

## PRELIMINARY STUDY ON TRAY SEEDING MACHINE IN RICE NURSERY CENTRE IN MARDI PARIT

Shahril Shah bin Mohamad Ghazali\*,  
Mohammad Afa bin Mhd. Bookeri,  
Muhammad Haniff bin Ahmad,  
TS Mohd Khusairy bin Khadzir,  
Azlan bin Othman  
*Engineering Research Centre, MARDI Seberang Perai*  
Email: shahril@mardi.gov.my

Nuraini binti Ahmad Ariff Shah,  
Wan Mohd Syafiq bin Wan Harun  
*Engineering Research Centre, MARDI Parit*

Mohamad Fakhrol Zaman bin Omar  
*Engineering Research Centre, MARDI Sintok*

Dr. Teoh Chin Chuang,  
Mohd Taufik bin Ahmad,  
Mohamed Fauzi bin Md. Isa,  
Hafidha bin Azmon  
*Engineering Research Centre, MARDI Serdang*

Azzami Adam bin Muhamad Mujab,  
Mohd Khalid bin Ahmad  
*Technology Commercialization and Business Centre, MARDI Parit*

Mohd Hafiz bin Mohd Yusoff  
*MARDI Parit*

Muhammad Naim Fadzli bin Abd Rani,  
Dr. Siti Norsuha binti Misman,  
Mohd Fitri bin Masarudin  
*Paddy and Rice Research Centre, MARDI Seberang Perai*

Dr. Hairazi bin Rahim @ Abdul Rahim  
*Socio-Economy, Market Intelligence and Agribusiness Research Centre, MARDI Serdang*

---

### ABSTRACT

*Mechanical transplanting is an important part of the rice seed production process. A good rice seedling mat is required for good and smooth transplanting in the paddy fields. The activity of preparing a rice seedling mat begins with the selection of good quality seeds, germination tests that produce a germination percentage of more than 80 percent, the soaking process for 24 hours, the tossing process for 24 hours, the process of sowing medium and rice seeds in trays, and storage for seedling germination and growth in the nursery until they are ready for transplanting. Agricultural workers face occupational health risks from farm machinery hazards, biological and chemical hazards, and social and environmental stresses. Despite mechanization expansion, work-related musculoskeletal disorders remain the leading cause of injury among employees. The purpose of this preliminary study on a rice tray seeding machine in a rice nursery centre is to identify and prioritise ergonomic risk factors and hazards for musculoskeletal disorders (MSDs) in the nursery industry. After the preliminary survey was completed, the project team and cooperators prioritised jobs or tasks for intervention. As a result, two specific priority intervention tasks have been identified: Task 1 is the repetitive refilling of the media and seed in the hoppers, and Task 2 is the repetitive delivery of a load of five sets of rice trays from stacking station to pallet. The interventions recommended to reduce hazards and improve ergonomic risk factors.*

*Keywords: rice tray seeding machine, ergonomic, musculoskeletal disorder, intervention*

---

### INTRODUCTION

The process of producing rice seeds also includes mechanical transplanting, which is an important step. It is necessary to have a good rice seedling mat in order to have a successful and trouble-free transplanting process in the paddy fields. The activity of preparing a rice seedling mat begins with the selection of seeds there are high quality. This followed by germination tests that produce a germination rate of more than 80 percent. Then comes the process of soaking for 24 hours, the process of tossing for 24

hours, the process of sowing medium and rice seeds in trays, and storage for seedling germination and growth in the nursery until they are ready to be transplanted into the paddy fields (Hossen et al., 2022).

Farmers and others working in agriculture frequently report encountering a variety of occupational health hazards. These risks can be classified into several categories. This category includes hazards associated with farm machinery, biological and chemical hazards, along with stresses related to social and environmental factors. (Benos et al., 2020). It has been reported that one of the most significant factors contributing to nonfatal occupational injuries and accidents that occur among farmers is the cultivation of paddy (Meyers et al., 2000; Sharifirad et al., 2022). Despite the development and expansion of mechanisation processes, particularly in rice nurseries, work-related musculoskeletal disorders remain the leading cause of employee injury. Because there has not been any prior extensive research done on the subject matter that is being discussed in this article, this preliminary study has been brought to the forefront of attention. As a result, the purpose of this study is to investigate the factors that put workers at the rice nursery centre in MARDI Parit at risk for musculoskeletal injuries.

## METHODOLOGY

This preliminary study on the rice tray seeding machine was carried out at the foundation seed rice nursery centre in MARDI Parit, which is in the state of Perak in Malaysia. The operation of the machine and all the activities that went along with it were observed and recorded. The measurements of the machine were taken as shown in Figure 1.

Figure 1: Rice tray seeding machine measurement (A, B, C, D, E)

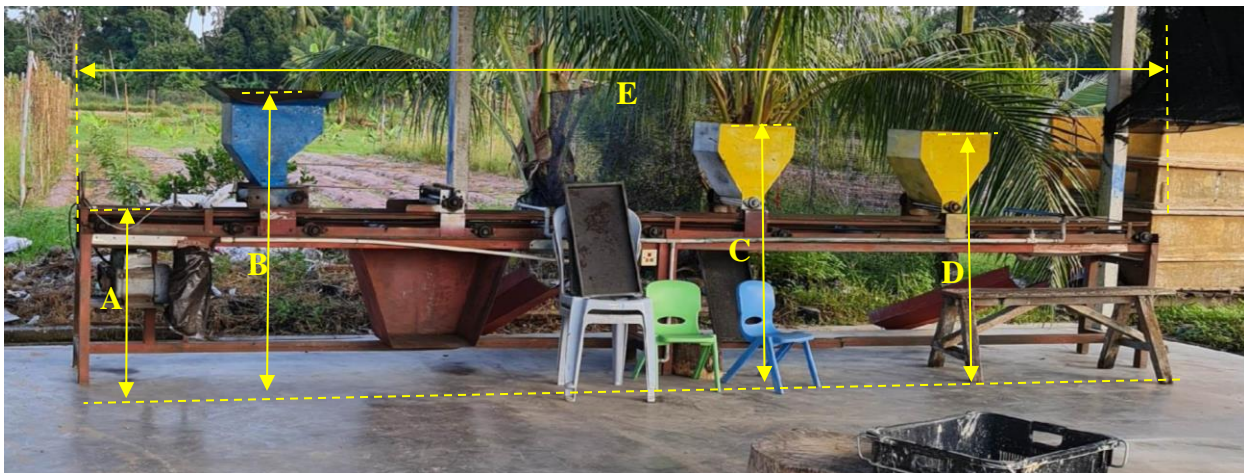
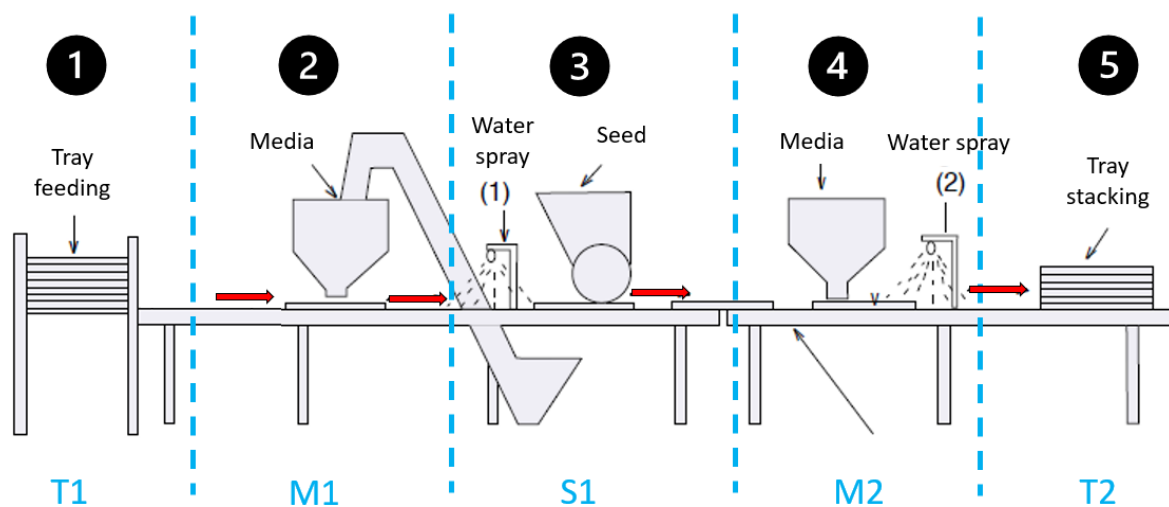


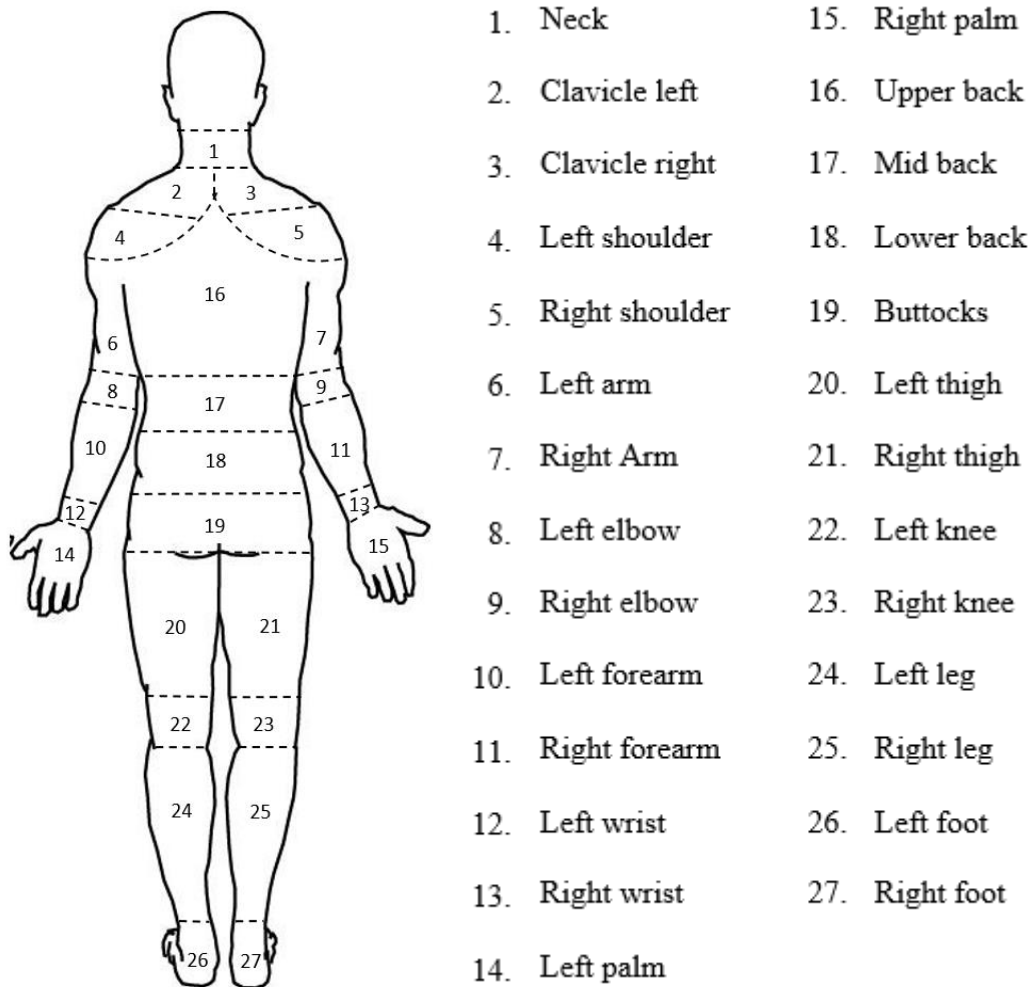
Figure 2: Rice tray seeding machine process and task observation based on original setup (T1, M1, S1, M2, T2).



Separation of tasks according to the initial configuration of the machine into five distinct tasks, labelled T1, M1, S1, M2, and T2, as shown in Figure 2. The worker's sampling was a direct sample, and they did so by actively performing a task on the machine.

The interview questionnaire was utilised to collect the necessary data (Inthiyaz et al., 2021). The questionnaire was divided into three separate parts. The first part contained demographic information such as the individual's name, gender, age, weight, and height. The second part consisted of the worker's working history, which included details such as duration of employment, prior experience with the task, and the work itself. The third section deals with workers' own reports of how painful or uncomfortable certain tasks were for them after they had completed them (see Figure 3). After the preliminary survey was completed, the project team and the cooperators ranked the different jobs or tasks that needed to be done for the intervention (Meyers et al., 1997).

Figure 3: Self-report on perceived pain/discomfort experienced by workers after performed the tasks in the questionnaire.



## RESULT AND DISCUSSION

Table 1 provides a summary of the responses from the demographic survey. It was found that the average number of years of work experience was 7.91, and the ages of the workers ranged from 26 to 56 on average. With a mean age of 38 years old and a standard deviation (SD) of 9.80 years, the largest number of workers were between the ages of 30 and 39. There are men making up 55 percent of the workforce, while women make up 45 percent.

Table 1: Demographic information of the rice tray seeding machine workers included in the study.

Variables	Range	Mean	SD
Age (years)	26.00-56.00	38.00	9.80
Weight (kg)	49.00-100.00	67.36	17.17
Height (cm)	148.00-188.00	159.09	11.31
Experience(years)	5.00-15.00	7.91	5.20



At various points throughout the process, each task (T1, M1, S1, M2, and T2) was observed. Rice husk hopper 1, B and rice husk hopper 2, D both measure 130 cm in height. The height of the tray machine processing line, A, is 85 cm. The seed hopper, C, measures 145 cm. The mean height of the workers was 159.09, with a standard deviation of 11.31. Through observation and interviews, it has been determined that the worker experiences discomfort with the height of the hoppers while performing the task of refilling the hopper, as depicted in figure 4. To perform the task in a repetitive manner, they were required to lift their shoulders and arms or to place themselves on a chair or platform.

Figure 4: Workers performing task at seed hopper and rice husk hoppers.



Figure 5: workers performing task at tray feeding, tray stacking and delivery to pallet.



Additionally, the workers are required to perform repetitive tasks while sitting and standing. It is necessary for workers in the tray stacking area to lift a lot of five loading trays, each weighing ten kg, from the stacking station to the pallet and arrange them in the arrangement depicted in Figure 5.

A modest number of questions concerning the workers' perceptions of pain and discomfort in different parts of their bodies were asked during the interview as shown in Figure 3. 63.6 percent of workers reported experiencing lower back pain or discomfort. This occurred as a result of repetitive movements, including bending the body, lifting and stacking trays, medium, seed, and refilling seed and media hoppers (Janowitz et al., 2004). Pain in the shoulders, discomfort in the buttocks, and pain in the feet account for 9.1 percent of the total, while discomfort or pain in the legs was the result of 18.2 percent of the total. This was caused by standing for an extended period and moving from one station to another at the machine.

Table 1: Self-report pain and discomfort results.

Pain/Discomfort self report		Result (%)
Code	Item	
4	Left shoulder	9.1
5	Right shoulder	9.1
18	Lower back	63.6
19	Buttocks	9.1
24	Left leg	18.2
25	Right leg	18.2
26	Left foot	9.1
27	Right foot	9.1

## SUMMARY

Observation and interview show the worker is uncomfortable with hopper height when it being refilled. They either used a chair or a platform, or they performed shoulder and arm lifts repeatedly. Repetitive work requires standing and sitting. Workers move 10-kg loading trays from stacking station to pallet. Few questions about discomfort and pain were asked during the interview. Pain in the lower back was experienced by 63.6% of workers that Working with seed and media hoppers while bending, lifting, and refilling them. 9.1% of people reported experiencing pain in their shoulders, buttocks, and feet, while 18.2% reported experiencing pain in their legs. The delivery of pallet stacking trays and the refilling of mediums and seed hoppers are two of the most important repetitive tasks that need to be studied to reduce ergonomic risk factors and hazards.

## REFERENCES

- Hossen, Md. A., Shahriyar, Md. M., Islam, S., Paul, H., & Rahman, Md. M. (2022). Rice Transplanting Mechanization in Bangladesh: Way to Make it Sustainable. *Agricultural Sciences*, 13(02), 130–149. <https://doi.org/10.4236/as.2022.132011>
- Benos, L., Tsaopoulos, D., & Bochtis, D. (2020). A review on ergonomics in agriculture. part I: Manual operations. In *Applied Sciences (Switzerland)* (Vol. 10, Issue 6, pp. 1–21). MDPI AG. <https://doi.org/10.3390/app10061905>
- Meyers, J. M., Faucett, J., Tejada, D. G., Kabashima, J., Miles, J. A., Janowitz, I., Duraj, V., Smith, R., & Weber, E. (2000). High risk tasks for musculoskeletal disorders in agricultural field work. *Proceedings of the XIVth Triennial Congress of the International Ergonomics Association and 44th Annual Meeting of the Human Factors and Ergonomics Association, "Ergonomics for the New Millennium,"* 616–619. <https://doi.org/10.1177/154193120004402232>
- Sharifirad, M., Poursaeed, A., Lashgarara, F., & Mirdamadi, S. M. (2022). Risk factors for musculoskeletal problems in paddy field workers in northern iran: A community-based study. *Journal of Research in Medical Sciences*, 27(1), 77. [https://doi.org/10.4103/jrms.jrms\\_1024\\_21](https://doi.org/10.4103/jrms.jrms_1024_21)
- Inthiyaz M, Mishra J, Mohanty SK, Pradhan PL, Behera D (2021) Ergonomics of Manual Transplanting Operations with Female Workers in Eastern India. *J Ergonomics*.11:282.
- Meyers, J. M., Miles, J. A., Faucett, J., Janowitz, I., Tejada, D. G., & Kabashima, J. N. (1997). Ergonomics in Agriculture: Workplace Priority Setting in the Nursery Industry. *AIHAJ*, 58(2), 121–126. [https://doi.org/10.1202/0002-8894\(1997\)058<0121:eiawps>2.0.co;2](https://doi.org/10.1202/0002-8894(1997)058<0121:eiawps>2.0.co;2)
- Janowitz, I., Fathallah, F., & Meyers, J. M. (2004). Stoop and Squatting Postures in the Workplace. <https://www.researchgate.net/publication/245024978>