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Study on Physical Discomfort of Coconut Farmers of Odisha †

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Abstract: Hard work like climbing a tall coconut tree while balancing and stretching the whole body increases musculoskeletal discomfort and pain. Scratches, cuts and dermatitis problems cause serious health problems. Injury and accidents badly affect the human body, reducing farmers' productivity and quality of work. Sometimes, they are physically incapable of performing such work or die. Sometimes, disasters and environmental conditions have a negative impact on coconut farming. The main aim of this study was to calculate the discomfort level of coconut farmers in the coastal districts of Odisha using the QEC (quick exposure checkup) tool of Ergofellow 3.0.

Keywords: coconut farmers; discomfort; QEC; ergonomics

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1. Introduction

The marketing channels of coir have been found to be well established in the coastal areas of Odisha, with no major value addition being found by the players at any level. The joint promotion of coconut-based industries by the state's agriculture department, state's industry department, and Coconut Development Board has been suggested [1]. Karunakaran [2] suggested that the coconut farmers should be provided with more incentives by the government for the cultivation of coconut crops. The coir fiber-making process requires very hard work, which is generally conducted in a dusty and noisy environment, leading to health problems affecting coir workers that include respiratory problems, eye problems, and also some kind of muscular disorder like headache, back pain, hand pain, leg pain, and knee pain [3]. In [4,5], the authors found a lack of productivity and lack of interest as well as motivation on the part of agricultural workers for cultivation because of the insufficient and scarce generation of income.

Particularly during the plucking of coconuts and cutting of branches, the farmers have to climb the tall tree manually with the help of a rope, their legs, and their hands supporting the tree.

2. Research Methodology

Here, fifty-six coconut farmers aged 25 to 55 years were considered for a "Musculoskeletal Disorder Problems" assessment while climbing coconut trees in Odisha (India). All the selected small-scale farmers belong to the Khordha, Nayagada, Puri, and Paradip coastal districts of Odisha. The coconut farmers and climbers have expertise of 5 to 15 years. Later, Lehmann and QEC (quick exposure check) tests were performed by "ErgoFellow 3.0" software to find out coconut farmers' musculoskeletal discomfort level by analysing their body posture during climbing. Hence, all coconut farmers during climbing and plucking are studied. Among all workers, two workers (climbing and plucking coconut) were engaged for maximum (4 to 5) hours and around 20 to 25 trees were climbed by them every day. Hence, compared to other categories of jobs, the two workers (climbing and plucking coconuts) were observed to be carrying handwork. So, Lehmann was used to find the kcal lost by climbing and plucking (Figure 1a,b).

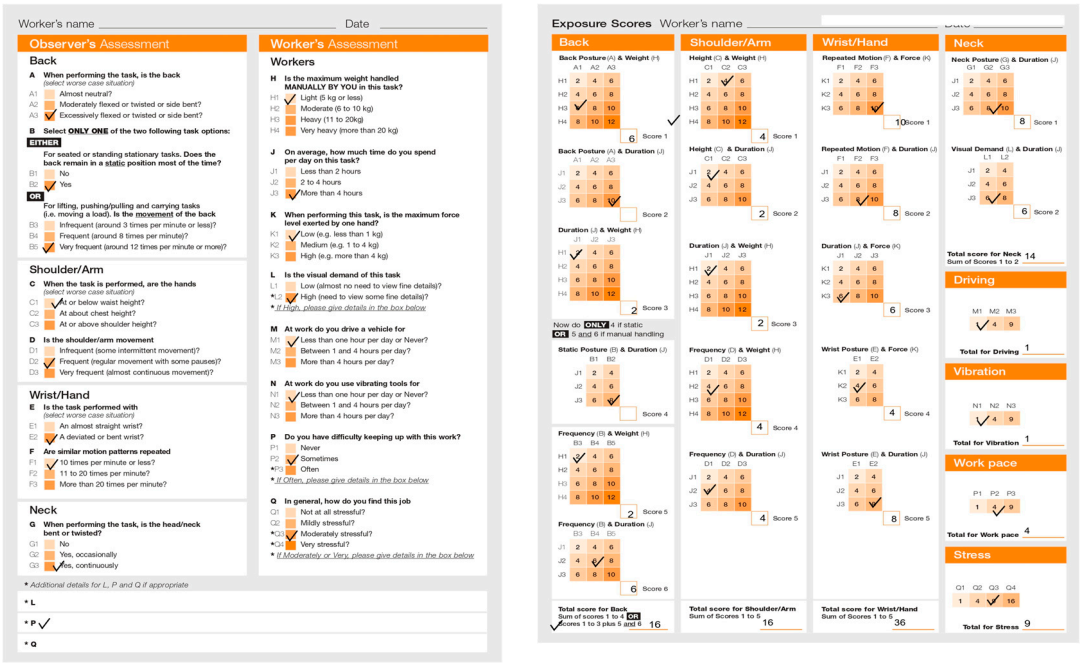


(**a**) (**b**)

Figure 1. (**a**) Image of plucking; (**b**) image of climbing tree.

3. Results and Discussion

Then, further analysis is conducted by a QEC (quick exposure check) using Ergofellow 3.0 software. The QEC tool was used to analyze Figure 1a (climbing) and Figure 1b (the plucking of coconuts). Figure 2a,b shows the QEC analysis of plucking and the score of plucking and Figure 3a,b shows the results for climbing.



(**a**) (**b**)

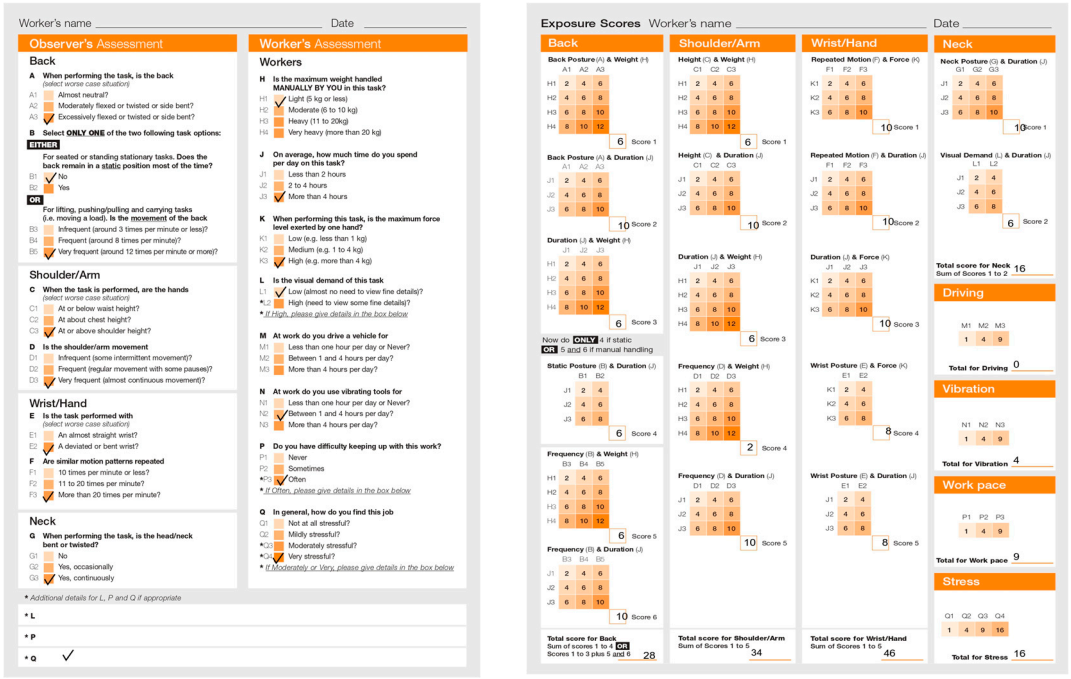
Figure 2. (**a**,**b**) show QEC analysis of plucking and score of plucking.

The total QEC score obtained from Figure 2 for plucking shows in Formula (1):

$$(16 + 16 + 36 + 14)/162 \times 100 = 44.44\% \quad (1)$$

The total QEC score obtained from Figure 3 for climbing shows in Formula (2):

$$28 + 34 + 46 + 16/162 \times 100 = 76.54\%. \quad (2)$$



(**a**) (**b**)

Figure 3. (**a**,**b**) show QEC analysis of climbing and score of climbing.

As per Brown and LI, a QEC score more than 40% means further investigation is required, below 40% means acceptable, and 50 to 69% means investigate further and change soon, but more than 70% means investigate and change immediately. The QEC score for plucking is 44.4%, which means further investigation is required, but the QEC score for climbing shows 76%, which means the farmer is at high risk; hence, action must be taken to investigate and change immediately. Further correlation analysis is conducted by taking the data for climbing.

4. Output for the Evaluations of Musculoskeletal Discomfort Level on Coconut Farmers during Climbing Operation

The "discomfort level" of agriculture farmers was considerable at $p = 0.05$, with more in "leg" then "Hand" and "back" (Table 1).

Table 1. Correlation of discomfort level and the associated parameters for farmers (Minitab).

Parameter	Correlation of Discomfort Level
Shoulder	0.464
Arms	0.536
Back	0.711
Hand	0.711
Leg	0.713
Feet	0.547

According to the QEC score, a modification of the design of coconut climbing devices/machines is essential, which can relieve farmers from MSD and pain and avoid accidents from falling.

5. Conclusions

In this study, based on the QEC score, climbing farmers were at a very risk and experienced discomfort. Hence, more research is essential for them to design a device for easier and less climbing effort. For plucking, ladder-like devices can also be used to

pluck coconuts and avoid accidents due to failure. The training of climbing and operating devices can reduce the frequency of accidents. Hence the government must take the initiative to help small-scale individual farmers by providing training for climbing or modern machinery at a subsidized rate.

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Informed Consent Statement: Consent of coconut farmers were taken before this study.

Data Availability Statement: No data is required in this study, pictures were taken from Nayagarha.

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