UNIVERSITI PUTRA MALAYSIA

SUBJECTIVE PREFERENCE AND PERCEPTION OF SAFETY AND THERMAL COMFORT ON FABRICS OF UPPER WORKING GARMENTS AMONG OIL PALM PLANTATION WORKERS AT SANDAKAN, SABAH.

AMIRAH AIDA BINTI MADZLAN

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BY

AMIRAH AIDA BINTI MADZLAN

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ABSTRACT

SUBJECTIVE PREFERENCE AND PERCEPTION OF SAFETY AND THERMAL COMFORT ON FABRICS OF UPPER WORKING GARMENTS AMONG OIL PALM PLANTATION WORKERS AT SANDAKAN, SABAH.
AMIRAH AIDA BINTI MADZLAN

INTRODUCTION: Garments are important for agricultural workers especially in tropical climate country and their primary role is to protect the body against unsuitable physical environments and injuries. The use of inappropriate garment may be the contributing factors that lead to heat-related illness and external physical injuries and because of this, the fabric of garments need to be considered while selecting the appropriate garment for work that can maximize the safety and health of the workers. There is in need to determine the best type of fabric for upper working garments. One way to do so is based on the workers' subjective preference and perception on safety and health aspects. **OBJECTIVE:** The purpose of this study is to determine the perception of safety and thermal comfort and subjective preference of upper working garments among oil palm plantation workers at Sandakan, Sabah. **METHOD:** A cross-sectional study was carried out among 113 harvesters in oil palm plantation. A questionnaire was used to collect information on sociodemographic and occupational information, perception on workplace safety and thermal comfort, fabric perceptions and subjective preference. **RESULTS:** The results indicated that a total of 75.2% workers in the plantation preferred 100% microfiber polyester as upper working garment's fabric. The subjective preference of fabrics were significantly associated with the prevalence of external physical injuries ($\chi 2=5.23$; p-value=0.02) and heat rash ($\chi 2=5.23$; p-value=0.02). Also, there is a significant association between the subjective preference with the perceptions in terms of thermal comfort for heat resistance ($\chi^2=22.63$; p-value<0.001) and sweat absorption ($\chi^2=15.77$; p-value< 0.001), safety ($\chi^2=34.74$; p-value<0.001) and comfort ($\chi^2=41.25$; p-value<0.001). Based on the results, the workers' preference of fabric was associated with their perception on the fabrics of clothing. **CONCLUSION:** Majority of the workers in the plantation preferred 100% microfiber polyester as upper working garment's fabric and selected 100% microfiber polyester for the perceptions on fabrics as safer, feels more comfortable, feels cooler when wearing and is quicker to dry under the sun. However, most of the workers perceived 100% cotton has better absorption rate. This study reveals the acceptance of workers on the properties of 100% microfiber polyester specifically the safety and thermal comfort characteristics to be used as fabric for upper working garments. This study provides data that can be used for further study to come out with related suggestions and design for upper working garment especially for outdoor agricultural workers working in tropical climate country.

Keywords: subjective preference, fabrics of upper working garments, oil palm plantation workers

ABSTRAK

PILIHAN SUBJEKTIF DAN PERSEPSI KESELAMATAN DAN KESELESAAN TERMAL FABRIK PAKAIAN KERJA ATAS DI KALANGAN PEKERJA LADANG KELAPA SAWIT DI SANDAKAN SABAH.

AMIRAH AIDA BINTI MADZLAN

PENGENALAN: Pakaian adalah penting untuk pekerja pertanian terutamanya di negara iklim tropika dan peranan utama pakaian adalah untuk melindungi tubuh daripada persekitaran fizikal dan kecederaan. Penggunaan pakaian yang tidak sesuai boleh menjadi faktor penyumbang yang menyebabkan penyakit yang berkaitan dengan haba dan kecederaan fizikal luaran dan kerana itu, fabrik pakaian perlu dipertimbangkan ketika memilih pakaian yang sesuai untuk kerja yang dapat memaksimalkan keselamatan dan kesihatan pekerja. Terdapat keperluan untuk menentukan jenis fabrik yang terbaik untuk pakaian kerja atas. Salah satu cara untuk melakukannya adalah berdasarkan pilihan subjektif dan persepsi pekerja terhadap aspek keselamatan dan kesihatan. **OBJEKTIF:** Tujuan kajian ini adalah untuk menentukan persepsi keselamatan dan keselesaan termal dan pilihan pakaian kerja atas pekerja di kalangan pekerja ladang kelapa sawit di Sandakan, Sabah. **KAEDAH**: Kajian rentas keratan telah dijalankan di kalangan 113 penuai di ladang kelapa sawit. Soal selidik digunakan untuk mengumpul maklumat mengenai maklumat sosiodemografi dan pekerjaan, persepsi tentang keselamatan tempat kerja dan keselesaan terma, persepsi fabrik dan pilihan subjektif. **KEPUTUSAN:** Hasilnya menunjukkan bahawa 75.2% pekerja di perladangan memilih poliester microfiber 100% sebagai fabrik pakaian kerja atas. Pilihan subjektif fabrik dikaitkan secara signifikan dengan kecederaan luka fizikal luar ($\chi2 = 5.23$; p-value = 0.02) dan ruam panas ($\chi2 = 5.23$; p-value = 0.02). Terdapat persamaan yang signifikan antara pilihan subjektif dengan persepsi dari segi keselesaan termal untuk rintangan haba ($\chi2 = 22.63$; p-value <0.001) dan penyerapan peluh ($\chi2 = 15.77$; p-value <0.001) $\chi2 = 34.74$; p-value <0.001) dan keselesaan ($\chi2 = 41.25$; p-value <0.001). Berdasarkan keputusan, pilihan pekerja terhadap fabrik dikaitkan dengan persepsi mereka terhadap fabrik pakaian. **KESIMPULAN:** Kebanyakan pekerja di perladangan memilih 100% poliester mikrofiber sebagai fabrik pakaian kerja atas dan 100% poliester microfiber terpilih untuk persepsi terhadap fabrik sebagai lebih selamat, berasa lebih selesa, berasa lebih sejuk ketika memakai dan lebih cepat kering di bawah matahari. Bagaimanapun, kebanyakan pekerja menganggap 100% kapas mempunyai kadar penyerapan yang lebih baik. Kajian ini mendedahkan penerimaan pekerja terhadap sifat 100% poliester mikrofiber khususnya ciri keselamatan dan keselesaan terma yang digunakan sebagai fabrik untuk pakaian kerja atas. Kajian ini memeberikan data yang boleh digunakan untuk kajian lanjut untuk mendapatkan saranan dan reka bentuk yang berkaitan untuk pakaian kerja atas terutama untuk pekerja pertanian yang bekerja di negara iklim tropika.

Kata kunci: pilihan subjektif, fabrik pakaian kerja atas, pekerja ladang kelapa sawit

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LIST OF ABBREVIATIONS

DOSM	**Department of Statistics Malaysia**
FFB	**Fresh Fruit Bunch**
MPOC	**Malaysian Palm Oil Council**
OSH	**Occupational Safety and Health**
OSHA	**Occupational Safety and Health Act**
PPE	**Personal Protective Equipment**
SOCSO	**Social Security Organization**
SPSS	**Statistical Package of Social Sciences**

CHAPTER 1

INTRODUCTION

1.1 Research Background

The growth of agriculture sector continued in 2015 with a contribution of 8.9% to the Gross Domestic Product (GDP). Department of Statistics Malaysia (2015) stated that oil palm was a major contributor to the GDP at 46.9% in 2015 followed by other agriculture which are livestock (10.7%), fishing (10.7%), rubber (7.2%) and forestry and logging (6.9%). In 2013, palm oil industry in Malaysia was one of the largest contributors of the economy (MPOC, 2013). A comprehensive statistics obtained from the publication of Selected Agricultural Indicators, Malaysia, 2016 showed that the workers in agriculture sector was 1,753,900 persons, increased by 3.5% and the number of non-citizens employed persons in the agriculture sector was 646,400 persons with an increase of 16.2 % compared to the previous year (Department of Statistics Malaysia, 2016).

Alongside with this tremendous outcome for employment and economic growth, there is an Occupational Safety and Health (OSH) concern in agricultural sectors. Agriculture workers such as in the oil palm plantation have been identified as a group with increased vulnerability to climate-sensitive health outcomes (Bethel & Harger, 2014). Due to their nature of work, agricultural workers face with a number of hazards that include

chemical hazards, biological hazards, ergonomic hazards, psychosocial hazards and physical hazards (Auyong, 2016). For instance, the major daily work done by oil palm plantation harvesters are cutting fresh fruit bunches (FFBs), collecting, loading and unloading FFBs to be sent to the processing plant.

Prolonged exposure to high temperature mainly in tropical climate countries, elevates the risk of heat-related illness among workers such as heat rash, heat syncope, heat cramps and heat exhaustion (Kjellstrom, Holmer, & Lemke, 2009). Apart from that, agricultural workers are exposed to the thorny fronds and the danger cuts that may cause external physical injuries to the body (Nawi et al., 2016). Therefore, the task requirement leads to unavoidable exposure to physical hazards such as heat and sharp objects.

Therefore, garment is an important issue for workers especially in Malaysia due to the tropical climate. The primary role of garments is to protect the body against unsuitable physical environments. Based on these roles, subjective preferences can be clearly defined, thus providing the best type of fabric to workers that can maximize safety and health. Depending on the types of fabric, different fabric possess different characteristics such as comfort (including thermal), water absorption and retention, air flow, abrasion and penetration resistance, elasticity, etc.

1.2 Problem Statement

Occupational contexts that involve hot and humid climatic conditions, heavy physical workloads and clothing create a strenuous and potentially dangerous thermal load for workers (Lucas et al., 2014). The effectiveness of sweating can be lessened due to high humidity and low wind speed by reducing the amount of evaporation that can occur, thus, decreasing possibilities for workers to lose excess heat. This may be further exasperated by garments worn by workers (Crowe et al., 2010) .

Harvesting activity in oil palm plantation is one of the activities in agriculture sector that expose the workers to heat stress (DOSH, 2016). A study conducted by Nasir et al. (2016) found that almost half of the harvesters had high humidity and heat stress exposure. This is because the intensive manual work tasks require the workers especially the harvesters in the oil palm plantation to work in high levels of sun exposure that may lead to heat-related illness. In addition, workers' physical exertion and dehydration could cause potential heat-related illness to the workers, thus, lessen work performance and productivity (Kjellstrom et al., 2009).

The likelihood of occupational injury due to heat-related ilness can also lead to unsafe working environment (Tawatsupa et al., 2013). Apart from that, due to the nature of work of oil palm plantation workers which involve cutting, collecting and unloading FFBs, they are exposed to sharp fronds and leaves that may cause superficial injuries. Apart from wearing personal protective equipment (PPE) such as safety helmet, the

harvesters do not wear any specific protective clothing during work to protect them from physical hazards such as abrasions and cuts. When the workers are exposed to get heat-related illness and injuries, the productivity of workers can be reduced. The use of inappropriate garments may be the contributing factors that lead to heat-related illness and external physical injuries and because of this, the fabric of garments need to be considered while selecting the appropriate clothing for work.

Furthermore, there is a limited study of the subjective preference and perception of workers for garments' fabric for occupational safety and health and there is a lack of recommendations for appropriate upper working garment. Proper type of attire for agriculture workers that relates to the thermal comfort was not emphasized before and workers was given their own right to choose their own upper garments without proper guidance (Taylor & Obendorf, 2010). This may lead to selecting inappropriate type of upper working garment's fabric for work.

1.3 Study Justification

It is important to determine the best type of fabric as the upper working garments for the outdoor workers. One way to do so is based on the workers' subjective preference and perceptions on safety and health aspects (protection/safety functions to protect wearers from physical injury and thermal environment and the comfort function which gives wear comfort to wearers).

The primary benefit of this study is to provide information to the stakeholder on the subjective preference of fabric of upper working garment from the data obtained of the subjective preference between 100% microfiber polyester and 100% cotton based on the workers perspective in occupational safety and health among oil palm plantation workers. Also, the data can be used to come out with related suggestions for fabric of upper working garment for agricultural sector especially for outdoor workers working in tropical climate country such as Malaysia. It will also provide preliminary feeding or exploratory finding for further study related to fabric for further study related to fabric for occupational safety and health.

1.4 Objective

1.4.1 General Objective

a. To determine the subjective preference and perception of safety and thermal comfort on fabrics of upper working garments among oil palm plantation workers at Sandakan, Sabah.

1.4.2 Specific Objectives

a. To determine the socio-demographic background and occupational information (history) among harvesters in an oil palm plantation company at Sandakan, Sabah.
b. To determine the prevalence of external physical injuries and heat-related illness among harvesters in an oil palm plantation company at Sandakan, Sabah.
c. To determine the perception on fabrics for safety properties and thermal comfort and the subjective preference among harvesters in an oil palm plantation company at Sandakan, Sabah.
d. To determine the association between the prevalence of external physical injuries and heat-related illness with the subjective preference of fabrics among harvesters in an oil palm plantation company at Sandakan, Sabah.

e. To determine the association between perception on fabrics for safety properties and thermal comfort with the subjective preference of fabrics among harvesters in an oil palm plantation company at Sandakan, Sabah.

1.5 Hypothesis

a) There is a significant association between the prevalence of external physical injuries and heat-related illness with the subjective preference of fabrics among harvesters in an oil palm plantation company at Sandakan, Sabah.

b) There is a significant association between perception on fabrics for safety properties and thermal comfort with the subjective preference of fabrics among harvesters in an oil palm plantation company at Sandakan, Sabah.

1.6 Conceptual Framework

Hazards and injuries are frequently associated with the activities of agricultural workers and the hazardous tasks exposed to the oil palm workers includes physical hazards. Nawi et al. (2016) stated that agricultural workers are exposed to risk of injury from the thorny fronds and the danger cut which can be classified as sharps. Apart from that, agricultural workers is one of the highest risk groups for heat exposure and clothing can be a heat load for the workers (Jackson & Rosenberg, 2010). Clothing should emphasize on the protection from potential external physical injury and heat-related illness caused by the exposure of heat.

Rameshbhai (2014) stated that the main purpose of clothing is to protect the body against inappropriate physical conditions such as by maintaining the ideal thermal environment for the body and preventing the body from being injured. The aspects in garments' fabric that relates to occupational safety and health that have to be considered when selecting the fabric are the protection/safety functions towards external injuries and heat-related illness. Clothing can be classified into having thermal, mechanical and physical properties, and fabrics falls under physical properties of clothing (Textile School, n.d.). Jørgensen (1991) described that the aspects under safety properties are resistance from abrasion and penetration. Marmarali (2007) stated good heat transmission, water absorption, water retention are under thermal comfort of fabric.

Based on these aspects, perception and the subjective preference of the types of upper working garments' fabric can be clearly defined, and may provide the best type of

fabric to workers that can maximize safety and health in the oil palm plantation. In this study the independent variable will be the prevalence of external physical injuries; prevalence of heat-related illness; perception on fabrics for safety properties and thermal comfort; and the dependent variable will be the subjective preference on the upper working garment's fabric to be worn for work. Figure 1.1 shows the conceptual framework of this study.

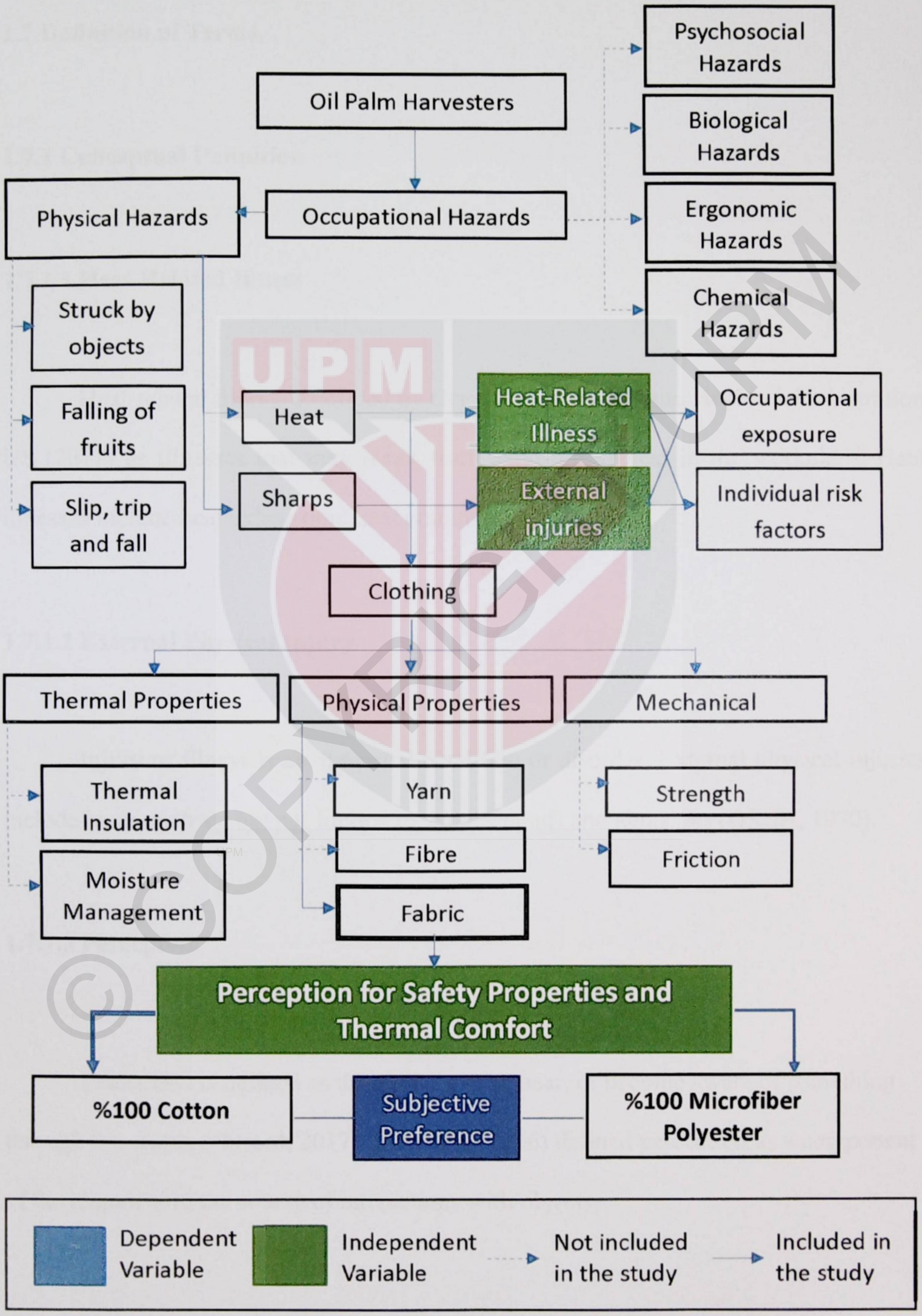


Figure 1.1: Conceptual Framework of This Study.

1.7 Definition of Terms

1.7.1 Conceptual Definition

1.7.1.1 Heat-Related Illness

Heat-related illness is defined by Occupational Safety and Health Administration US (2017) as illnesses that may result from exposure to heat in the workplace. Heat illnesses include heat exhaustion, heat cramps and heat rash.

1.7.1.2 External Physical Injury

Injury or illness is an abnormal condition or disorder. External physical injuries include cases such as, but not limited to, cuts, wounds and abrasions (OSHA, 1970).

1.7.1.3 Perception

Perception is defined as the ability to see, hear, or become aware of something through the senses (Oxford, 2017). Buxbaum (2016) defined perception as a component of development in the course of interactions with objects.

1.7.1.4 Subjective Preference

According to Oxford Dictionaries (2017), subjective is defined as being influenced by or based on personal feelings, tastes, or opinion. Preference has a definition of greater liking for one alternative over others.

1.7.2 Operational Definition

1.7.2.1 Heat-related illness

Symptoms of illnesses experienced by the harvesters that may result from exposure to heat in the plantation. The prevalence of heat related illness will be measured by the response of the respondents via questionnaire.

1.7.2.2 External Physical Injury

External physical injury is any cuts, abrasions and wounds on the parts of the body while the workers wear their upper working garments, resulted from unsafe act or unsafe condition occurred among oil palm plantation workers. Prevalence of external physical injuries will be measured by the response of the respondents via questionnaire.

1.7.2.3 Perception

Perception is measured by the workers perceive between the two fabrics, which one has better thermal comfort and safety properties such as heat resistance, water absorption, water retention, resistance from cuts and abrasion and fabric comfort based from the workers' experience and cutaneous touch that developed the perception.

1.7.2.4 Subjective Preference

Subjective preference of upper working garment's fabric was measured by the response of the respondents via questionnaire. The workers are given two fabrics (100% cotton and 100% microfiber polyester) to choose as their subjective preference of fabric if upper working garment is to be provided by the employer.

CHAPTER 2

LITERATURE REVIEW

2.1 Fabric of Garment

The main purpose of garment is to protect the body against injury and any inappropriate environment such as from heat, cold, wind etc. and apart from these important functions, garment has to provide comfort to the wearer (Chattopadhyay, 2008). Chattopadhyay (2008) further stated that one of the attributes in garment other than colour, texture, thickness etc. is fabric. Uttam (2013) noted that there is a variety fabric types that are available commercially and these fabrics differ in their structure which may affect the thermal comfort and safety of the fabrics. The properties of fabric are basically determined by the properties of the fibers. It is important to determine the suitability of fabric in a garment. Fabric characteristics can be subjectively assessed and one way to do so is by touching the fabrics (Luible et al., 2007).

Polyester and cotton are two types of fabrics which are widely used for garments. In 2016, total demand for polyester fibers is dominated by polyester, which accounts for about 68% of overall consumption (IHS Markit, 2016). According to a study by Saini et al (2016), cotton and polyester fabric differed in weaving pattern and surface morphology under magnification. Cotton has a dense weave whereas polyester is less dense. Single

strands of cotton has a convoluted structure with grooves and folds on its surface consistent with its natural origin while polyester had a smooth surface congruous with its synthetic origin and spinning.

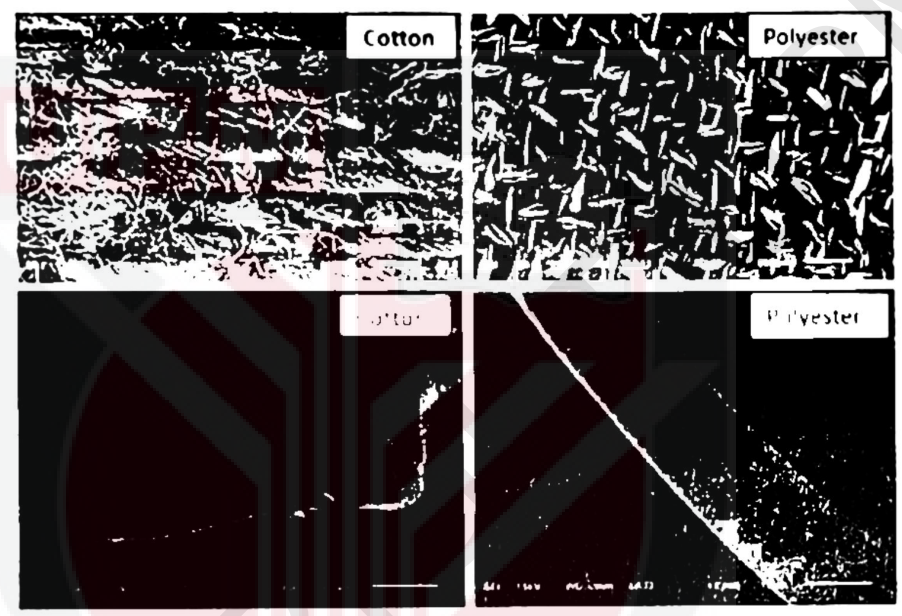


Figure 2.1: Comparison of Weave and Surface Structure of Single Strands of Cotton and Polyester

2.1.1 Microfiber Polyester

Microfiber polyester is synthetic and the fiber is split many times smaller than a human hair (DEOHS University of Washington, 2011). The use of microfibers in the fabric introduce some special properties in the fabric and the feature is said to have a unique high-density weave structure comprising millions of micro-crimped fiber loops (Uttam, Zail, & Campus, 2013). Rameshbhai (2014) stated that polyester is a synthetic fiber and hydrophobic and now widely used in active wear.

Figure 2.2: 100% Microfiber Polyester Upper Garment

2.1.2 Cotton

Whereas cotton accounts for half of the world's consumption of fibers while polyester is today the second most used fiber after cotton and far ahead of other synthetics both in terms of production and consumption. Cotton is a natural fiber, made of long chains of natural cellulose containing polysaccharides (Pritchard et al., 2000). Rameshbhai (2014) noted that natural fibers such as cotton are hydrophilic, accounting that their surface has bonding sites for water molecules and making water tends to be retained in the fibers, which have poor moisture transportation and release.

Figure 2.3: 100% Cotton Upper Garment

2.1.3 Properties of Fabric

2.1.3.1 Safety Property of Fabric

Tapie, Tan, and Shim (2017) stated that another critical aspect of fabric performance is its ability to prevent excessive deflection, as a large deflection may lead to severe damage and basically, penetration resistance should be considered in designing protective systems involving high-strength fabrics to withstand projectile impact. Cutting resistance is an important properties of fabrics, and the resistance consists of two aspects of the materials which are intrinsic strength reflection of the material, and the other is the frictional contribution (Vu Thi, Vu-Khanh, & Lara, 2005). Polyester material provided high strength and abrasion resistance (Pritchard et al., 2000). While another study conducted by Bhardwaj et al. (2016) stated that the synthetic fibers such as polyester has a better cut resistance behaviour compared to cotton.

2.1.3.2 Comfort of Fabric

Pritchard, Sarsby and Anand (2000) stated that protective clothing must provide resistance to the elements, whilst at the same time providing comfort during wear. Garments' comfort is an important aspect because it can give impact towards the performance of individuals at work. Consumers consider fabric sensorial properties as one of determining factors in choosing garments. The sensorial properties could be categorized into two types which tactile properties and mass transfer related comfort properties (Hong & Kim, 2007). The tactile comfort is described as the mechanical interaction between the garments' material and the human body (Yoon, Sawyer, & Buckley, 1984).

The skin sensorial wear comfort is defined by the mechanical sensations, which a fabric causes in direct contact with the skin and poor skin sensorial wear comfort may contribute to skin irritations (Bartels, 2006). Uttam et al. (2013) mentioned that cotton gives a good combination of softness and comfort but it is not recommended for use in active sportswear due to its proneness to absorb and keep moisture.

2.1.3.3 Thermal Comfort of Fabric

Thermal comfort is associated with the ability of fabric to keep the temperature of skin through transfer of heat and perspiration generated within the human body (Behera et al., 1997). Etzi et al. (2014) stated that thermal comfort depends on combinations of clothing, climate and physical activity. Taylor, Lee and Obendorf (2010) conducted a study to understand the protection and thermal comfort performance of a wide range of protective clothing stated that it becomes extremely vital in determining thermal comfort, especially in hot environment in which sweat production and evaporation from the human body are the prime cooling mechanisms for maintaining thermal comfort and avoiding heat stress. An appropriate skin temperature can be kept by wearing garments (Taylor, 1982). Yin (2012) noted that based on a large database collected, there is a significant relationship between thermal comfort and microclimatic conditions, including solar radiation, atmospheric pressure, maximum temperature, wind speed and relative humidity.

Rameshbhai (2014) stated that the body humidity is absorbed by the fabric when we start to sweat. Cooling cannot occur if the humidity is not transported to the surface to dry and remains in the fabric because the body warms up and even more sweat is produced. A good moisture handling property should have a good sweat absorption and fast drying property for getting more tactile comfort. Nawaz, Troynikov and Watson (2011) reported 100% cotton is

excellent in transferring heat but it might not be preferable in hot environment where body sweats profusely. This is because cotton has the ability to hold water but unable to transfer moisture to the environment.

If the humidity is high, sweat is still produced but evaporation is reduced which reduces the cooling effect (McNeill & Parsons, 1999). Thus, it is important to wear clothing with low water retention properties so it can dry quickly and keep water away from the skin. Rameshbhai (2014) noted that high low water retention for efficient heat transfer under a mild thermal stress condition, and rapid liquid transport characteristics for transferring heat efficiently, contribute to a good thermal comfort of clothing fabric. The evaporation of sweat is extremely effective and therefore becomes more and more critical with increasing environmental temperature.

2.1.4 Effects of Fabric on Subjective Preference

Clothing is an essential human need with several functions. The choice of clothing is based on many factors such as personal desires and the particular application; which are user dependent. However, people's preferences may also be dynamic with age which can be the confounding factor (Kamalha et al., 2013). A study conducted by Forsythe and Thomas (1989) to examine the relationship between consumer fiber preferences for a casual blouse and demographic variables found that the preferences were not generally related to demographic characteristics. Wong

(2005) surveyed that amongst the subjects who tried the same particular garment, many of them (67%) preferred the ones which were made of polyester. Construction Industry Council suggested wearing clothing made of natural materials such as cotton in the construction site, but the workers do not prefer the recommended clothing due to fabric is thick and impermeable, making the recommendation was not implemented well (Chan et al., 2016).

2.1.5 Garment's Fabric and Occupational Safety and Health

Wearing appropriate clothing is a safety measure for workers working in hot weather (Chan et al., 2016). Ukponmwan (2009) described one of the roles of garment's fabric is to enable the body to maintain itself in thermal balance, core and skin temperature, and sweat dissipation according to the environmental conditions and activity of the wearer. Clothing can be used to control heat stress when the body fails to eliminate heat when working in hot environments (DOSH, 2016a). According to Nawaz et al., (2011), garment's fabric is one of the factors that affect human heat exchange with the environment. Also, fabric functions to reduce the risks of posing considerable potential for injury to the workers working with the hazard with its resistance from cuts and abrasion property.

2.2 Occupational Safety and Health in Agricultural Sector

2.2.1 Exposure to Heat

Climate change is one of the greatest threat facing the world. This is because it causes rise in the ambient temperature of the environment (World Health Organization, 2015). Center of Disease Control (2004) stated that outdoor workers who are exposed to heat are at risk of heat stress, for instance are farmers, construction workers, miners, factory workers, and others. Cortez (2009) explained that heat stress also has a direct effect on production by causing poor task performance and it elevates the possibility of work-related morbidity and injuries. Agriculture is among the major employer in the developing world, operations carried by agricultural workers is normally at high risk of heat stress, as they work under high pressure, perform extended hours of work in high heat and humidity, suffer dehydration and often do not have sufficient knowledge on the prevention of heat exposed (Sadiq, 2016).

2.2.2 Exposure to Sharps

Apart from oil palm workers are exposed heavy workload and also bending working posture due to carrying the fresh fruit bunches (FFBs), the workers also are exposed to danger cut due to lifting the thorny fronds, thus making the agriculture workers exposed to risk of injury (Nawi et al., 2016). Serious injury at work over the

prior year was reported with 5%, and most common categories of injuries are blunt force, stab-cut, fall and other. Nawi et al. also stated that harvesters carrying a sharp chisel or sickle while walking to harvest fresh fruit bunch. This also exposes the workers to risk of injury due to sharps. International Labour Organization (2004) stated that among the major safety and health hazards in oil palm plantations are cutting tools such as chisels which may cause injuries ranging from minor cuts to severe wounds and oil palm fruit and thorns that may cause skin abrasions and severe injuries due to penetration on the body.

2.2.3 Heat-Related Illness

A cohort study conducted in Thailand by Tawatsupa et al. (2013), reported that almost 20% of workers experienced occupational heat stress which has strong and significant association with occupational injury. The study provides evidence connecting heat stress and occupational injury in Thailand which is a tropical climate country, same as Malaysia.

A study by Kjellstrom, Holmer and Lemke (2009) found that occupational heat stress elevates the risk of injury and ill-health among workers can be elevated if workers are exposed to hot and humid environment, mainly in tropical climate countries and the addition of workers' physical exertion and dehydration can cause potential heat-related-illness or heat exhaustion that can lead to fainting and collapse

that can advance to occupational injury and thus, lessen work performance and productivity.

Heat related illness is defined by Occupational Safety and Health Administration US (2014) as illnesses that may result from exposure to heat in the workplace, and clothing and equipment may be the contributing factors that lead to it. Heat rash, heat syncope, heat cramps, heat exhaustion, and heat stroke are the sets of symptoms caused by excess heat and the body's autonomic dissipation (Jackson & Rosenberg, 2010). Heat cramps is the spasm of the muscle that can occur on set during or after working time and heat exhaustion is also the most common heat related illness (Sadiq, 2016). Jackson and Rosenberg (2010) also stated that Hyperthermia from exertion and environmental conditions during agricultural work manifests itself by various symptoms and may lead to death. Therefore, it is crucial that employers and supervisors have the knowledge of heat-related illness prevention to devise and implement safety measures that suit local conditions. CDC (2004) stated that the use of appropriate garments may prevent heat-related illness among the workers and because of this, the fabric of garments need to be considered while selecting the appropriate clothing for work.

2.2.3.1 Occupational Accidents in Agricultural Sector in Malaysia

In Guidelines on Heat Stress Management at Workplace 2016 stated heat stress may increase workplace accidents due to stress and fatigue. In the

guidelines, DOSH (2016) reported that there were three cases reported in year 2013 and 2014 that occurred among trainees during field training under the hot sun.

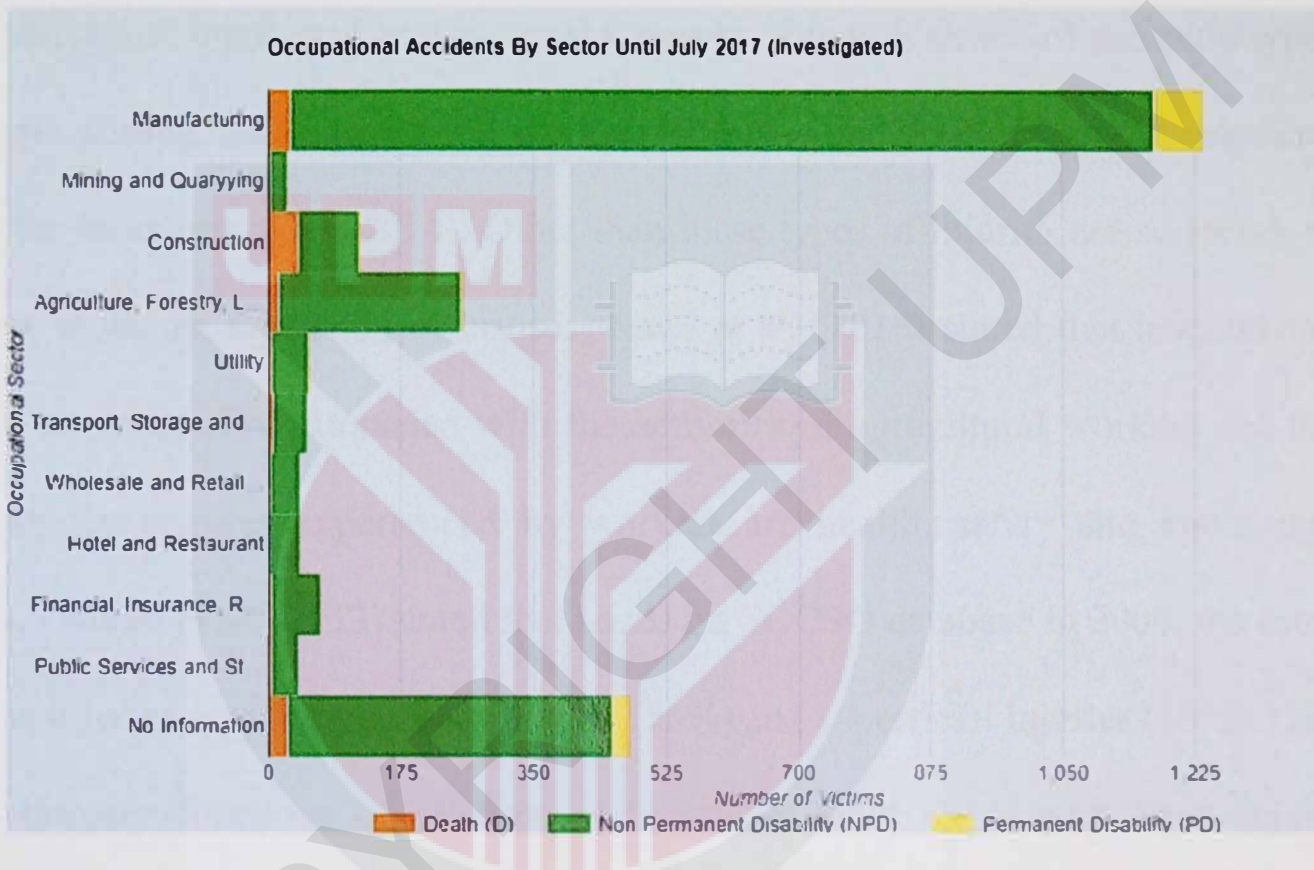


Figure 2.4: Chart of Number of Occupational Accident by Sector in Malaysia

The data of occupational accident of different sectors can be access through Department of Safety and Health (DOSH). Based on figure 2.2, the occupational accidents by sector until August 2016 showed that manufacturing sector (1238) had the highest number of accidents followed by sector without information (478) and agriculture, forestry, logging and fishing (260).

2.2.4 External Physical Injuries

Agriculture is one of the most hazardous sector with high prevalence of accidental death, injury and occupational illnesses. The prevalence of the main types of injuries among male agricultural workers in India was 29.0% for cut injuries and 22.0% for laceration (Das, 2014). Other than these types of injuries are scratches or abrasion, avulsion, contusion or bruises. Nawi et al. (2016) stated that hazards and injuries are frequently associated with the activities of agricultural workers and the most popular injuries experienced by workers are health, safety and ergonomic injuries. Ganesh et al. (2013) noted that based on SOCSO database in 2006, the most common injuries were unspecified wounds (55%) and superficial injuries (10%). One of the primary functions of clothing is to protect from the wearer from injury (Chattopadhyay, 2008). Bhardwaj, Kaushik, and Jajpura (2016) noted that protective clothing should focus on more protection in situations where hazards or risks are present that have the potential to be dangerous or pose considerable potential for injury or damage to the person working with the hazard

CHAPTER 3

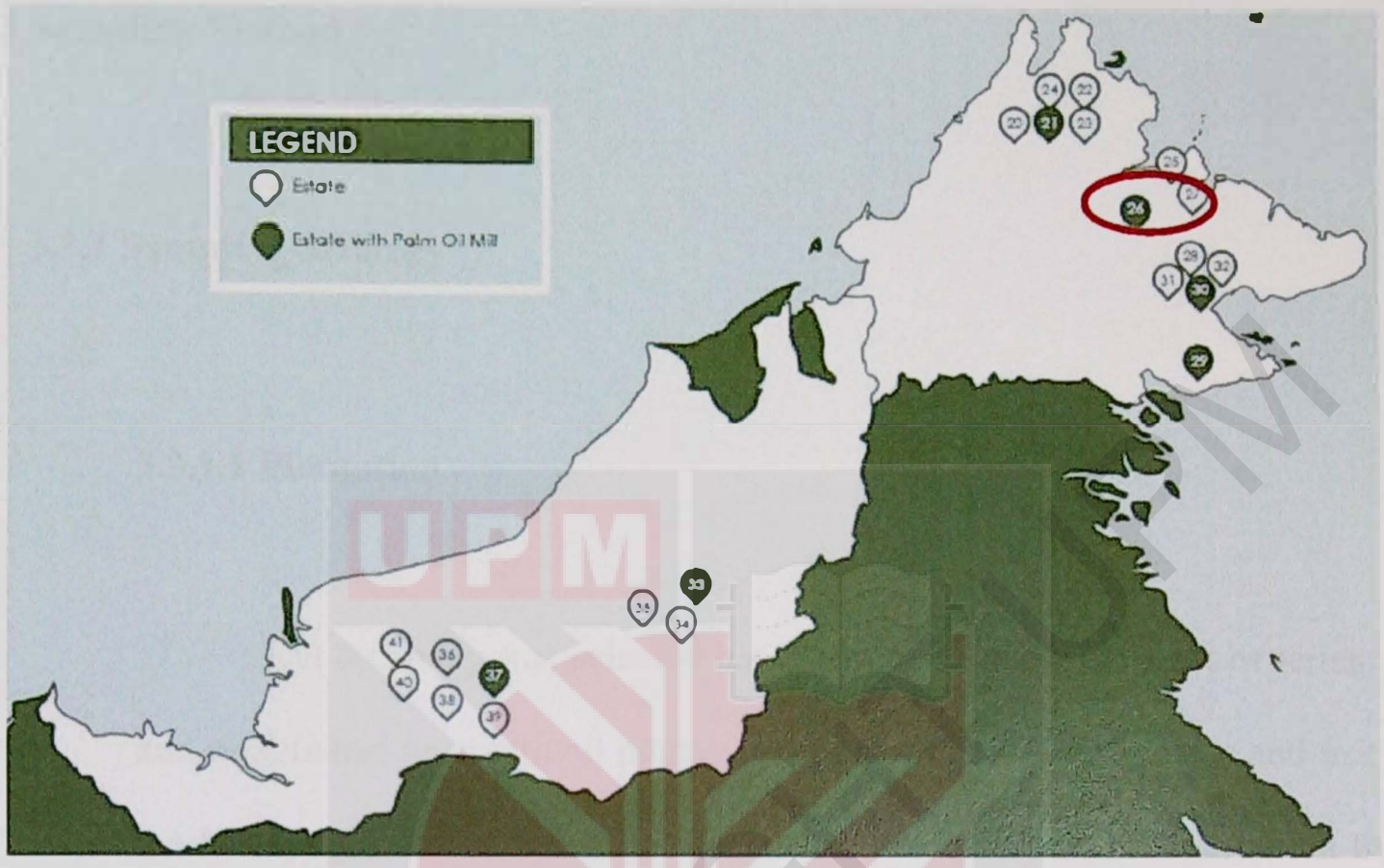
METHODOLOGY

3.1 Study Design

This study was a cross-sectional study that was conducted from February to March 2018 to gather the information on the perception and subjective preference between 100% microfiber polyester and 100% cotton among oil palm plantation workers at Sandakan, Sabah. Subset of the population was selected and from these individuals, data were collected to help answer research questions of interest.

3.2 Study Location

The study was carried out in two plantations in Sandakan which were Sutera Plantation and Nak Plantation. The plantation company requested to remain anonymity.



20. Sungai Sungai	26. Nak	31. Bukit Segamaha	36. Pedai
21. Sungai Sungai	27. Sutera	32. G&G	37. Jih
22. Sungai Sungai	28. LTT-Sabah	33. Loagan Bunut	38. Kelimut
23. Kawananan	29. Segaria	34. Sungai Lelak	39. Maong
24. Lembah Paitan	30. Sungai Segamaha	35. Bukit Limau	40. Mapai
25. Resort			41. Bawan

Figure 3.1: Locations of the Plantations Circled in Red.

3.3 Sampling Method

3.3.1 Sampling Strategy

3.3.1.1 Plantation

The company was selected because it was one of the most experienced and established upstream oil palm plantation company in Malaysia and one of the Malaysia's oldest and largest diversified conglomerates. Apart from that, the selection of the company was based on the consideration of the permission by the management, accommodation, facilities and the availability of the plantation. For the selection of the plantations, purposive sampling was used as the plantations were determined by the management of the company.

Figure 3.2: Sutera Plantation, Sandakan, Sabah

Figure 3.3: Nak Plantation, Sandakan, Sabah

3.3.1.2 Respondents

The harvesters from Nak and Sutera Plantations were selected by purposive sampling as respondents in this study where the management had selected the workers from the name list to participate as respondents.

3.3.2 Study Population

The study population was among oil palm plantation workers of a company in Sandakan, Sabah. The sample size of this study was calculated based on the objectives.

3.3.3 Sampling Frame

The sampling frame used was the workers name list from Nak and Sutera plantations. The total was 162 workers from Sutera Plantation and Nak Plantation in Sandakan, Sabah.

3.3.4 Sampling Unit

The sampling unit for this study was the harvesters who are working in oil palm plantation. The inclusive and exclusive criteria are listed as below:

Inclusive Criteria:

i. Harvesters
ii. Foreign workers
iii. Age between 18-55 years old
iv. Minimum working experience of 6 months and above

Exclusive Criteria

Harvesters who had peripheral nerve damage to the fingers (condition such as numbness, prickling or tingling, etc) were excluded from this study because patients with peripheral nerve damage might have sensory functions disturbance (Ceynowa

et al., 2017). This might affect the feel of the workers towards the fabric's physical properties.

3.3.5 Sample Size Calculation

A sample size calculation was carried out using the sample size formula of proportion of two groups (Lwanga & Lemeshow, 1991).

$$n = \frac{Z^2_{1-\alpha/2}[P_1(1-P_1) + P_2(1-P_2)]}{d^2}$$

Where:

n = Sample size

$Z_{1-\alpha/2}$ = the number of standard errors away from the mean = 1.96

P_1 = estimated proportion (larger)

P_2 = estimated proportion (smaller)

d =desired precision

A study conducted by Delong et al. (2014) to determine the tactile response and preference among subjects surveyed that 12% of them preferred the ones which are made of cotton and 7% of them preferred the ones which are made of polyester, thus P_1 = 0.12 and P_2 = 0.07. Therefore, by computing the expected proportion of workers' subjective fabric preference, a 95% confidence interval (1.96) and the precision (0.05), the sample size was calculated as below:

$$n = \frac{1.96^2[0.12\,(1-0.12)+0.07\,(1-0.07)]}{0.05^2}$$

$$= 263 \text{ workers}$$

Finite population correction formula was used due to smaller proportion of the population.

$$n = \frac{n_0}{1+\left(\frac{n_0-1}{N}\right)}$$

Where,

n_0= sample size

N = population size.

The population of harvesters in the planations is 162 (N = 162). When the sample size is adjusted for the size of the population, the sample size is:

$$n = \frac{263}{1+\left(\frac{263-1}{162}\right)}$$

$$= 101 \text{ respondents}$$

The calculated sample size was 101 respondents. A response rate of 90% was estimated for this study, therefore, n = 101 / 0.9 = 113. Thus, the final sample size for this study was 113 respondents.

3.4 Study Instrumentation

3.4.1 Questionnaire

A set of questionnaires was used to gather information from the selected respondent. A copy of the questionnaire is attached in Appendix 3. Distribution of questionnaire session was conducted at the management office. The workers who have peripheral nerve damage to the fingers (condition such as numbness, prickling or tingling, etc) were requested to self-report to the researcher before answering the questionnaire in order to exclude them from the study. The questionnaires include:-

Section A: Personal Information

Section B: Occupational Information

Section C: Workplace Safety

Section D: Workplace Thermal Comfort

Section E: Fabric Perception and Subjective Preference

Section A collected the respondent background information such as age, race, marital status, educational background and income.

Section B focused on the occupational information. It consists of closed-ended questions on their working years as harvesters and plantation workers and

working hours. Plus, this section also asked about the respondents' shirts information that they are wearing during the work and during that moment.

Section C determined the prevalence of any external physical injuries (at work) to their body during wearing the upper garments and the severity of the injuries.

Section D determined the thermal comfort of the workplace. This include on how they perceive the temperature at the plantation, the comfort of the wind movement, the parts of their body which they feel hottest, and prevalence of heat-related illness.

Section E determined the perception of fabrics for safety properties and thermal comfort and the subjective preference of upper working garment's fabric of the workers. This section will be based on physical properties felt by the workers of two upper working garment's fabrics which were 100% cotton and 100% microfiber polyester. All other properties (thickness, weight and colour) of the upper working garment were homogenized. Based on the workers feels towards the physical properties, they were required to choose between the two fabrics for the perception on safety properties (resistance from abrasion and penetration) and thermal comfort (heat resistance, water retention, water absorption); and the workers' subjective preference between the two fabrics to wear for work.

3.4.2 Fabrics of Upper Working Garment

Two types of fabric were used in this study; 100% Cotton and 100% Microfiber Polyester. During the study, the respondents were allowed to touch and feel the two fabric types before answering the section E (Fabric Perception and Subjective Preference) in the questionnaire. The colour, size, thickness and weight of the garment were homogenized to minimize bias.

Figure 3.4: Different fabrics of upper working garment

3.5 Data Collection

Data was collected during February until March 2018 by using a set of questionnaire to identify their socio-demographic background, occupational information, workplace safety, workplace thermal comfort and fabric perception and subjective preference. The respondents were given two types of fabrics of upper working garment to touch and feel before answering the section E (Fabric Perception

and Subjective Preference) in the questionnaire. The respondents were approached after working hours, and were required to gather in the plantation community hall. The questionnaires were distributed to the workers and written consents were requested. The workers were divided into several groups consisting of 5-10 workers in each groups and guidance was provided throughout the process of answering the questionnaire. Explanation, guidance and translation of the questionnaire are given to the non-educated, illiterate and foreign workers respectively by the appointed translators from the plantation's administration. They were given roughly 30 minutes to fill in the questionnaire. Table 3.5 shows the flow process of data collection.

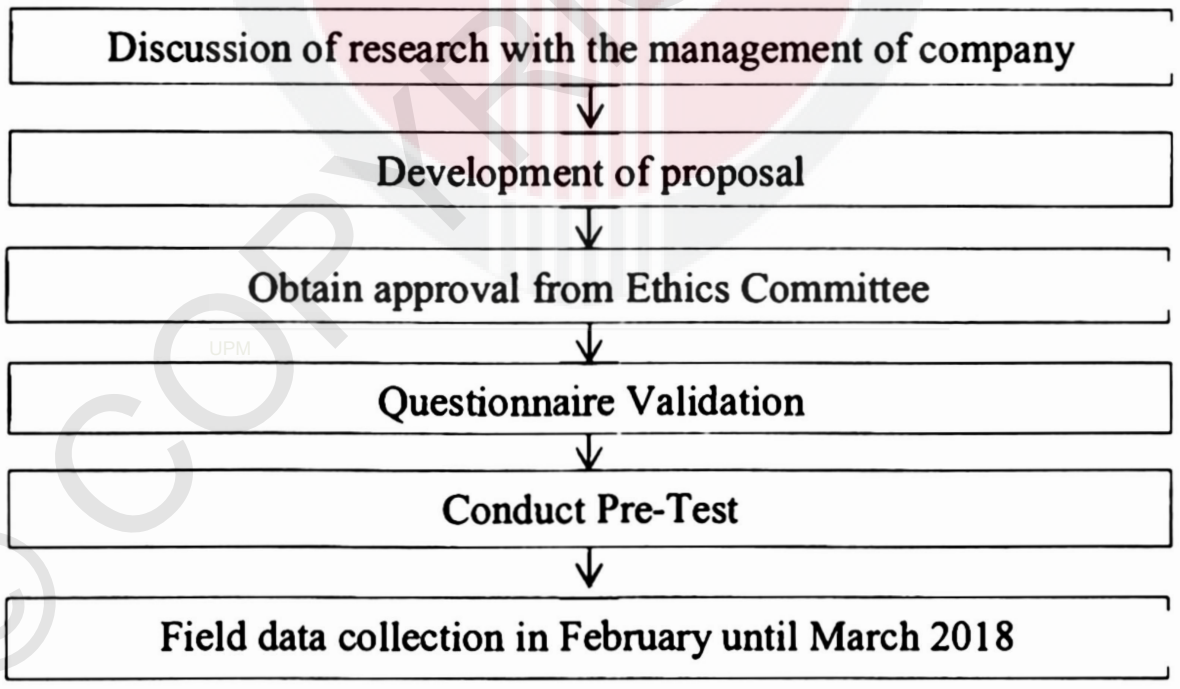


Figure 3.5: Data Collection Process

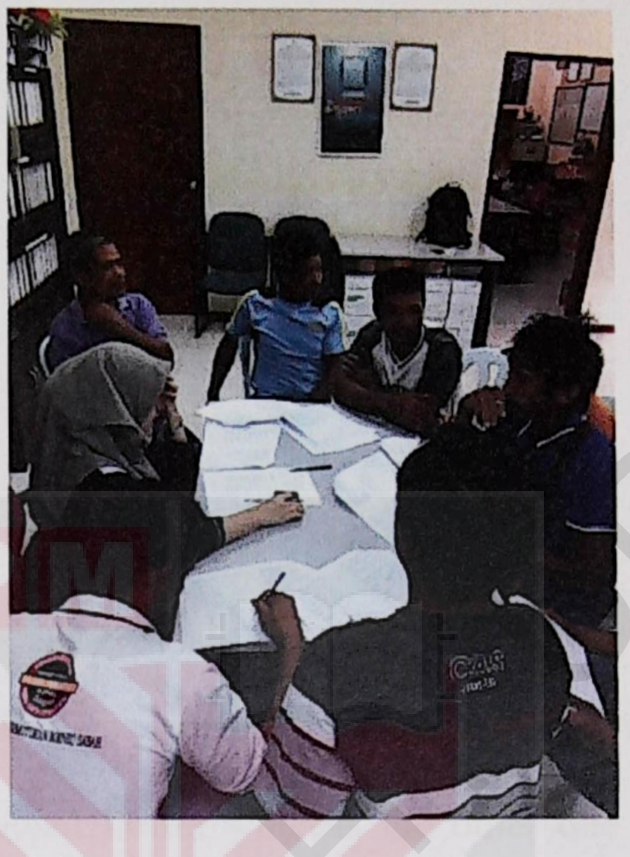


Figure 3.6: Data Collection in Sutera Plantation, Sandakan, Sabah

Figure 3.7: Data Collection in Nak Plantation, Sandakan, Sabah

3.6 Quality Control

3.6.1 Validity Test

3.6.1.1 Content Validity

The content of the questionnaire was reviewed by two experts whereby one of them holds a PhD in occupational safety and health, specializing in ergonomics and occupational health whereas the other one is an officert in occupational safety and health from Department of Occupational Safety and Health, Malaysia. The content validation was to ensure that the questions were related to the objectives of the study.

To ensure the translation of the questionnaire was accurate, the questionnaire was validated by an Indonesian student who is proficient in both Malay and Indonesian languages. The questionnaires that were given to the workers were both in Malay and Indonesian language for respondents' better understanding as the respondents from Sutera Plantation and Nak Plantation are majority Indonesians.

3.6.1.2 Face Validity

Indonesian workers from agricultural sectors were chosen as respondents to carry out face validity where they were asked to answer the questionnaire with guidance from the researcher. They were required to voice out any difficulties in answering the questionnaire in terms of question structures, question contents, question wordings and instructions given. Amendments were made according to the feedbacks given.

3.6.2 Reliability Test

A pre-test was conducted among 22 harvesters from Resort Plantation in Sandakan, Sabah as the respondents were similar to those in Sutera and Nak Plantation in terms of demographic. The reliability test was conducted to assess the consistency of the questionnaire. The results of the pre-test shows that the reliability was 0.701 which indicated that the questionnaire has an acceptable reliability.

Table 3.1: Value of Reliability Test

$\alpha \geq 0.9$	Excellent reliability
$0.9 > \alpha \geq 0.8$	Good reliability
$0.8 > \alpha \geq 0.7$	Acceptable reliability
$0.7 > \alpha \geq 0.6$	Questionable reliability
$0.6 > \alpha \geq 0.5$	Poor reliability
$0.5 > \alpha$	Unacceptable reliability

3.6.3 Data Analysis

Descriptive data was reported using frequency and percentage. Chi-Square test/ Fisher exact test was used to determine the association between the prevalence of external physical injuries and heat-related illness with the subjective preference of fabrics among oil palm plantation workers; and the association between the perception of the fabrics for thermal comfort and safety properties with the subjective preference of fabrics among oil palm plantation workers. Statistical significance was set at 5%. The data was analysed using SPSS Version 22.

Table 3.2: List of Statistical Analysis

Objectives	Statistical Analysis
a. To determine the socio-demographic background and occupational information (history) among harvesters in oil palm plantation company at Sandakan, Sabah.	Descriptive Analysis
b. To determine the prevalence of external physical injuries and heat-related illness among harvesters in oil palm plantation company at Sandakan, Sabah.	Descriptive Analysis

Objectives	Statistical Analysis
c. To determine the perception of fabrics for safety and thermal comfort and the subjective preference of fabrics among harvesters in oil palm plantation company at Sandakan, Sabah.	Descriptive Analysis
d. To determine the association between the prevalence of external physical injuries and heat-related illness with the subjective preference of fabrics among harvesters in oil palm plantation company at Sandakan, Sabah.	Chi-Square Test / Fisher Exact Test
e. To determine the association between the perception of fabrics for safety and thermal comfort with the subjective preference of fabrics among harvesters in oil palm plantation company at Sandakan, Sabah.	Chi-Square Test / Fisher Exact Test

3.6.4 Ethical Consideration

This study had been approved from the University Ethics Committee for Researches Involving Human Subject of Universiti Putra Malaysia (JKEUPM-2017-208). Written inform consent was requested from the respondents who were selected to participate in this study before the data was collected. Privacy of information and confidential of respondents were protected and secured by not filling the name, phone number and identification card number.

CHAPTER 4

RESULTS

4.1 Socio-Demographic Background and Occupational Information (History)

Referring Table 4.1, majority (34.5%) of the respondents were aged between 26-35 years old and of 75.9% (82) workers' race were Bugis. A total 77.5% (86) of the workers were single, 53.3% (56) of the workers had primary education and 74.3% (75) had monthly income less than RM 1000.

Most of the workers comprised of [57.7% (64)) had prior experience working as harvesters. A total of 39.6% (42) of the respondents had been working as harvesters for less than five years and 39.8% (33) has been working in the plantation within six to fifteen years.

Most of the respondents [97.3% (108)] wear garments during work where specifically 40.5% (45) of them wore t-shirt, 66.7% (74) wear sleeveless garments and 95.5% (106) buy their own shirt for work.

Table 4.1: Socio-demographic background and occupational information (history) among harvesters in an oil palm plantation of a company at Sandakan, Sabah. (N=113)

	Frequency (n)	Percentage (%)
Age		
Below 25 years old	26	23.6
26-35 years	39	35.5
36-45 years	31	28.2
Above 46 years old	14	12.7
Race		
Bugis	82	75.9
Suluk	11	10.2
Timur	5	4.6
Javanese	1	0.9
Bajau	3	2.8
Others	6	5.6
Marital Status		
Single	22	19.8
Married	86	77.5
Divorced	3	2.7
Educational Level		
No formal education	28	26.7
Primary school	56	53.3
Secondary school	21	20.0
Monthly Income		
Less than RM1000	75	74.2
RM1000 – RM2000	23	22.8
More than RM2000	3	3.0
Experience working as a harvester	64	57.7
Yes	47	42.3
No		
How long has been working as a harvester		
5 years or below	42	39.6
6-15 years	41	38.7
16-25 years	14	13.2
26 years or above	9	8.5

	Frequency (n)	Percentage (%)
How long has been working in this plantation		
5 years or below	29	34.9
6-15 years	33	39.8
16-25 years	13	15.7
26 years or above	8	9.6
Workers wearing garments while working		
Yes	108	97.3
No	3	2.7
Types of garment used for work		
T-shirt	45	40.5
Polo shirt	26	23.4
Shirt	5	4.5
Jersey	28	25.2
Singlet	2	1.8
Others	2	1.8
Not wearing garments	3	2.7
Types of sleeves used for work		
Sleeveless	74	66.7
Short sleeve	32	28.8
Long sleeve	2	1.8
Not wearing garments	3	2.7
Source of garment		
Buy their own shirt	106	95.5
Contributed by other parties	2	1.8
Not wearing garments	3	2.7

4.2 The Workplace Safety and Thermal Comfort

Referring to Table 4.2.1, 93.8% (106) of the respondents perceived their workplace as safe. There were 43.8% (46) who had experienced some form of external physical injuries during their tenureship in the plantation. From those who claimed to have experienced external physical injuries, 23.8% (25) of them had been injured once a year where 20.0% (21) had required MC for more than four days.

Table 4.2.1: The workplace safety among harvesters in an oil palm plantation company at Sandakan, Sabah. (N=113)

	Frequency (n)	Percentage (%)
Perceived Workplace safety		
Safe	106	93.8
Unsafe	7	6.2
Prevalence of external physical injuries		
Yes	46	43.8
No	59	56.2
Frequency of injuries		
Once a week	3	2.9
Once a month	8	7.6
Once every 3 months	5	4.8
Once every 6 months	6	5.7
Once a year	25	23.8
No injuries	58	55.2
Days of MC for the injuries		
MC not required	20	19.0
MC $\leq$ 4 days	6	5.7
MC > 4 days	21	20.0
No injuries	59	55.2

From Table 4.2.2, a total of 45.1% (51) of the workers perceived the temperature at workplace as hot although 86.7% (98) felt comfortable with wind movement in the plantation. There were 48.7% (55) of the workers who felt hottest on the head for frontal part of body, followed by chest [45.1% (51)] and stomach with [34.5% (39)] while for the back part of their body, 59.3% (67) of the workers felt hottest at their upper back followed by lower back [30.1% (34)] and head [22.1% (25)].

For the prevalence of heat-related illness symptoms, most of the respondents [92.0% (104)] had experienced profuse sweating followed by 87.6% (99) excessive thirst and 79.6% (90) fatigue. Similarly, 92.9% (105) workers' preventive measure for the heat-related illness was rest at cool area.

Table 4.2.2: The thermal comfort among harvesters in an oil palm plantation company at Sandakan, Sabah. (N=113)

	Frequency (n)	Percentage (%)
Perceived thermal environment of the plantation		
Cold	1	0.9
Cool	0	0
Slightly cool	8	7.1
Neutral	18	15.9
Slightly Warm	11	9.7
Warm	24	21.2
Hot	51	45.1
Perceived comfort in air movement in the workplace		
Yes	8	86.7
No	15	13.3

	Frequency (n)	Percentage (%)
Frontal parts of body which feels hottest		
Head	55	48.7
Neck	19	16.8
Shoulder	5	4.4
Upper arm	10	8.8
Forearm	5	4.4
Hand	2	1.8
Chest	51	45.1
Stomach	39	34.5
Groin	4	3.5
Leg	2	1.8
Foot	3	2.7
Back parts of body which feels hottest		
Head	25	22.1
Neck	17	15.0
Shoulder	14	12.4
Upper arm	8	7.1
Forearm	2	1.8
Hand	2	1.8
Upper Back	67	59.3
Lower Back	34	30.1
Buttock	2	1.8
Leg	3	2.7
Foot	1	0.9
Heat-related illness		
Dehydration	99	87.6
Exhaustion	90	79.6
Headache	78	69.6
Dizziness	73	64.6
Muscle / Abdominal cramps	37	33.3
Loss of consciousness	3	2.7
Heat rash	49	43.4
Preventive measures		
Drink plenty of water	81	71.7
Rest at a cool area	105	92.9
Take off the shirt	52	46.0
Take a bath	22	19.5
Others	2	1.8

4.3 The Perception on Fabrics for Safety Properties and Thermal Comfort and the Subjective Preference.

Based on the result obtained in Table 4.3, for the perceptions on fabrics for safety, 67.3% (76) of the workers perceived 100% microfiber polyester as safer and 74.3% (84) perceived to be more comfortable to wear during work. In terms of thermal comfort was broken down into three perceptions; 76.1% (86) of the workers feels cooler when wearing 100% microfiber polyester, 65.5% (74) perceived 100% cotton has better absorption rate and 85.8% (97) of them feels 100% microfiber polyester is quicker to dry under the sun. For the subjective preference of upper working garment's fabric, 75.2% (85) of the workers preferred 100% microfiber polyester to be worn for work in the plantation.

Table 4.3: The perception for safety properties and thermal comfort of fabrics and the subjective preference among harvesters in an oil palm plantation company at Sandakan, Sabah. (N=113)

	Frequency (n)	Percentage (%)
Subjective preference of upper working garment's fabric to be worn during work		
100% Cotton	28	24.8
100% Microfiber Polyester	85	75.2
Feels safer (has better resistance from penetration) when wearing during working		
100% Cotton	37	32.7
100% Microfiber Polyester	76	67.3
More comfortable to wear during working		
100% Cotton	29	25.7
100% Microfiber Polyester	84	74.3

	Frequency (n)	Percentage (%)
Feels cooler when wearing during working (has better heat resistance)		
100% Cotton	27	23.9
100% Microfiber Polyester	86	76.1
Has better sweat absorption rate		
100% Cotton	74	65.5
100% Microfiber Polyester	39	34.5
Quicker to dry under the sun		
100% Cotton	16	14.2
100% Microfiber Polyester	97	85.8

4.4 The Association between Prevalence of External Physical Injuries and Heat-related illness with the Subjective Preference.

Table 4.4.1 shows the association between prevalence of external physical injuries and subjective preference of upper working garment's fabric among oil palm plantation workers. There was a significant association between prevalence of external physical injuries and subjective preference of upper working garment's fabric among oil palm plantation workers in a company in Sandakan, Sabah (χ^2=5.231; p-value=0.022). From the 43.8% (46) workers who had experienced external physical injuries, 87% (40) of them preferred 100% microfiber polyester as the upper working garment's fabric.

Table 4.4.1: The association between prevalence of external physical injuries and subjective preference of upper working garment's fabric among harvesters in an oil palm plantation company at Sandakan, Sabah. (N=113).

Variables	Subjective Preference of Upper working garment's Fabric, N (%)		χ^2	df	p-value*
	100% Cotton	100% Microfiber Polyester			
External Physical Injuries					
Yes	6 (13)	40 (87)	5.231	1	0.022*
No	19 (32.2)	40 (67.8)			

** P-value is significant at 0.05*

The prevalence of heat-related illness was divided into seven symptoms which were exhaustion, dehydration, rashes, headache, dizziness, loss of consciousness and cramps. Based on the result obtained in Table 4.4.2, there was a significant association between rashes and subjective preference of upper working garment's fabric (χ^2= 5.111; p-value = 0.024). There was no significant association between the other six symptoms and subjective preference of upper working garment's fabric among oil palm plantation workers in a company in Sandakan, Sabah.

Table 4.4.2: The association between prevalence of heat-related illness and subjective preference of upper working garment's fabric among harvesters in an oil palm plantation company at Sandakan, Sabah. (N=113)

Prevalence of Heat Related Illness	Subjective Preference of Upper working garment's Fabric, N (%)		χ^2	df	p-value*
	100% Cotton	100% Microfiber Polyester			
Exhaustion					
Yes	21 (23.3)	69 (76.7)	0.496	1	0.481
No	7 (30.4)	16 (69.6)			
Dehydration					
Yes	25 (25.3)	74 (74.7)	0.096	1	1.000[a]
No	3 (21.4)	11 (78.6)			
Rashes					
Yes	7 (14.3)	42 (85.7)	5.111	1	0.024*
No	21 (32.8)	43 (67.2)			
Headache					
Yes	19 (24.4)	59 (75.6)	0.056	1	0.812
No	9 (26.5)	25 (73.5)			
Dizziness					
Yes	14 (19.2)	59 (80.8)	3.471	1	0.062
No	14 (35.0)	26 (65.0)			
Loss of Consciousness					
Yes	1 (33.3)	2 (66.7)	0.121	1	1.000[a]
No	27 (24.5)	83 (75.5)			
Cramps					
Yes	8 (21.6)	29 (78.4)	0.220	1	0.639
No	19 (25.7)	55 (74.3)			

[a] Statistical test-Fisher's exact test

* *P-value is significant at 0.05*

4.5 The Association between Perception on Fabrics for Safety Properties and Thermal Comfort with the Subjective Preference.

Table 4.5 shows that the association between perception on fabrics for safety properties and thermal comfort with the subjective preference of fabrics among harvesters in an oil palm plantation company at Sandakan, Sabah. There were significant association of the subjective preference of fabrics with perceptions in terms of feeling cooler to wear ($\chi^2 = 22.629$; p-value < 0.001), has better sweat absorption ($\chi^2 = 15.768$; p-value < 0.001), feels safer to wear during work ($\chi^2 = 34.737$; p-value<0.001) and feels more comfortable to wear during work (χ^2=41.248; p-value<0.001) among harvesters in an oil palm plantation company at Sandakan, Sabah. There was no significant association between perceptions in terms of feels quicker to dry with the subjective preference of fabrics among harvesters in an oil palm plantation company at Sandakan, Sabah.

Table 4.5: The association between perception on thermal comfort and safety properties with subjective preference of fabrics among harvesters in an oil palm plantation company at Sandakan, Sabah. (N=113)

Perceptions in terms of	Subjective Preference of Upper working garment's Fabric, N (%)		χ^2	df	p-value*
	100% Cotton	100% Microfiber Polyester			
Feels cooler to wear					
100% Cotton	16 (59.3)	11 (40.7)	22.629	1	<0.001*
100% Microfiber Polyester	12 (14.0)	74 (86.0)			
Has better sweat absorption rate					
100% Cotton	27 (36.5)	47 (63.5)	15.768	1	<0.001*
100% Microfiber Polyester	1 (2.6)	38 (97.4)			
Feels quicker to dry under the sun					
100% Cotton	7 (43.8)	9 (56.3)	3.599	1	0.68[a]
100% Microfiber Polyester	21 (21.6)	76 (78.4)			
Feels safer to wear during work					
100% Cotton	23 (62.2)	14 (37.8)	34.737	1	<0.001*
100% Microfiber Polyester	5 (6.6)	71 (93.4)			
Feels more comfortable to wear					
100% Cotton	19 (65.5)	10 (34.5)	41.248	1	<0.001*
100% Microfiber Polyester	9 (10.7)	75 (89.3)			

[a] Statistical test-Fisher's exact test

* *P-value is significant at 0.05*

CHAPTER 5

DISCUSSION

5.1 Socio-Demographic Background and Occupational Information (History).

From this study, most of the respondents were aged within the range of 26 to 35 years old which were considered as young and productive (Kalyanaratne, 2015). A total of 75.9% of the respondents were Bugis. Based on a study conducted by Omar and Amat (2017), Bugis race is one of the ethnic groups in Sabah that contributes to the workforce and they are productive workers. In terms of education, a large number of the respondents had undergone primary education. Adults who have achieved a particular level of primary education has been to classify them as literate (Smith-Greenaway, 2015). Therefore, the respondents had basic skills to write and read but still the required was assistance given.

A total of 74.2% workers had monthly income less than RM1000 which is considered as low-income (Leh, Mansor, & Musthafa, 2016). The workers comprised of 57.7% had experience working as harvesters, 39.6% had been working as harvesters for less than five years and 39.8% has been working in the plantation within six to fifteen years. Bena et al. (2013) stated that five years of experience may resulted in lower injury risk among workers and less work experience contributes to higher injury incidence.

Most of the workers wear sleeveless garments in the plantation which was described as lack of protection because sleeveless garments would leave the arms bear to exposure (Saris, 2012). Previous studies suggested that long-sleeves garments are more suitable to be worn by agriculture workers to protect the arm from husk, itching and cut (Gogoi et al., 2016) and sun (Woolley & Buettner, 2009).

5.2 Prevalence of External Physical Injuries and Heat-related illness.

5.2.1 Prevalence of External Physical Injuries.

The prevalence of external physical injuries among the workers was 43.8%. The external physical injuries experienced by the workers might be due oil palm fruit, thorns and cutting tools such as chisels which might cause skin abrasions, injuries ranging from minor cuts to severe wounds due to penetration on the body. Based on International Labour Organization (2004), these are major safety and health hazards in oil palm plantations.

However majority of the workers (93.8%) perceived the workplace as safe. This is in contrast to Das (2014) who stated that agriculture is one of the most hazardous sector with high prevalence of accidental death, injury and occupational illnesses. Education had a significant influence on safety perception of foreign workers (Korkmaz & Park, 2018). This might be due to their education level whereby the workers did not manage to identify hazards which made them think that their workplace was safe. Nawi et. al. (2016) found

that oil palm plantation workers are exposed to the risk of hazardous tasks daily. Hazards and injuries are frequently associated with the activities of agricultural workers and they are exposed to risk of injury from the thorny fronds and the danger cut.

5.2.2 Prevalence Heat-related illness.

There were 45.1% workers in the plantation perceived the temperature as hot because workers involved harvesting activities in agriculture sector are exposed to hot environment (DOSH, 2016). The warm conditions lead the workers to produce sweats to provide evaporative cooling effect on the skin surface (Ukponmwan, 2009) and clothing impedes with the workers ability to lose heat to the environment (DOSH, 2016). Therefore, cooling garments must be worn by the workers in the plantation that can prevent heat stress (Lotens, 2006). Most of the workers felt comfortable with the wind movement in the plantation and this could contribute to the effectiveness of fabric of upper working garments to evaporate sweats in windy environments (Theses & Wigboldy, 2013).

Most of the workers felt hottest on the head, chest and stomach for frontal part of body, while for the back part of the body, workers felt hottest at their upper back followed by their lower back and on the head. Chest, stomach, upper back and lower back are the parts of body that have contact with fabrics when wearing upper garments. The body parts that the workers feel hot were the parts where they wear safety helmets and shirts. This might be due to garments they worn because the body temperature will rise if no cooling

would be present and clothing may impede heat and vapour transport between the skin and the environment (Gavin, 2003). Also, the highest areas which show the most tactile sensation due to garment worn were the upper back, bicep area and the front of the shoulders (Bernard, 2009).

The exposure to hot environment in the plantations could elevate the risk of injury and ill-health among workers especially in Malaysia, a tropical climate country. Most of the workers had experienced profuse sweating followed by fatigue and excessive thirst, due to the body reacts to heat. As the body of the workers failed to replace water lost in sweat, it leads to heat exhaustion which include fatigue and excessive thirst as the symptoms (DOSH, 2016). Also, the addition of workers' physical exertion and dehydration could cause potential heat-related illness to the workers (Kjellstrom et al., 2009). DOSH further described that rest at cool area as on one of the first aid treatments to return the body temperature to normal. This preventive measure was taken by 92.9% of the workers for the heat-related illness

5.3 Perception on Fabrics for Safety Properties and Thermal Comfort with the Subjective Preference.

Based on the results in Table 4.1, most of the workers wear cotton T-shirt for work compared to polyester jersey. Nevertheless, Table 4.3 shows that there was a strong preference for microfiber polyester compared to cotton among the harvesters in the plantation despite the fact that most of the workers often wear cotton T-shirt for work. The

preference of garment's fabric could be influenced on many factors such as personal desires and the particular function which are determined by the wearers (Kamalha et al., 2013), and that their preference may have been influenced by factors such as their previous experiences on heat-related illness and external physical injuries and their perceptions for safety and thermal comfort.

The touch or interactions with the upper working garments' fabric provided to the workers could have developed the perception of the workers (Buxbaum, 2016). Also, the workers' perception on the fabrics might have been developed or influenced from experiences in wearing the garments (Bishop, 2008). Based on the results, the perception of majority of the workers that view polyester is safer could be related to cutting resistance (Vu Thi et al., 2005) and protection against abrasion (Chan et al., 2016) which are important properties of fabrics. These properties are important to the nature of their work where fronds and leaves can cause various superficial skin injuries and where the workers may brush themselves against rough surfaces while working. Apart from that, their perception on polyester as being more comfortable might be corresponded to the fabric's comfortable smooth feel based on their touch on the fabric which is a profound quality for workers for active wear uses (Uttam et al., 2013).

In terms of perception of thermal comfort, it could be that the workers experience of wearing the garments have influenced the workers on how they perceived the fabric. The perception that polyester dries faster by majority of the respondents could have been related to their experience and the fabric's physical appearance appears to wick moisture during physical activities in the plantation, whereas cotton fabric becomes saturated

because the ability to evaporate reduces as water retention increases (Theses & Wigboldy, 2013). Apart from that, most of the workers perceived that polyester feels cooler to wear compared to cotton which might have kept the body cool due to their heat resistance property (Uttam, 2013). However, more than half of the respondents perceived cotton has better absorption rate. This could be explained based on a study conducted by Kaplan and Okur (2008) which found that cotton can absorb high amount of sweat due to its hygroscopic property where the fabric readily attracts water from its surroundings, through either absorption or adsorption.

Comparing the two fabrics, the workers find polyester as being safer and more comfortable as well as having better thermal comfort for heat resistance and sweat absorption. Most of the workers wear cotton T-shirt for work compared to polyester jersey based on the results in Table 4.1. However, majority of the workers selected polyester as their preference. There was a possibility that workers chose the fabric for upper working garments based on the perception for thermal comfort and safety property of the fabrics that have been developed from both; feel on the physical properties of fabrics and their prior experience. A study conducted by Buxbaum (2016) stated that stimuli (such as touch, experience etc.) that enhance the favorable perception are likely to increase their decision on preference.

5.4 The Association between Prevalence of Heat-Related Illness with the Subjective Preference of Upper Working Garment's Fabric.

Based on Table 4.4.1, there was a significant association between prevalence of external physical injuries and subjective preference of upper working garment's fabric among oil palm plantation workers, thus the null hypothesis is rejected. This shows that the subjective preference of the upper working garments could have been influenced by the workers' prevalence of external physical injuries. Their experience on wearing the garments might which led or not to the external physical injuries may have possibly influenced the workers' choice of upper working garment's fabric. In a study of fabric by Bhardwaj et al. (2016), polyester was found to have better cut resistance behavior to compare to cotton and thus, might have provide better protection against external physical injuries which lead the respondents to select the fabric.

Subjective preference of the upper working garments could also be influenced by the workers' experience on rashes, thus the null hypothesis is rejected. Based on Table 4.4.2, there was a significant association between prevalence of rashes with subjective preference of upper working garment's fabric. However, there were no significant associations between the prevalence of other symptoms of heat-related illness with the subjective preference of upper working garment's fabric among oil palm plantation workers. There is no association between heat-related illness and subjective preference of work uniform's fabric among oil palm plantation workers in a company in Sandakan, Sabah. Majority of the respondents selected polyester as Bartels (2006) described in his research that polyester fiber does not lead to a significant worsening of the skin comfort

based on the workers' experience. Subjective preference of the upper working garments might have not been influenced by other symptoms of heat-related illness. It may be the case that the workers who subjectively preferred polyester or cotton had not develop to an extent of dehydration, exhaustion, headache, dizziness and loss of consciousness when wearing the garments.

5.5 The Association between Perception on Fabrics for Safety Properties and Thermal Comfort with the Subjective Preference.

There is a significant association found between perception on fabrics for safety properties and thermal comfort with the subjective preference, thus the null hypothesis is rejected. Corresponding to the association perception on safety property with the subjective preference of upper working garment's fabric, a study conducted by Staelin and Weinstein (1974) found that the awareness of safety may affect the consumer's selection of the items. The respondents did consider the safety aspects when they chose the garment's fabric. Most of the workers chose polyester as the upper working garment's fabric and the perception of the workers for safety properties for polyester that could have influenced the workers' subjective preference might be due to fabric material provides strength and abrasion resistance compared to cotton (Wang, 2014). This showed that fabric made from microfiber polyester might have improved handle with strength and durability. As for comfort, more than half of the respondents chose polyester to be more comfortable might be corresponded to garment's fabric made from 100% polyester has

the best comfort performance (Kaplan & Okur, 2008) based on their experience that developed their perception or psychological views.

The perception of the workers for thermal comfort might have influenced the workers' subjective preference of upper working garment. Polyester fabric garments might have better thermal comfort (Theses & Wigboldy, 2013) compared to cotton because cotton traps moisture out during hard physical activity and body sweats (Chinta & Gujar, 2013). It was also mentioned in previous study that polyester promotes better cooling to the body while working (Chan et al., 2016). The perception for heat resistance which was described to the workers as feeling cooler when wearing the upper working garments could lead the respondents to select the fabric as upper working garments. It was important to consider thermal comfort when choosing upper working garment especially for workers working outdoor who were exposed to prolonged exposure to heat in order to minimize the risk of getting heat-related illnesses.

The subjective preference was not associated with the perception on drying rate which indicated that workers did not choose their garment's fabric based on the perception on feels quicker to dry. This may suggest the possibility that the workers did not consider drying rate when they chose the garment's fabric, but they might be considering others factors. Drying rate is an aspect to be considered in selecting a fabric as cooling cannot occur if the humidity is not transported to the surface to dry and remains in the fabric because the body warms up and even more sweat is produced (Rameshbhai, 2014).

CHAPTER 6

CONCLUSION.

The primary benefit of this study is to provide information to the stakeholder on the perception of safety and thermal comfort and subjective preference of upper working garments. The data can be used as an input for suggesting the type of fabric for upper working garment to be used in agriculture sector especially for outdoor workers working in tropical climate country such as Malaysia.

In conclusion, majority of the workers in the plantation preferred 100% microfiber polyester as upper working garment's fabric. The respondents perceived that 100% microfiber polyester as safer, feels more comfortable, feels cooler when wearing and is quicker to dry under the sun. However, more than half of the workers perceived 100% cotton has better absorption rate.

There is a significant association between prevalence of external physical injuries, prevalence of heat rash and perceptions in terms of thermal comfort (feeling cooler to wear and has better sweat absorption), comfort and safety properties with the subjective preference of upper working garment's fabric among oil palm plantation workers. The associations indicated that the injuries, heat rash and the perceptions may influence the workers in selecting the fabric for upper working garment as their subjective preference.

This study reveals the acceptance of workers on the properties of 100% microfiber polyester specifically the safety and thermal comfort characteristics to be used as fabric for upper working garments. There was a possibility that workers chose the fabric based on their prior experiences and touch that developed their psychological views instead of knowledge.

STUDY LIMITATIONS

There are several limitations during the conduct of this study. Firstly, the information about prevalence of external physical injuries and heat-related illness were obtained by the workers self-reporting the injuries and illness. The validity of such information can be challenged by different sources of biases such as recall or reporting bias as there were no clinical diagnosis and examination to confirm about the prevalence.

Secondly, the results of the study is based on the subjective preference of the workers which depended upon the workers opinions and psychological views and there was no testing of materials conducted to confirm the effects of the fabrics with the prevalence of injuries and illness. Also, the information on workplace temperature and wind movement of the plantations were based on the perceptions of the workers which is only based on personal judgement. Besides that, the workers were given the 100% microfiber polyester and 100% cotton to only feel the physical properties to answer the perceptions on thermal comfort, comfort and safety properties and the subjective preference. This might lead to inaccurate judgement as the workers did not given the garments for trials to wear for work.

Apart from that, there were limited previous studies being carried out regarding preference of upper working garment's fabric, which had limited the researcher to carry out comparison. Lastly, this study only involved two fabrics which were 100% cotton and 100% microfiber polyester because these fabrics are the most made available. The two

types of fabrics which are 100% Cotton and 100% microfiber polyester are used to determine subjective preference because of they are the most used fiber in terms of production and consumption (Pritchard et al., 2000).

RECOMMENDATIONS

In response to the results of this study, a few suggestions suggested in order to improve future studies are as:

1. The information on prevalence of external physical injuries and heat-related illness can be obtained from the workers medical record to confirm on the injuries and illness that can be obtained from the company's management.
2. Include testing of materials conducted to confirm the effects of the fabrics with the prevalence of injuries and illness such as by using thermal manikins.
3. Use Wet Bulb Globe Temperature (WBGT) to assess the effect of temperature, humidity and wind speed on workers.
4. The workers can be given garments to wear to answer the perceptions on thermal comfort, comfort and safety properties and the subjective preference for better judgement for the workers to select the fabrics.
5. Further studies should be conducted on fabrics for occupational safety and health as this study only acted as an exploratory study to provide preliminary information on subjective preference of upper working garment's fabric for occupational safety and health among oil palm plantation workers.
6. Further studies could also involve more types of fabrics and include blended or composite fabrics as well in their study.

For the recommendation for the purpose of improving workplace situations are as follow:

1. Consider substituting and providing garments that provide protection from injury and give thermal comfort.
2. Give awareness on the important aspects that can guide them to select the best type of garments' fabric that are suitable for work.

REFERENCES

Auyong, H. N. (2016). A review of occupational safety and health risks in agriculture sector in Malaysia. Paper presented at International Conference on Agricultural and Food Engineering (August), 23–25. https://www.researchgate.net/publication/309674353_A_Review_of_Occupational_Safety_and_Health_Risks_in_Agriculture_Production_Sector_in_Malaysia

Bartels, V. T. (2006). Physiological comfort of biofunctional textiles, *33*, 51–66. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/16766881

Bena, A., Giraudo, M., Leombruni, R., & Costa, G. (2013). Job tenure and work injuries: A multivariate analysis of the relation with previous experience and differences by age. *BMC Public Health*, *13*(1). https://doi.org/10.1186/1471-2458-13-869

Bernard, A. (2009). No Title. *Factors Affecting Human Comfort Response to Garments*. Retrieved from https://repository.lib.ncsu.edu/bitstream/handle/1840.16/311/etd.pdf?sequence=1&isAllowed=y

Bethel, J. W., & Harger, R. (2014). Heat-related illness among Oregon farmworkers, 9273–9285. https://doi.org/10.3390/ijerph1 10909273

Bhardwaj, A., Kaushik, J., & Jajpura, L. (2016). Study of cut-resistant material , their mechanism , characteristics and evolution performance, *5*(11), 16–22.

Bishop, P. (2008). Fabric Testing. *Fabric Testing*. https://doi.org/10.1533/9781845695064.228

Buxbaum, O. (2016). Key insights into basic mechanisms of mental activity. *Key Insights into Basic Mechanisms of Mental Activity*, 1–104. https://doi.org/10.1007/978-3-319-29467-4

CDC. (2004). Tips for preventing heat-related illness centers for disease control and prevention, *2675*(888), 26–39.

Ceynowa, M., Pankowski, R., Rocławski, M., & Mazurek, T. (2017). The sensory function of the uninjured nerve in patients after median and ulnar nerve injury. *Journal of Hand Therapy*, *30*(1), 97–103. https://doi.org/10.1016/j.jht.2016.10.006

Chan, A. P. C., Guo, Y. P., Wong, F. K. W., Li, Y., Sun, S., & Han, X. (2016). The development of anti-heat stress clothing for construction workers in hot and humid weather. *Ergonomics*, *59*(4), 479–495. https://doi.org/10.1080/00140139.2015.1098733

Chattopadhyay, R. (2008). Design of apparel fabrics: role of fibre, yarn and fabric parameters on its functional attributes. *Journal of Textile Engineering*, *54*(6), 179–

190. https://doi.org/10.4188/jte.54.179

Chinta, S. K., & Gujar, P. D. (2013). Significance of moisture management for high performance textile fabrics. *International Journal of Innovative Research in Science, Engineering and Technology*, *2*(3), 814–819. Retrieved from http://www.ijirset.com/upload/march/46_Significance of Moisture.pdf

Cortez, O. D. (2009). Heat stress assessment among workers in a Nicaraguan sugarcane farm. *Global Health Action*, *2*(1). https://doi.org/10.3402/gha.v2i0.2069

Crowe, J., Moya-Bonilla, J. M., Román-Solano, B., & Robles-Ramírez, A. (2010). Heat exposure in sugarcane workers in Costa Rica during the non-harvest season. *Global Health Action*, *3*(September), 1–9. https://doi.org/10.3402/gha.v3i0.5619

Das, B. (2014). Agricultural work related injuries among the farmers of West Bengal, India. *International Journal of Injury Control and Safety Promotion*, *21*(3), 205–215. https://doi.org/10.1080/17457300.2013.792287

Delong, M., Wu, J., & Park, J. (2014). Shifting touch preference. *Tactile Response and Shifting Touch Preference*.

DEOHS University of Washington. (2011). What is microfiber? Retrieved from http://deohs.washington.edu/sites/default/files/brochures/microfiber-factsheet.pdf

Department of Statistics Malaysia. (2016). Department of statistics malaysia press release. *Department of Statistics Malaysia*, (June), 5–9. https://doi.org/10.1017/CBO9781107415324.004

DOSH. (2016). A brief guidance for the protection of employees against the effects of heat stress for outdoor works.

DOSH. (2016). Guidelines on heat stress management at workplace 2016, 1–4. Retrieved from http://www.dosh.gov.my/index.php?lang=en

Etzi, R., Spence, C., & Gallace, A. (2014). Textures that we like to touch : An experimental study of aesthetic preferences for tactile stimuli. *Consciousness and Cognition*, *29*, 178–188. https://doi.org/10.1016/j.concog.2014.08.011

Forsythe, S. M., & Thomas, J. B. (1989). Natural, synthetic, and blended fiber contents: an investigation of consumer preferences and perceptions. *Clothing and Textiles Research Journal*, *7*(3), 60–64. https://doi.org/10.1177/0887302X8900700310

Gavin, T. P. (2003). Clothing and thermoregulation during exercise. *Sports Medicine*, *33*(13), 941–947. https://doi.org/10.2165/00007256-200333130-00001

Gogoi, N., Choudhury, S., & M., G. (2016). Designing and construction of protective clothing for agricultural workers. *International Journal of Engineering and Technical Research (IJETR)*, *6*(3), 59–62.

Hong, C. J., & Kim, J. B. (2007). A study of comfort performance in cotton and

polyester blended fabrics. I. Vertical wicking behavior. *Fibers and Polymers*, *8*(2), 218–224. https://doi.org/10.1007/BF02875795

International Labour Organization. (2004). Safety and health fact sheet oil palm, 1–2.

Jackson, L. L., & Rosenberg, H. R. (2010). Preventing heat-related illness among agricultural workers, 200–215. https://doi.org/10.1080/1059924X.2010.487021

Jørgensen, L. B. (1991). Textiles and textile implements. *Ribe Excavations 1970-76*, *3*, 1–5.

Kalyanaratne, A. (2015). Housing and labor productivity of female tea pluckers in Sri Lanka. *Technical Report*, (May). https://doi.org/10.13140/RG.2.1.4169.1042

Kamalha, E., Zeng, Y., Mwasiagi, J. I., & Kyatuheire, S. (2013). The comfort dimension ; a review of perception in clothing. https://doi.org/10.1111/joss.12070

Kaplan, S., & Okur, A. (2008). The meaning and importance of clothing comfort: A case study for Turkey. *Journal of Sensory Studies*, *23*(5), 688–706. https://doi.org/10.1111/j.1745-459X.2008.00180.x

Kjellstrom, T., Holmer, I., & Lemke, B. (2009). Workplace heat stress, health and productivity-an increasing challenge for low and middle-income countries during climate change. *Global Health Action*, *2*(1). https://doi.org/10.3402/gha.v2i0.2047

Korkmaz, S., & Park, D. J. (2018). Comparison of safety perception between foreign and local workers in the construction industry in Republic of Korea. *Safety and Health at Work*, *9*(1), 53–58. https://doi.org/10.1016/j.shaw.2017.07.002

Leh, O. L. H., Mansor, N. A., & Musthafa, S. N. A. M. (2016). The housing preference of young people in Malaysian urban areas : A case study Subang Jaya , Selangor. *GEOGRAFIA Online Malaysian Journal of Society and Space*, *7*(7), 60–74.

Lotens, W. (2006). Heat exchange through clothing. *Safe Work Bookshelf*, (March 2011), Ch. 42. Retrieved from http://www.ilo.org/safework_bookshelf/english

Lucas, R. A. I., Epstein, Y., & Kjellstrom, T. (2014). Excessive occupational heat exposure: A significant ergonomic challenge and health risk for current and future workers. *Extreme Physiology and Medicine*, *3*(1), 1–8. https://doi.org/10.1186/2046-7648-3-14

Luible, C., Varheenmaa, M., Magnenat-Thalmann, N., & Meinander, H. (2007). Subjective fabric evaluation. *Proceedings - 2007 International Conference on Cyberworlds, CW'07*, (November), 285–291. https://doi.org/10.1109/CW.2007.62

Lwanga, S., & Lemeshow, S. (1991). *Sample size determination in health studies: a practical manual, 1991. World Health Organization, Geneva*. Geneva: World Health Organization. https://doi.org/10.2307/2290547

Marmarali, A. (2007). Thermal comfort properties of some knitted structures, *15*(5), 94–

96.

Malaysian Palm Oil Council, 2013. Government to continue to improve palm oil industry. Retrieved from http://www.mpoc.org.my/Government_To_Continue_To_Improve_Palm_Oil_Industry.aspxDOSM

McNeill, M. B., & Parsons, K. C. (1999). Appropriateness of international heat stress standards for use in tropical agricultural environments. *Ergonomics*, *42*(6), 779–797. https://doi.org/10.1080/001401399185289

Nasir, N. S. M., Tamrin, S. B. M., Subramanian, K., Shukoor, N. S., Zolkifli, N., Ng, G. S., … Ananta, G. P. (2016). Association of workplace stressors with salivary alpha-amyl-ase activity levels among fresh fruit bunch cutters in Selangor. *Iranian Journal of Public Health*, *45*(1), 68–76. Retrieved from http://ijph.tums.ac.ir/index.php/ijph/article/view/6156

Nawaz, N., Troynikov, O., & Watson, C. (2011). Thermal comfort properties of knitted fabrics suitable for skin layer of protective clothing worn in extreme hot conditions. *Advances in Textile Engineering*, *331*, 184–189. https://doi.org/10.4028/www.scientific.net/AMR.331.184

Nawi, N. S. M., Deros, B. M., Rahman, M. N. A., Sukadarin, E. H., & Nordin, N. (2016). Malaysian oil palm workers are in pain : hazards identification and ergonomics related problems Malaysian oil palm workers are in pain : hazards identification (May).

Omar, A. T., & Amat, A. (2017). Etika kerja etnik bugis di sabah: satu kajian di organisasi awam, *25*, 75–86.

Occupational Safety and Health Administration US (2014). Occupational heat exposure. Retrieved from https://www.osha.gov/SLTC/heatstress/heat_illnesses.html

Oxford Dictionaries (2018). Perception. Retrieved from https://en.oxforddictionaries.com/definition/perception

Pritchard, M., Sarsby, R. W., & Anand, S. C. (2000). *Handbook of Technical Textiles*. *Handbook of Technical Textiles*. https://doi.org/10.1533/9781855738966.372

Rameshbhai, A. J. (2014). Critical study to improve the water transport properties of knitted fabric, 264. Retrieved from http://hdl.handle.net/10603/56181

Response, T., & Preference, S. T. (n.d.). Shifting Touch Preference.

Sadiq, L. (2016). Assessing the impact of heat on health and productivity among Nigerian farmers : a review of literature corresponding author : Lukman Shiji Sadiq, Universiti Putra Malaysia , Department of 2 . Materials and Method 3 . Results and Discussion, *2*(3), 6–9.

Saini, A., Rauert, C., Simpson, M. J., Harrad, S., & Diamond, M. L. (2016).

Characterizing the sorption of polybrominated diphenyl ethers (PBDEs) to cotton and polyester fabrics under controlled conditions. *Science of the Total Environment*, *563–564*(September), 99–107. https://doi.org/10.1016/j.scitotenv.2016.04.099

Saris, K. (2012). Application of an appearance-based intervention to improve sun protection outcomes of outdoor workers in Queensland , Australia (May).

Smith-Greenaway, E. (2015). Educational attainment and adult literacy: A descriptive account of 31 sub-saharan africa countries. *Demographic Research*, *33*(1), 1015–1034. https://doi.org/10.4054/DemRes.2015.33.35

Staelin, R. & and Weinstein, A.G. (1974). Correlates of Consumer Safety Behavior. Association for Consumer Research, 87-100.Retrieved from http://www.acrwebsite.org/search/view-conference-proceedings.aspx?Id=5653

Tapie, E., Tan, E. S. L., Guo, Y. B., & Shim, V. P. W. (2017). Effects of pre-tension and impact angle on penetration resistance of woven fabric. *International Journal of Impact Engineering*, *106*, 171–190. https://doi.org/10.1016/j.ijimpeng.2017.03.022

Tawatsupa, B., Yiengprugsawan, V., Kjellstrom, T., Berecki-gisolf, J., Seubsman, S., & Sleigh, A. (2013). Association between Heat stress and occupational injury among thai workers : Findings of the Thai Cohort Study, 34–46.

Taylor, P., Lee, S., Obendorf, S. K., Lee, S., & Obendorf, S. K. (2010). Barrier effectiveness and thermal comfort of protective clothing materials Barrier effectiveness and thermal comfort of, (October 2014), 37–41. https://doi.org/10.1533/joti.2005.0143

Textile School (n.d). Physical properties and characteristics of fabrics. Retrieved from https://www.textileschool.com/199/physical-properties-and-characteristics-of-fabrics/

Theses, M., & Wigboldy, K. (2013). The effects of a moisture-wicking fabric shirt on the physiological responses during acute exercise in the heat.

Ukponmwan, J. O. (2009). Ther thermal insulation properties of fabrics. *Textile Progress*, *24*(4), 1–54.

Uttam, D. (2013). Active sportswear fabrics. *International Journal of IT, Engineering and Applied Sciences ResearchXplore International Research Journal Consortium*, *2*(1), 2319–4413. Retrieved from https://pdfs.semanticscholar.org/664b/084e4930ddc1ba511f44ceaa106939a0423e.pdf

Uttam, D., Zail, G., & Campus, S. (2013). Active sportswear fabrics, *2*(1), 34–40.

Vu Thi, B. N., Vu-Khanh, T., & Lara, J. (2005). Effect of friction on cut resistance of polymers. *Journal of Thermoplastic Composite Materials*, *18*(1), 23–36. https://doi.org/10.1177/0892705705041157

Wang, F. (2014). Protective clothing. *Protective Clothing*, *44*(0), 366–391. https://doi.org/10.1533/9781782420408.3.366

Woolley, T., & Buettner, P. (2009). Similarity of sun protection attitudes and behaviours within north Queensland peer groups. *Health Promotion Journal of Australia*, *20*(2), 107–11. https://doi.org/10.1071/HE09107

World Health Organization. (2015). Climate and health country profile 2015: Malaysia. *United Nations Framework Convention on Climate Change*, 1–8. Retrieved from http://www.who.int/iris/handle/10665/246124

Yoon, H. N., Sawyer, L. C., & Buckley, A. (1984). Improved comfort polyester. *Textile Research Journal*, *54*(6), 357–365. https://doi.org/10.1177/004051758405400601

Appendix I

(Ethical Approval Letter)

ETHICS COMMITTEE FOR RESEARCH INVOLVING HUMAN SUBJECTS
(JKEUPM)
UNIVERSITI PUTRA MALAYSIA

Research title	:	**Subjective Preference for the Fabric of Work Uniform in the Perspective Of Occupational Safety and Health Among Oil Palm Plantation Workers At Sandakan, Sabah**
Study Site	:	**Sandakan, Sabah**
JKEUPM Ref No.	:	**JKEUPM-2017-208**
Researcher	:	**Amirah Aida bt Madzlan**
Supervisor	:	**Dr. Ng Yee Guan**

Documents received and reviewed with reference to the above study:

1. Ethics Application Form, Version 1 dated 31/10/2017
2. Respondent Information Sheet & Consent (English), Version 2 dated 4/12/2017
3. Respondent Information Sheet & Consent (Malay), Version 2 dated 4/12/2017
4. Proposal (English), Version 2 dated 9/1/2018
5. Questionnaire (English), Version 2 dated 9/1/2018
6. Questionnaire (Malay), Version 2 dated 9/1/2018
7. Curriculum Vitae of:
    a. Dr. Ng Yee Guan
    b. Assoc Prof. Dr. Shamsul Bahri Hj Mohd Tamrin

The University Research Ethics Committee, Universiti Putra Malaysia (JKEUPM) operates in accordance to the ICH-GCP Guidelines.

Decision by JKEUPM:

[X] Approved

[X] **Permission MUST BE OBTAINED from the respective hospitals/ institutions before conducting the research**

[ ] Disapproved

Please note that the approval is VALID UNTIL 12 JANUARY 2019

Researchers should comply with the following:

1. Complete a Study Final Report upon study completion (Form 3.2).

Appendix II

(Ethical Consent Form)

JAWATANKUASA ETIKA UNIVERSITI UNTUK PENYELIDIKAN MELIBATKAN MANUSIA (JKEUPM)
UNIVERSITI PUTRA MALAYSIA, 43400 UPM SERDANG, SELANGOR, MALAYSIA

BORANG 2.4: PENERANGAN DAN PERSETUJUAN RESPONDEN

Sila baca maklumat berikut dengan teliti. Sekiranya anda mempunyai sebarang pertanyaan, sila kemukakan kepada penyelidik.

1. TAJUK KAJIAN:

Pilihan Subjektif untuk Fabrik Seragam Kerja untuk Keselamatan dan Kesihatan Pekerjaan di kalangan Pekerja Ladang Kelapa Sawit di Sandakan, Sabah.

2. PENGENALAN:

Pakaian seragam kerja memainkan peranan penting dalam keselesaan pekerja terutamanya di Malaysia kerana mempunyai iklim tropika. Tujuan utama pakaian adalah untuk melindungi tubuh daripada keadaan fizikal yang tidak sesuai seperti mengekalkan persekitaran terma yang ideal untuk badan dan mencegah tubuh daripada cedera akibat lelasan, radiasi, angin dan lain-lain.

Berdasarkan peranan ini, persepsi subjektif tentang status keselesaan pengguna dapat dijelaskan dengan jelas, dengan itu menyediakan jenis fabrik terbaik kepada pekerja yang dapat memaksimumkan keselamatan dan kesihatan. Bergantung pada jenis fabrik, fabrik yang berbeza mempunyai ciri-ciri yang berbeza seperti keselesaan (termasuk haba), penyerapan air dan pengekalan, aliran udara, lelasan dan rintangan penembusan, keanjalan, dan sebagainya.

Oleh itu, tujuan kajian ini adalah untuk menentukan hubungan antara pilihan subjektif fabrik pakaian (100% mikrofiber polyester dan 100% kapas) berdasarkan perspektif pekerja dalam Keselamatan dan Kesihatan Pekerjaan di kalangan Pekerja Minyak Sawit di Sandakan, Sabah.

3. APAKAH YANG PERLU ANDA LAKUKAN?

Anda akan diminta untuk menjawab soal selidik yang mencatatkan data anda mengenai latar belakang sosio-demografi, pilihan seragam kerja, kebarangkalian kecederaan badan, penyakit yang berkaitan dengan haba, persepsi terhadap fabrik dari segi keselamatan pekerjaan dan sifat terma. Bagi Bahagian Pilihan Fabrik (Bahagian E) dalam soal selidik, responden akan diberi 100% poliester microfiber dan 100% kapas untuk merasakan sifat fizikal.

Anda akan dibantu oleh penyelidik sepanjang proses menjawab soal selidik. Jika anda menghadapi sebarang masalah menjawab soal selidik, anda boleh meminta penjelasan lanjut dari penyelidik. Ini adalah penglibatan secara sukarela. Sekiranya anda tidak mahu menyertai atau pada bila-bila masa menarik diri daripada penyelidikan ini, anda perlu memaklumkan penyelidik sebelum anda berbuat demikian.

4. SIAPA YANG TIDAK BOLEH MENYERTAI KAJIAN INI?

Pengurus majikan dan perladangan.
Penuai yang mengalami kerosakan saraf periferi pada jari (keadaan seperti kebas, rasa mencucuk atau semut-semut, dll)

5. APAKAH FAEDAH MENYERTAI KAJIAN INI?

(a) KEPADA ANDA SEBAGAI PESERTA?

Apabila menjawab soal selidik, peserta akan dijelaskan dengan aspek penting dalam memilih fabrik seperti perlindungan dari kecederaan, keselesaan termal, keselesaan fabrik dan praktikaliti. Oleh itu, para peserta dapat mengetahui aspek-aspek penting yang dapat membimbing mereka untuk memilih jenis fabrik terbaik yang sesuai untuk bekerja. Secara langsung, aspek ini dapat meningkatkan produktiviti dan keselamatan pekerja.

Selepas peserta telah memberi maklum balas kepada soal selidik, para peserta akan diberikan tanda penghargaan untuk penyertaan mereka. Penglibatan dalam kajian ini sukarela dan peserta boleh meninggalkan kajian ini pada bila-bila masa. Apabila menarik diri dari kajian, peserta perlu memaklumkan kepada penyelidik mengenai penarikan diri.

(b) KEPADA PENYELIDIK?

Para penyelidik akan dapat menyumbang penyelidikan yang sangat berguna untuk menentukan hubungan antara pilihan pakaian fabrik subjektif (100% mikrofiber polyester dan 100% kapas) berdasarkan perspektif pekerja dalam Keselamatan dan Kesihatan Pekerjaan di kalangan Pekerja Minyak Sawit di Sandakan, Sabah . Berdasarkan maklumat ini, jenis fabrik yang sesuai berdasarkan pilihan pekerja ladang kelapa sawit boleh dicadangkan kepada syarikat.

6. ADAKAH IA BERISIKO?

Terdapat risiko yang minimum kerana anda hanya perlu menjawab set soal selidik ini di bawah bimbingan penyelidik sambil merujuk kepada warna pakaian yang disediakan. Sepanjang proses menjawab soal selidik, anda mungkin mengalami risiko psikososial yang minimum seperti kekeliruan ketika menghadapi kesulitan memahami persoalan dalam soal selidik. Tiada rawatan perubatan yang disediakan dalam kajian ini.

7. ADAKAH MAKLUMAT DAN IDENTITI SAYA KEKAL RAHSIA?

Ya. Semua maklumat dan identiti peserta akan dirahsiakan.

Perisian pemprosesan data tidak akan mengandungi pengenal atau maklumat peribadi anda sementara kuesioner fizikal yang anda isi akan dimusnahkan dengan merobek dan dilupuskan setelah semua data telah dipindahkan (dimasukkan) ke perisian pemprosesan data dalam masa 1 bulan.

8. SIAPA YANG SAYA PERLU HUBUNGI SEKIRANYA SAYA MEMPUNYAI SOALAN TAMBAHAN SEMASA MENGIKUTI PENYELIDIKAN INI?

a) Ng Yee Guan,
Jabatan Kesihatan Persekitaran dan Pekerjaan,
Fakulti Perubatan dan Sains Kesihatan,
Universiti Putra Malaysia.
No. Fax : 03-89472395
No. Pejabat : 03-89472396
No. Telefon : 019-2771103
Emel : shah86zam@upm.edu.my

b) Amirah Aida Binti Madzlan,
Bachelor Sains Kesihatan Persekitaran dan Pekerjaan,
Jabatan Kesihatan Persekitaran dan Pekerjaan,
Fakulti Perubatan dan Sains Kesihatan,
Universiti Putra Malaysia.
No. Telefon : 012-6227800
Emel : amirahaidamadzlan@gmail.com

Sila tandatangan di sini sekiranya anda telah membaca dan memahami kandungan halaman ini

9. PERSETUJUAN

Saya..... **No Kad Pengenalan.** ..... **beralamat**.....

.....**dengan ini bersetuju untuk mengambil bahagian secara sukarela** dalam penyelidikan yang tersebut di atas *(~~kajian klinikal/percubaan ubat-ubatan/rakaman video/kumpulan sasaran/temuduga/~~ soal selidik).

Saya telah diberi penjelasan secara menyeluruh mengenai penyelidikan ini dari segi metodologi, risiko dan komplikasi (seperti tertulis pada Helaian Penerangan Responden). Saya memahami bahawa saya berhak menarik diri dari penyelidikan ini pada bila-bila masa tanpa memberi sebarang alasan.Saya juga memahami bahawa sebarang maklumat yang berkaitan identiti saya akan dirahsiakan.

Saya* berminat / tidak berminat untuk mengetahui keputusan kajian yang melibatkan saya.

I setuju/tidak bersetuju untuk imei/gambar/rakaman video/ rakaman suara digunakan dalam apa jua bentuk penerbitan atau pembentangan. (sekiranya berkaitan).

Tandatangan .....
(Responden)

Tandatangan .....
(Saksi)

Tarikh : .....

Nama :.....

No. K/P :.....

Saya mengesahkan bahawa saya telah menerangkan kepada responden ini sifat dan tujuan penyelidikan yang tersebut di atas.

Tarikh .....

Tandatangan .....
(Penyelidik)

Appendix III

(Questionnaire)

UNIVERSITI PUTRA MALAYSIA

ID | | | | |

Pilihan Subjektif Terhadap Fabrik Pakaian untuk Keselamatan dan Kesehatan Kerja di Lapangan Pekerja Kelapa Sawit di Sandakan, Sabah

Pilihan Subjektif Terhadap Fabrik Pakaian untuk Keselamatan dan Kesihatan Pekerjaan dalam Kalangan Pekerja Ladang Kelapa Sawit di Sandakan, Sabah

Nombor Induk Pekerja
Nombor Induk Pekerja : .....

Organisasi
Organisasi : ( ) NAK Plantation ( ) Sutera Plantation

Tarikh
Tanggal : ___ / ___ / 2017

Tanda Tangan
Tandatangan : .....

Arahan / *Instruksi*:

1. Borang soal selidik ini mengandungi enam (6) bahagian:
   Borang soal selidik ini mengandungi enam (6) bagian:

Bahagian A: Maklumat Peribadi *Bagian A: Informasi Diri* **Bahagian B: Maklumat Pekerjaan** *Bagian B: Informasi Pekerjaan* **Bahagian C: Keselamatan Tempat Kerja** *Bagian C: Keselamatan Tempat Kerja*	**Bahagian D: Kselesaan Terma Tempat Kerja** *Bagian D: Kenyamanan Termal Tempat Kerja* **Bahagian E: Pilihan Fabrik** *Bagian E: Preferensi Fabrik*

2. Anda diminta untuk menjawab semua soalan yang terdapat di dalam borang soal selidik ini.
   Anda diminta untuk menjawab semua soalan yang ada di dalam soal selidik ini.

3. Sila menjawab berdasarkan arahan yang diberikan di setiap soalan.
   Sila jawab menurut arahan yang diberikan di setiap soalan.

4. Sila kembalikan borang soal selidik kepada pengkaji setelah selesai menjawab semua soalan.
   Borang soal selidik hendaklah dikembalikan kepada pengkaji setelah selesai menjawab semua soalan.

Bahagian A : Maklumat Peribadi
Bagian A : Informasi Diri

1.1 **Umur**
Umur ..... **tahun** / *tahun*

1.2 **Bangsa**
Bangsa .....

1.3 **Status Perkahwinan**
Status Pernikahan
1. Bujang / *Bujang* ☐
2. Bernikah / *Berkahwin* ☐
3. Bercerai / *Bercerai* ☐

1.4 **Tingkat Penddikan**
Tahap Pendidikan
1. Tidak Sekolah / *Tidak Bersekolah* ☐
2. Dasar / *Rendah* ☐
3. Menengah / *Menengah* ☐

1.5 **Gaji**
Gaji .....

Bahagian B : Maklumat Pekerjaan
Bagian B : Informasi Pekerjaan

2.1. Pernahkah anda bekerja sebagai pemotong di tempat lain sebelum ini?
Apakah anda bekerja sebagai pemanen tempat lain sebelumnya?

1. Ya / *Ya* ☐
2. Tidak / *Tidak* ☐

2.2. Berapa lamakah anda bekerja sebagai pemotong?
Berapa lamakah anda bekerja sebagai pemanen?

_____ tahun / *tahun*

2.3. Berapa lamakah anda telah bekerja di ladang ini?
Berapa lamakah anda bekerja di perkebunan ini?

_____ tahun / *tahun*

2.4. Adakah anda memakai baju semasa anda bekerja sebagai seorang pemotong buah sawit?
Adakah anda memakai baju semasa anda bekerja sebagai seorang pemanen?

1. Ya / *Ya* ☐
2. Tidak / *Tidak* ☐

Jika Ya sila jawab semua. Jika tidak, sila teruskan dengan Soalan 2.5.
Jika Ya sila jawab semua. Jika tidak, sila teruskan dengan Soalan 2.5.

2.4.1. Apakah jenis baju yang anda suka pakai untuk memotong?
Apakah jenis baju yang suka dipakai oleh anda semasa memotong?

1. Baju tee / *Baju tee* ☐
2. Baju polo / *Baju polo* ☐
3. Kemeja / *Kemeja* ☐
4. Jersi / *Jersi* ☐
5. Singlet / *Singlet* ☐
6. Lain- lain / *Lainnya* ☐

2.4.2. Apakah jenis lengan baju yang anda lebih suka?
Apakah jenis lengan yang anda pilih?

1. Lengan pendek / *Lengan pendek* ☐
2. Lengan panjang / *Lengan panjang* ☐
3. Tanpa lengan / *Tidak berlengan* ☐

2.4.3. Bagaimanakah anda mendapatkan baju untuk bekerja?
Bagaimanakah anda mendapatkan baju untuk bekerja?

1. Disediakan oleh majikan / *Diberi oleh majikan* ☐
2. Membeli baju sendiri / *Membeli baju sendiri* ☐
3. Sunbangan oleh pihak lain / *Sumbangan dari pihak lain* ☐

Bahagian C : Keselamatan Tempat Kerja
Bagian C : Keselamatan di Tempat Kerja

3.1 Pada pendapat anda, adakah tempat kerja anda selamat untuk bekerja?
Menurut pendapat anda, apakah tempat kerja anda aman bagi anda untuk bekerja?

Ya / *Ya* ( ) Tidak / *Tidak* ( )

3.2 Pernahkah anda mengalami sebarang kecederaan (di tempat kerja) pada badan anda di mana anda memakai baju?
Pernahkah anda mengalami luka-luka (di tempat kerja) ke tubuh anda dimana anda mengenakan kemeja??

Ya / *Ya* ( ) Tidak / *Tidak* ( )

3.3 Jika ya, sila jawab soalan di bawah. **Jika tidak**, sila teruskan dengan soalan D.
*Jika ya, tolong jawab pertanyaan berikut. **Jika tidak**, lanjutkan ke soalan D.*

3.3.1. Berapa kerapkah anda mengalami kecederaan?
Seberapa sering anda mengalami luka-luka?

Sekali setiap minggu ( )
Sekali setiap minggu
Sekali setiap bulan ( )
Sekali setiap bulan
Sekali setiap 3 bulan ( )
Sekali setiap 3 bulan
Sekali setiap 6 months ( )
Sekali setiap 6 bulan
Sekali setiap tahun ( )
Sekali setiap tahun

3.3.2. Apakah tahap kecederaan tersebut?
Bagaimana beratnya luka-luka itu?
Apakah tahap kecederaan tersebut?

Tidak memerlukan Cuti Sakit ( )
Cuti Sakit > 4 hari ( )
Cuti Sakit ≤ 4 hari ( )

Bahagian D : Keselesaan Suhu Tempat Kerja

Bagian D : Kenyamanan Suhu Tempat Kerja

4.1 Bagaimanakah anda rasa dengan suhu persekitaran di tempat kerja anda (ladang kelapa sawit)?

Bagaimana perasaan anda dengan suhu di sekitar tempat kerja anda (perkebunan kelapa sawit)?

( )	( )	( )	( )	( )	( )	( )
Sejuk / *Sejuk*	Dingin / *Keren*	Sedikit dingin / *Sedikit dingin*	Neutral / *Netral*	Sedikit hangat / *Sedikit hangat*	Hangat / *Hangat*	Panas / Panas

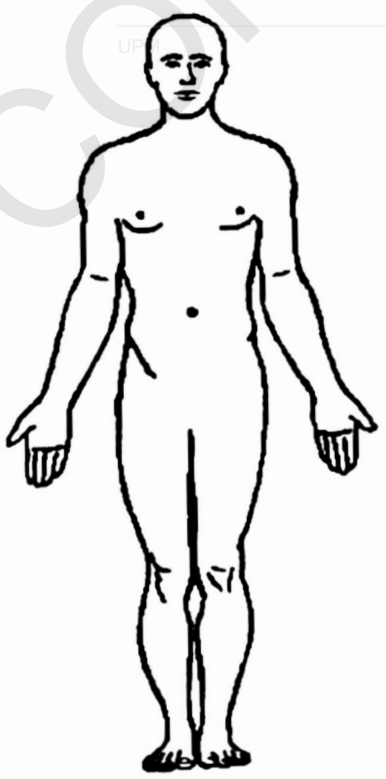
4.2 Adakah anda rasa selesa dengan pergerakan angin di tempat kerja anda?

Apakah anda merasa nyaman dengan gerakan angin di tempat kerja anda?

( ) Ya / *Ya* ( ) Tidak / *Tidak*

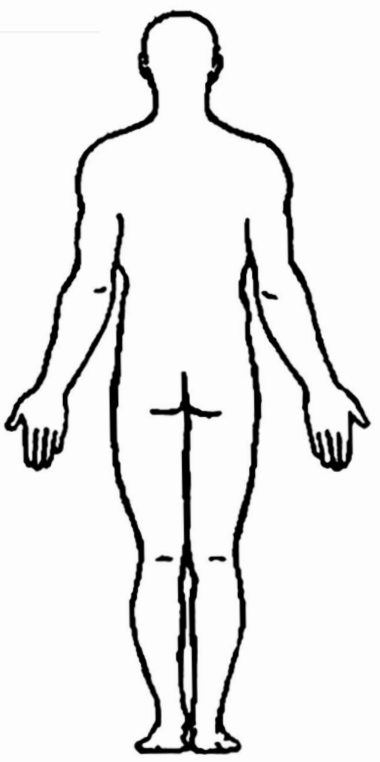
4.3 Bulatkan bahagian badan yang anda rasa paling panas semasa bekerja sebagai seorang pemotong buah sawit? (Anda boleh bulatkan lebih daripada **SATU (1)** pilihan)

*Lingkari bagian tubuh anda dimana anda merasa terpanas saat bekerja sebagai pemanen? (Anda bisa melingkari lebih dari **SATU (1)** pilihan)*



Rajah 1 (Bahagian Hadapan Badan)

Diagram 1 (Bagian Depan Tubuh)



Rajah 2 (Bahagian Belakang Badan)

Diagram 2 (Bagian Belakang Tubuh)

4.4 Pernahkah anda mengalami gejala-gejala seperti yang berikut? *Pernahkah anda mengalami gejala berikut?*			**Jika Ya**, adakah gejala ini disebabkan oleh cuaca panas? *Jika Ya, apakah gejala ini disebabkan cuaca panas?*	
4.4.1. Dahaga yang berlebihan *Haus yang berlebihan*	Ya *Ya*	Tidak *Tidak*	Ya *Ya*	Tidak *Tidak*
4.4.2. Kelesuan *Kelelahan*	Ya *Ya*	Tidak *Tidak*	Ya *Ya*	Tidak *Tidak*
4.4.3 Sakit kepala *Sakit kepala*	Ya *Ya*	Tidak *Tidak*	Ya *Ya*	Tidak *Tidak*
4.4.4 Pening *Pusing*	Ya *Ya*	Tidak *Tidak*	Ya *Ya*	Tidak *Tidak*
4.4.5 Kekejangan otot atau perut *Kram otot atau perut*	Ya *Ya*	Tidak *Tidak*	Ya *Ya*	Tidak *Tidak*
4.4.6 Berpeluh secara berlimpah-limpah *Berkeringat yang melelahkan*	Ya *Ya*	Tidak *Tidak*	Ya *Ya*	Tidak *Tidak*

4.4 Pernahkah anda mengalami gejala-gejala seperti yang berikut? *Pernahkah anda mengalami gejala berikut?*			**Jika Ya**, adakah gejala ini disebabkan oleh cuaca panas? *Jika Ya, apakah gejala ini disebabkan cuaca panas?*	
4.4.7	Kehilangan kesedaran *Hilang kesadaran*	Ya / *Ya* ☐	Tidak / *Tidak* ☐	Ya / *Ya* ☐	Tidak / *Tidak* ☐
4.4.8	Ruam Panas *Ruam panas*	Ya / *Ya* ☐	Tidak / *Tidak* ☐	Ya / *Ya* ☐	Tidak / *Tidak* ☐

4.5 Bagaimanakah anda sejukkan badan anda apabila anda rasa panas semasa bekerja? (Anda boleh menanda lebih dari satu pilihan)

Bagaimana anda mendinginkan tubuh saat Anda merasa panas saat bekerja?(Anda bisa mencentang lebih dari satu pilihan)

( ) Banyakkan minum air / *Minum banyak air*
( ) Beristirahat di tempat yang sejuk / *Rehat di tempat yang dingin*
( ) Menanggalkan baju anda / *Menanggalkan baju anda*
( ) Mandi / *Mandi*
( ) Lain-lain / *Lainnya*
Nyatakan / *Sebutkan*: _____

Bahagian E : Pilihan dan Persepsi Fabrik
Bagian E : Preferensi dan Persepsi Fabrik

100% Kapas dan 100% Microfiber Polyester adalah fabrik pilihan untuk kajian ini. Berdasarkan jadual di bawah, sila pilih **SATU (1)** jenis fabrik dengan menandakan (✓) pada jenis fabrik yang anda fikir sesuai untuk setiap ciri berikut:
*Kapas dan 100% Microfiber Polyester adalah fabrik pilihan untuk studi ini. Berdasarkan tabel di bawah ini, silahkan pilih **SATU (1)** jenis fabrik dengan menandai (✓) pada jenis fabrik yang menurut anda sesuai untuk setiap fitur berikut:*

5.1 Pilihan dan Persepsi Fabrik Berdasarkan Keselesaan Haba dan Ciri Keselamatan

Preferensi dan Persepsi Fabrik Berdasarkan Keselesaan Termal dan Fitur Keselamatan

No.	Ciri-ciri *Fitur*	100% Kapas *100% Kapas*	100% Mikrofiber Polyester *100% Mikrofiber Polyester*
5.1.1 Keselesaan *Keselesaan*			
5.1.1.1.	Lebih selesa untuk dipakai ketika bekerja *Lebih nyaman dipakai saat bekerja*	☐	☐
5.1.2 Ciri Keselamatan *Fitur Keselamatan*			
5.1.2.1.	Lebih selamat untuk dipakai sewaktu bekerja *Lebih aman dipakai saat bekerja*	☐	☐

No.	Ciri-ciri *Fitur*	100% Kapas *100% Kapas*	100% Mikrofiber Polyester *100% Mikrofiber Polyester*
5.1.3 Keselesaan Termal *Keselesaan Termal*			
5.1.3.1	Lebih sejuk untuk dipakai ketika bekerja *Berasa lebih dingin dipakai saat bekerja*	☐	☐
5.1.3.2	Mempunyai kadar penyerapan peluh yang lebih bagus *Memiliki tingkat penyerapan keringat yang lebih baik*	☐	☐
5.1.3.3	Lebih cepat kering di bawah matahari *Lebih cepat mengering di bawah terik matahari*	☐	☐

5.2 Pilihan Subjektif Fabrik bagi Pekerja Ladang Kelapa Sawit
Preferensi Subjektif Fabrik bagi Pekerja Ladang Kelapa Sawit

No.	Ciri-ciri *Fitur*	100% Kapas *100% Kapas*	100% Mikrofiber Polyester *100% Mikrofiber Polyester*
5.2.1	Jika majikan anda akan memberi baju untuk anda pakai ketika bekerja, fabrik manakah anda lebih suka? *Jika atasan anda akan menyediakan baju agar anda bekerja, fabrik mana yang anda lebih sukai?*	☐	☐

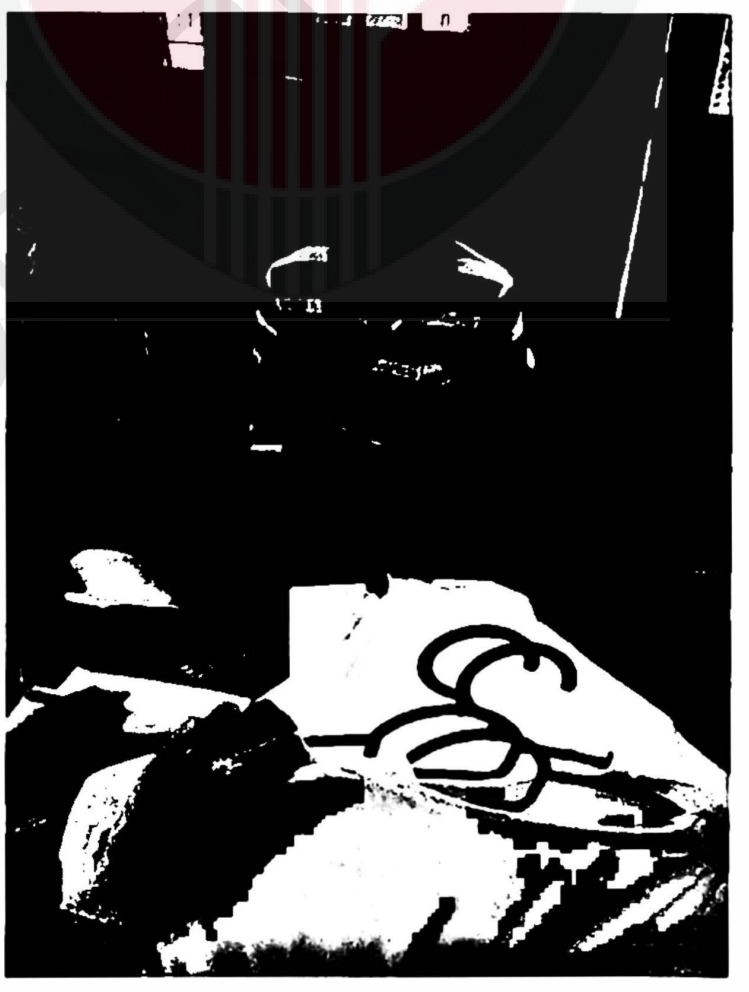
Kami ingin mengucapkan terima kasih atas kerjasamanya. Jawaban anda akan dijaga kerahasiaannya dengan peneliti dan akan digunakan sebagai bagian dari penelitian akademis. Jangan ragu untuk menulis ulasan tentang keseluruhan soal selidik.

Kami ingin mengucapkan terima kasih atas kerjasama anda. Jawapan anda akan disimpan dengan rahsia dengan penyelidik dan akan digunakan sebagai sebahagian daripada penyelidikan akademik. Jangan teragak-agak untuk menulis ulasan mengenai keseluruhan soalan.

TERIMA KASIH.

Appendix IV
(Photograph of Research Study)

Respondents answering the questionnaire under the guidance of the researcher



The respondents touching and feeling the two fabrics type before answering section E in the questionnaire.