most studies suggest job dissatisfaction, sleep disorders, excess alcohol use increase the risk of occupational injuries (12, 13).This study also indicate that workers who were used to drink alcohol were 1.62 times more likely to be injured than those who do not consume alcohol before adjusting [AOR: 1.62, 95% CI: (1.05-2.48)] and 1.72 times more likely to be injured after adjusting for other behavioral and environmental factors [AOR: 1.72, 95%CI:(1.06-2.80)]. Similarly, those who had sleeping disorder were more than 2 times more to be likely injured than those who had not sleeping disorder before adjusting [OR: 2.31, 95% CI: (1.65-3.24)] and 1.64 times more likely to be injured after adjusting for other behavioral and environmental factors [AOR: 1.64, 95% CI: (1.12-2.41)].Those who were not satisfied with their job were more likely to be injured before adjusting other factors [OR: 1.83, 95% CI: (1.30-2.58)]. These were similar to a study made in Gondar (31).

Study participants who were used to work more than 48 hours per week were more likely to be injured compared to those who were engaged for 48 hours and less in both crude odds ratio [OR: 8.74, 95% CI: (5.57-13.71)] and adjusted [OR: 8.27, 95% CI: (4.96-13.79)].The result agreed with a study made on small and medium scale industries in Gondar. Similarly, workers with out health and safety training were more likely to be injured than those who had training in both crude [OR: 6.24, 95% CI: (2.54-15.31)] and adjusted [OR: 2.87, 95% CI: (1.02-8.06)]. This result also agreed with the above study findings (31). Workers involved in Dubti state farm [OR: 0.18, 95% CI: (0.11-0.28)] and Dubti ginning factory [OR: 0.28, 95% CI: (0.15-0.53)] were less likely to be injured compared to Detbahri state farm workers. This could be mainly that Detbahri state farm is located in rural area, not easily accessible that could hamper appropriate administrative and safety support. In addition, the observation made also revealed poor working conditions in detbahri state farm compared to Dubti ginning factory and Dubti

State farm. On the other hand all study participants 810(100%) were revealed that work place supervision had never been made in the last 12 months. This was inconsistent to a study made which revealed 76.9% of participants respond that work place supervision were made (31).

7. Strengths and Limitations of the study

Strengths

1. Since there are no published studies on the magnitude and factors related to occupational injuries among agro-industrial setting workers in Ethiopia, this study can provide base line information.
2. One year cross-sectional studies enable to see the overall magnitude of occupational injuries annually so that it includes all production seasons.

3. Policy makers and other responsible bodies could use information in this study to improve occupational safety and health services at work places.

Limitations

1. One year cross-sectional study design could result in recall bias (under or over report of injury events).
2. Workers who were injured and on leave during the study time may underestimate any association.
3. Lack of similar studies particularly in Ethiopia made difficult in comparing results.

8. Conclusion and recommendations

Conclusion

Information on the magnitude of occupational injuries and its determinant factors related to this injury is paramount important in making the problem more visible to policy makers and other responsible body. Hence, preventive strategies can be designed to improve the overall occupational health and safety services in working areas so that injuries could easily be minimized and promote production opportunity.

In this study, the overall occupational injury prevalence rate of 783 per 1000 exposed workers per year is high. Seventy (11.0%) injured respondents were hospitalized. There was also one death while working. A total of 6153 work days were lost among 634 injured respondents, being 11.4 days lost on average per an injured worker.

In agreement to similar studies made, working more than 48 hours per week, absence of health and safety training, alcohol consumption, sleeping disorder, job dissatisfaction and absence of personal protective devices among workers were significantly increases the risk of occupational injuries.

Consistent to other similar studies, work environment observation showed that working sections lack occupational health and safety services that pose various physical, mechanical, chemical, Psychological and ergonomic hazards. Similarly, all study participants revealed that supervision on health & safety conditions of work places had never been made in the last 12 months.

Recommendations

Based on the findings of this study and the above conclusion made, the following issues are recommended:

1. The existing laws, policies, regulations, directives and work place standards in the country as to occupational safety, health and work environment conditions should be implemented and enforced at all levels to maintain the safety and health of the worker.
2. Occupational safety and health services should be established in the company and include as an integral part of their concern.

3. Occupational safety and health committees should be established and run effectively.
4. Ongoing health and safety information and / or training should be given to employees
5. Periodic supervision on health and safety conditions of work places should be emphasized accordingly at all levels.
6. Standard quality personal protective devices should be available and its utilization should also be monitored regularly by the company.
7. Workers should not spend more than 48 hours per week at work.
8. Any injury events should be recorded properly and timely, and kept by the company.

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Annex 1. English version questionnaire

Questionnaire for the assessment of occupational injuries in Tendaho Agricultural Development S.C, Afar Regional State.

Identification

Name of the enterprise _____ Name of the department _____

Name of the working section_____

Address: 1. Dubti 2. Detbahri

Introduction and consent form

Hello, my name is _____. I am here on behalf of the research team of Addis Ababa University of Medical faculty of community health department. We would like to understand how big the problem of occupational injuries is and what causes this injury. To get this information, we are carrying out interviews in this enterprise. The results from this project will be used to help policy makers and other responsible bodies to improve occupational safety and health services in the enterprise. I would like to ask you some questions about an incident that resulted in injury to you while at job in the previous 12 months.

The question about occupational injuries that I would like to ask you will take about 30 minutes of your time. What you tell me will be kept strictly confidential. This information will be kept securely and no one out side of this research team will find out the answers that you give me. During the course of interview, you are free to stop the interview at any point, or not to answer any of the questions that we ask. Do I have your permission to proceed? 1. Yes 2. No

Informed consent certified by

Interviewer name_____ Signature_____

Date of interview _____Time started_____ Time completed_____

Result of interview: 1. Completed 2. Respondent not available

3. Refused 4. Incomplete

Checked by supervisor: Name_____ Signature_____

Date_____

No	Question	Possible Response	Skipping	Response code
Part I: Socio- demographic characteristics				
101	Sex	1. Male 2.Female		
102	Age	_____ Years		
103	Religion	1.Orthodox 3.Protestant 2. Muslim 99.Other, specify		
104	Ethnicity	1.Amhara 2.Afar 3.Tigrie 4.Oromo 99.Other, specify		

105	Educational level	1.Illitrate 2.Read & write 3.Primary(1-8 grades) 4.Secondary (9-12) 5.Technical 6.College Diploma/Degree		
106	Marital status	1.Married 3.Divorced/Separated 2.Single 4.Widowed		
107	Residence	1.Urban 2.Rural		
108	Job category	_____		
109	Pattern of employment	1.Permanent 2.Temporary		
110	Total service year in this enterprise	_____Month/Year		
111	Service duration in the same job	_____ Month/Year		
112	Monthly salary	_____ Birr		
Part II. Occupational injury characteristics				
201	Have you had an incident at job that resulted in an injury in the last 12 months?	1.Yes 2.No	If no, skip to Q 301	
202	Have you had an incident at job that resulted in an injury in the last 2 weeks?	1.Yes 2.No		
203.	If yes to Q 201and/or Q202 how many times	_____per year _____per 2 weeks		
204	Parts of the body affected	Per year / Per 2 weeks 1.Eyes _____ _____ 2.Upper arm _____ _____ 3.Lower arm _____ _____ 4.Finger _____ _____ 5.Head _____ _____ 6.Upper leg _____ _____ 7.Lower leg _____ _____ 8.Tooth _____ _____ 9.Anterior trunk _____ _____ 10.Neck _____ _____ 11.Back _____ _____ 12.Knee _____ _____ 13.Toes _____ _____ 14.Face _____ _____ 15.Multiple _____ _____ 99.Other, specify _____ _____		

205	Type of injury	1.Laceration 2.Fructure 3.Amputation 4.Crushing 5.Eye injury 6.Heat strain 7.Burn 8.Ear injury 9.Electrocutions 10.Back pain 11.Poisoning 12.Cuts 13.Dislocation 14.Puncture 15.Suffocation 16.Snake bite 99.Other, specify	1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No _____		
206	What were you doing at the time of injury?	_____				
207	Causes of injury	1.Struck by/against an object 2.Machinery 3.Hit by falling objects 4.Falling accident 5.Hand tools 6.Pesticides 7.Fire 8.Lifting heavy objects 9.Electricity 10.Splinting objects 11.Snake bite 99.Other,specify	1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No _____		
208	What was the reason given by the respondent for the causes of injury?	1.Absence of protective devices 2. Misuse of protective devices 3. Disorder of normal operation 4. Absence of safety education 5.Improper hand working Instruments 6.Absence/inadequate machine safe guards 99.Other, specify	1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No _____		
209	Day of injury	1.Monday 2.Tuesday 3.Wednesday 4.Thursday 5.Friday 6.Saturday 7.Sunday 22.Do not remember	1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No 1.Yes 2.No		

210	Time of injury	1.In the morning 1.Yes 2.No 2.In the afternoon 1.Yes 2.No 3.In the evening 1.Yes 2.No 4.In the mid-night 1.Yes 2.No 22.Do not remember		
211	Were you hospitalized as a result of injury in the last 12 months?	1.Yes 2.No		
212	If yes to Q.211, for how long?	_____ days		
213	Number of working days lost due to injury at work for the last one year	_____ days		
Part III. Working Environment Information				
301	Hours worked per week	_____ hr		
302	Do work places supervised regularly?	1.Yes 2.No		
303	Have you had any occupational safety training / education?	1.Yes 2.No		
304	How long since your last training/education?	_____days/month/years		
Part IV. Worker's Behavior Information				
401	Do you drink alcohol?	1.Yes 2.No	If no, skip to Q403	
402	If yes to Q401, how often?	1.Every day 2.1-3 days / week 3.Occasionally		
403	Do you chew khat?	1.Yes 2.No	If no, skip to Q405	
404	If yes to Q403, how often?	1.Every day 2.1-3 days / week 3.Occasionally		
405	Do you smoke cigarette?	1.Yes 2.No	If no, skip to Q407	
406	If yes to Q405, how often?	1.Every day 2.1-3 days / week 3.Occasionally		
407	Do you have sleeping disorders?	1. Yes 2. No	If no, skip to Q409	
408	What is the reason for this sleeping disorder?	1. Working more than 8 hrs/day in the enterprise 2. Engage in additional duties outside the enterprise 3. Evening/Mid-night working time 4. Work burden 99.Other, specify		
409	Are you satisfied with your assigned job?	1. Yes 2. No		
410	Do you use personal protective devices?	1. Yes 2. No	If no, skip to Q412	

411	If yes to Q410, what type?	1.Gloves 1.Yes 2.No 2.Respirators 1.Yes 2.No 3.Goggles 1.Yes 2.No 4.Face shield 1.Yes 2.No 5.Boots 1.Yes 2.No 6.Ear plug 1.Yes 2.No 7.Helmet 1.Yes 2.No 99.Other, specify		
412	What is your reason for not using personal protective devices?	1.Absence of protective devices 2.Not comfortable to use 3.Absence of safety & health education 4.It decrease work performance 5.Create health & safety hazards 99.Other, specify		

Thank you!!

Annex 2. Amharic version of the qestionnaire

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¾SÖÃp lØ`---------

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2®9	Ñ<Ç~ ¾Å[cu*ƒ* k”	1. c™ 2. T¡c™ 3. □aw 4. NS<e 5. ›`w 6. pÇT@ 7. □G<É 22. ›Le□¨<eU	1. ›- 1. ›- 1. ›- 1. ›- 1. ›- 1. ›- 1. ›-	2. ¾KU 2. ¾KU 2. ¾KU 2. ¾KU 2. ¾KU 2. ¾KU 2. ¾KU		
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210	Ñ<Ç~ ¾Å[cu*ƒ* Ñ>²?	3. T 4. K?K=*ƒ* 22. ›Le<eU	1. ›- 2. ¾KU 1. ›- 2. ¾KU	
211	uÅ[cu-*ƒ* Ñ<Ç*ƒ* U¡"Á*ƒ* uÖ?" }sU }¯}¨< ¡Sª M;	1. ›- 2. ¾KU		
212	›-ŸJ'KU"ÁIM Ñ>²?;	_____ k"*ƒ*		
213	ŸY^Ò` u}ÁÁ² Ñ<Ç„‹ U¡"Á*ƒ* vKñ*ƒ* ›Y^ G<K*ƒ* ¨^*ƒ* ¨<eØ ŸY^ ¾k\u*ƒ* k"*ƒ* w³*ƒ*	_____ k"*ƒ*		
¡õM fe*ƒ* : ¾Y^ x" u}SKŸ}				
3®1	udU"*ƒ* U" ÁIM W¯*ƒ* ÃW^K<?	_____		
3®2	¾Y^ x lØØ` }Å`ÑA Á¨nM?	1. ›- 2. ¾KU		
3®3	¾Y^ LÃ ÅI"'*ƒ*" u}SKŸ} *ƒ*UI`*ƒ* ¨ÃU eMÖ" ¨eÅ¨< Á¨<nK<?	1. ›- 2. ¾KU	¾KU "K< ¨Å ØÁo 401 ÃKñ	
304	KSÚ[h Ñ>²? eMÖ"/*ƒ*UI`*ƒ* Ÿ¨cÆ U" ÁIM Ñ>²? J'-*ƒ*;	_____k"*ƒ*/¨^*ƒ*/¯S*ƒ*		
¡õM ›^*ƒ* : ¾W^}—¨" vl] u}SKŸ}				
4®1	›M¢M SÖØ ÖØ}¨< Á¨<nK<?	1. ›- 2. ¾KU	¾KU "K< ¨Å ØÁo 403 ÃKñ	
4®2	¾T>ÖÖ< ŸJ'	1. u¾k'< 2. Ÿ1-3 k" udU"*ƒ* 3. ›Mö ›Mö		
4®3	Ý*ƒ* ÃpTK<?	1. ›- 2. ¾KU	¾KU "K< ¨Å ØÁo 405 ÃKñ	
4®4	¾T>pS< ŸJ'	1. u¾k'< 2. Ÿ1-3 k" udU"*ƒ* 3. ›Mö ›Mö		
4®5	c=Ò^ ÁÚdK<?	1. ›- 2. ¾KU	¾KU "K< ¨Å ØÁo 407 ÃKñ	
4®6	¾T>ÁÚc< ŸJ'	1. u¾k'< 2. Ÿ1-3 k" udU"*ƒ* 3. ›Mö ›Mö		
4®7	¾"pMõ ‹Ó` ›Ku-*ƒ*?	1. ›- 2. ¾KU	¾KU "K< ¨Å ØÁo 409 ÃKñ	
408	¾"pMõ ‹Ó` ¾T>ÑØS-*ƒ* uU" U¡"Á*ƒ* K=J" Ã‹LM;	1. uÉ`Ï~ uk" Ÿ 8 c¯*ƒ* uLÃ Se^*ƒ* 2. ŸÉ`Ï~ u}ÚT] ¾ÓM e^ Se^*ƒ* 3. ¾e^ Ñ>²? uUi*ƒ*/ K?K=*ƒ* SJ" 4. ¾e^ Ý" S•` 99. K?L "K ÃÖke		
4®9	uY^- Åe}— '-*ƒ*?	1. ›- 2. ¾KU		
410	uY^ x- ¾Ñ<Ç*ƒ* SŸLŸÁ SX]Á-‹" ÃÖkTK<;	1. ›- 2. ¾KU	¾KU "K< ¨Å ØÁo 412 ÃKñ	
411	¾T>ÖkS< ŸJ' U" ›Ã'*ƒ*	1. Õ"*ƒ* 1.›- 2.¾KU 2. ¾›õ"Ý" ›õ SŸLŸÁ 1.›- 2.¾KU 3. ¾›Ã" SŸLŸÁ S'ì` 1.›- 2.¾KU 4. ¾ò*ƒ* SŸLŸÁ 1.›- 2.¾KU 5. x+ ÝT 1.›- 2.¾KU 6. ¾Ða SŸLŸÁ 1.›- 2.¾KU 7. ¾ß"pL*ƒ* SŸLŸÁ 1.›- 2.¾KU 99. K?L "K ÃÖke		
412	¾TÃÖkS< ŸJ' U¡"Á}- U"É"	1. ¾SŸLŸÁ SX]Á-‹ 1.›- 2.¾KU		

	’¨<?	vKŞ•^†¨< 2. K›ÖnkU U‡eLMJ’ 3. ¾Ål”’ƒ“ Ö?“ ›Övup ƒUl`ƒ eKTÃcØ 4. ¾Y^ ›ðéçU” cKT>k”e 5. KÅl”’ƒ¨“ KÖ?“ Ö”p K=ÁeŸƒM eKT>‹M 99. K?L "K ÃÖke	1.›- 1.›- 1.›- 1.›- _____	2.¾KU 2.¾KU 2.¾KU 2.¾KU	

›ScÓ“KG<!

Annex 3. Work environment observation checklist

Checklist for the observation of working environment in Tendaho Agricultural Development S.C, Afar Regional State (Adapted from 31).

Identification

- Name of the enterprise_____
- Name of the department_____
- Name of the working section_____
- Address: 1.Dubti 2. Detbahri

Hazards in working environment

1. Is there excessive heat in the workplace? 1. Yes 2 No. Yes requires that a worker is found sweating when naked or with light clothing; if investigator feels as sudden heat wave when entering in to the industry.

2. Is there excessive dust in the workplace? 1. Yes 2. No. Yes requires if the investigator experiences sudden sneezing up on entering the industry or if the worker's eyebrows, hair, nostrils and cloths is observed by investigators to be covered with dust particle.

3. Is there excessive noise in the workplace? 1. Yes 2. No. Yes requires that it is difficult to communicate with nearby worker with out shouting.

4. Is there warning sings or safety rules? 1. Yes 2 No. Yes requires no lack of such arrangement while inspection around.

5. Do the employees use the necessary personal protective devices? 1. Yes 2.No yes requires no lack in use of safety devices seen at inspection around.

6. Do all production equipments have the appropriate protective arrangement?

1. Yes 2. No. Yes requires no lack of such arrangement

7. What is the most dangerous incident in the industry during the last 12 months? _____

8. Was there any preventive measures implemented? 1. Yes 2.No. Yes requires specification of preventive measures.

9. Does the industry have copy of the most important safety and health regulations?

1. Yes 2. No Yes requires a copy of the regulation.

10. Does the industry have health and safety personnel? 1. Yes 2. No. Yes requires either implementation as result of initiative from health and safety personnel or written programme for action worked out with them.

11. Does the industry follow written health and safety plan of action in the workplace?

1. Yes 2. No. Yes requires completion of at least one of the measures in the plan.

12. Does the industry have meetings to discuss safety and health factors with the employees in the last six months? 1 Yes 2 No Yes requires minutes with written conclusions.

13. Are training needs considered in connection with new employment, equipment or other changes? 1. Yes 2. No Yes requires an example or training given as a consequence of a change.

14. Does the working section have first aid equipment? 1 Yes 2 No Yes requires that first - aid equipment be valuable in the production area and that content be as prescribed.

Thank you!