

## **Chapter I Preliminary**

### **I.1 Background**

Transfer of material in agriculture is still done manually based on a worker's physical capabilities (without the use of tools). Manual materials handling activities are lifting, carrying and lowering. This type of work has a high risk of injury because there is a direct contact between the load and the human body, which can cause injury to the parts of the body such as the neck, shoulders, arms, spine to the legs.

Lower spine is a critical part of the force (Chaffin and Anderson, 1991). Low Back Pain is a pain in the lower back caused by damage to the intervertebral disc. The damage caused by the load incurred by the spinal segment exceeds the resistant force of the segment. Factors causing such damage include posture or position is not ergonomic, a heavy load is lifted, and the frequency of displacement activities.

PT. ABO FARM is one company that is engaged in agriculture located in Ciwidey, West Java. PT. ABO FARM is a company that focuses on exporting the beans. In the exporting the beans, there are several processes, one of the processes is the acceptance of the beans in collectors workstation which use plastic in the loading process that will be taken by using a pickup truck.

The results of observations conducted by the researcher, is known in collector workstation, the removal of material transactions are carried out manually by the operator when moving the plastic bag containing beans into a pickup truck (loading) to be transported to the PT. ABO FARM. Material that is transferred have an average weight of 55 kg/sack. One of the agencies that deal with health and safety issues in the U.S. that is NIOSH (National Institute of Occupational Safety and Health) states that the safe limit for maximum lifting load is 23 kg. Therefore, it can be seen that the load is lifted by the operator collecting lifting load exceeds the maximum safe limit.

The observation of the posture of the operator also showed the presence of non-ergonomic working posture when operators perform the manual material handling process. Figure I.1 showed operator bent to pick up a plastic bag. It is one of non-ergonomic working postures that is back and chest thrust forward over an angle  $\geq 20^{\circ}$  to the vertical line. This posture is a risk factor for Musculoskeletal Disorders (MSDs).



Figure I.1 Operators Taking Sack Bean

In addition, researchers conducted interviews with three operators to obtain information that could corroborate the alleged occurrence of MSDs by a form of identification that is Standard Nordic Questionnaire (SNQ). The results of SNQ can be seen in Figure I.2.

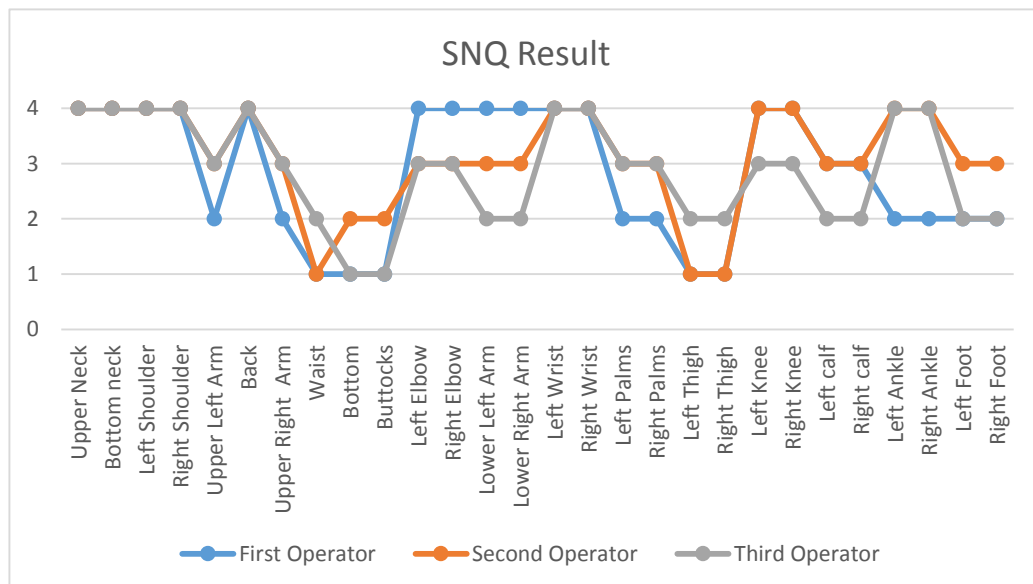


Figure I.2 Graph of SNQ Result

Operator 1 feel very pain in the upper neck, lower neck, left shoulder, right shoulder, back, left elbow, right elbow, left forearm, right forearm, right wrist, left wrist, left knee and right knee. Operator 2 felt very pain at the upper neck, left shoulder, right shoulder, back, left wrist, right wrist, left knee, right knee, left ankle and right ankle. Operator 3 felt very pain at the upper neck, lower neck, left shoulder, right shoulder, back, right wrist, left wrist, left ankle and right ankle.

Based on these results can be seen in the category of pain experienced by the operator that is very pain (4), pain (3), little pain (2) and no pain (1). SNQ results also showed that the three operators feel very pain in the back/spine. From the analysis of a wide variety of work that shows the pain is closely related to the compression load (press) that occurs in the lumbar intervertebral disc between number 5 and number 1 sacrum (L5/S1) and have also found that 85-95% of the hernia occurs in the lumbar disc number 4 and number 5 lumbar (L4/L5) and (L5/S1). (Chaffin and Park, 1973)

Therefore, in this study will be conducted biomechanical analysis and design of a safe method of manual material handling to minimize compressive force occurs at L5/S1 compression force in accordance with the normal limits (the action limit) recommended by NIOSH and than eventually will be able to minimize fatigue and reduce the risk of injury to the spine L5/S1.

## **I.2 Problem Definition**

In this section expressed problem definition of the research described in the research question. Problem definition is as follows:

1. How to design a method of manual material handling in the form of beans in order to reduce the risk of MSDS?

## **I.3 Research Objectives**

This section describes the purpose of the research conducted.

1. Designing a method of manual material handling in the form of beans in order to reduce the risk of MSDS.

#### **I.4 Research Limitations**

1. The product in PT. ABO FARM that is discussed in this research is the export of beans.
2. This research focuses on the process of loading beans with plastic sacks and the average load is 55 kg.
3. This research focuses on the process of loading beans in collector workstation before being taken to the PT. ABOFARM.
4. The data used is based on data taken at the time of the study.
5. Manual material handling method is designed based on container size specifications of the first research proposal
6. Existing condition of manual material handling is by lifting sacks in horizontal position.
7. The position of the body at the time of lifting of the existing operators assumed to be symmetric.
8. In this research, the proposed method that is given does not considering the friction forces that occur when the operator pushed the container. The friction is equal to 0 N.

#### **I.5 Benefits of Research**

The benefits of this research is as follows:

1. The operator in collector workstation has a new manual material handling method to make the process of loading beans so that the chances of a complaint MSDs can be minimized.

#### **I.6 Systematics Writing**

This research described the systematic writing as follows:

##### **Chapter I Preliminary**

This chapter contains a description of the background research, the formulation of the problem, the purpose of the study, limitation of the study, the benefits of research, and systematic writing.

**Chapter II    Review of Literature**

This chapter contains the literature relevant to the problem under study and also discussed the results of previous studies. The second section discusses the relationships between concepts into research studies and description of research contributions.

**Chapter III    Research Methodology**

In this chapter the research steps described in detail include: stages of formulating research problems, formulate hypotheses, and developing models of research, operationalization of variables to identify and conduct research, prepare research questionnaire, designing data collection and processing, test instruments, designing data processing analysis.

**Chapter IV    Data Colecting and Processing**

In this chapter the data is shown and described on general corporate and other data collected through various processes such as observation and data from the company. The data have been collected and processed using the processing stages according to which has been described in Chapter III.

**Chapter V    Analysis and Design**

In this chapter the design of the proposal will be made to provide better conditions for the company. The design of this proposal will include biomechanical analysis and analysis of the calculation results of the NIOSH equation on the existing condition and the design method of material removal.

**Chapter VI    Conclusions and Suggestions**

In this chapter will be shown the conclusion from the results of this study along with suggestions for further research.