

**ANALISIS ERGONOMI PROSES MUAT KELAPA SAWIT
MANUAL UNTUK MENGURANGI RESIKO *MUSCULOSKELETAL*
DISORDERS (MSDs) PADA PEKERJA**

TESIS

Untuk memenuhi sebagian persyaratan
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ABSTRACT

The process of harvesting oil palm in Indonesia in general is still done manually, such as ngegrek, ngangkong, ngutip, and load activities. This research is focused on palm oil loading activities. Preliminary research states that in the process of loading oil palm the risk of developing Musculoskeletal Disorders (MSDs) is very high. There are 12 upper body members who are at high risk of getting MSDs from the process of loading oil palms. The purpose of this study is to investigate the body parts most frequently affected by problems with oil palm loading workers, analyze the biomechanical burden experienced by oil palm loading workers on problematic body parts, and determine the length and the safe distance of the palm oil loading process.

The method used in this study is a subjective method through the filling of the Nordic Body Map (NBM) and Rapid Upper Limb Assessment (RULA) questionnaires, the Natural Hose Motion Method (SAG), and the calculation of biomechanical loads on the worker's body. Based on the results of a subjective investigation it was found that there were three members of the body that most often felt pain by workers when carrying out the process of loading oil palms, namely the back, neck and shoulders. This is due to the large angles formed by the movements of these limbs on average exceeding the safe zone limits of human movements in working according to the SAG method. The existing loading process (on the ground now) poses a high risk of MSDs to workers. This is evidenced by the high RULA score and the magnitude of the biomechanical load on the shoulders and back of workers which exceeds the recommended limits of NIOSH.

Improvement of the loading process is carried out on the work method by changing the body posture taking into account the body's natural movement angle, changing the safe distance and length of the corner used during the loading process of the oil palm, and reducing the load and frequency of the loading process. The equation built to determine the ideal corner length is $H = (A-B) / \cos \theta$ where H: corner length, A: truck height, B: shoulder height, and θ : large angle at the corner end. While the safe distance in carrying out the loading process can be determined by the Equation $F = E + G$, where F is the safe distance, G is the distance between the tailgate with the base of the corner, and E is the distance between the base of the corner against the body of the worker. This equation can be used in general for other oil palm loading cases. Improvements made to the loading process of oil palm can reduce the risk of MSDs to workers, as evidenced by a decrease in RULA score, and a large reduction in biomechanical load within the safe limit according to NIOSH's recommendations.

Keywords: *loading process of oil palm, MSDs, NBM, SAG, RULA, biomechanics*