Optimization Of Women Labor In Tea Estate Through Ergonomic Study

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Abstract- *India's tea business depends heavily on the manufacture of tea powder, especially in Ooty. The production of tea powder has significantly increased by 30.7% from 2018 to 2023. This growth demonstrates the value of tea cultivation in the area.*

The important role that women workers play in tea leaf picking is one noteworthy component of the country's tea industry. The bulk of workers in the tea industry are women, and they play a significant part in picking tea leaves. The requirement for skilled women workers to complete this taxing operation is the main factor driving the demand for leaf tea plucking in tea estates. accuracy and aptitude. It is the most time-consuming task in the manufacture of tea, and it is completed by devoted people. These people are qualified to do this crucial operation since they have the knowledge and experience needed.

Keywords- Ergonomic, REBA, Parteo's law Brain Storming

I. INTRODUCTION

The project study is being conducted in India, which is the world's second-largest producer of tea and fourth-largest exporter of the beverage. The second-largest agro-based industry in India is the tea industry. About 23% of the world's total tea production, or 1322 million kg, was produced in India in 2017 (Tea Board of India, 2018). Ooty is blessed with excellent soil and agro-climatic conditions for growing tea. There are two methods for removing tea leaves from the plant: mechanical and manual. In 2018, Ooty produced 645.14 million kg of tea mechanically, which was close to 49% of all tea produced in India (Tea Board of India, 2018). Tea is a popular beverage in India. Manual plucking consists of vigorous hand movements performed repeatedly while tilting the neck and spine forward.

II. LITERATURE REVIEW

Literature review from the existing body of knowledge has provided the following:

The comprehensive summary of the previous research on the topic of optimizations of women in tea estate through study by using Pareto's Principle 80/20 method is summarized below. The problems and defects in the process are identified and analyzed which produces a proper solution for the process involved.

[1]. The Numerous steps can be performed to reduce these musculoskeletal complaints, including:
Ergonomic improvements: Setting up ergonomic workplaces with suitable seating, movable furniture, and instruments with ergonomic designs will assist lessen physical stress.

[2]. Women who work in tea plantations in Himachal Pradesh will need to have their work environment, tasks, and physical health evaluated as part of an ergonomic evaluation. Although I don't have access to current information on tea plantations or the exact conditions in Himachal Pradesh

[3].Occupational safety and health (OSH) is crucial for reducing the risk of work-related diseases and injuries and ensuring the wellbeing of employees in the green tea business. Here are some important factors for green tea workers' OSH .Ergonomics Chemical Exposure Machine Safety Work Environment Occupational Health Programs

[4]. Due to their working conditions, tea plantation workers are subject to a number of occupational dangers, including physical strain, exposure to dangerous chemicals, musculoskeletal illnesses, respiratory problems, and mental pressures.

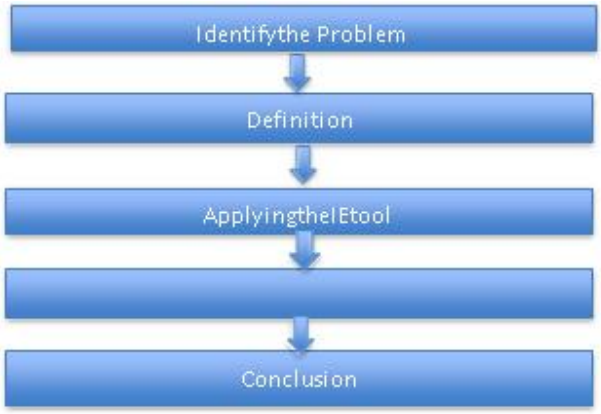
[5]. Chronic work-related musculoskeletal diseases (WRMSDs) of the distal upper extremity are a group of conditions that affect the hands, wrists, and forearms' muscles, tendons, nerves, and other tissues as a result of repetitive duties or unfavorable workplace ergonomics. These ailments can cause discomfort, a loss of strength or sensation, and restricted function. assessment and treatment of persistent WRMSDs

[6]. Ergonomics and environmental studies are essential for enhancing the working conditions for tea leaf pluckers and advancing environmentally friendly tea production. Tea plantations may improve employee wellbeing, lessen negative effects on the environment, and produce high- quality tea by

taking ergonomic concepts into account and putting them into practice.

[7]. It's crucial to remember that, in order to ensure accuracy and safety, such tests should only be carried out under the guidance of experienced experts, such as exercise..

III. METHODOLOGY



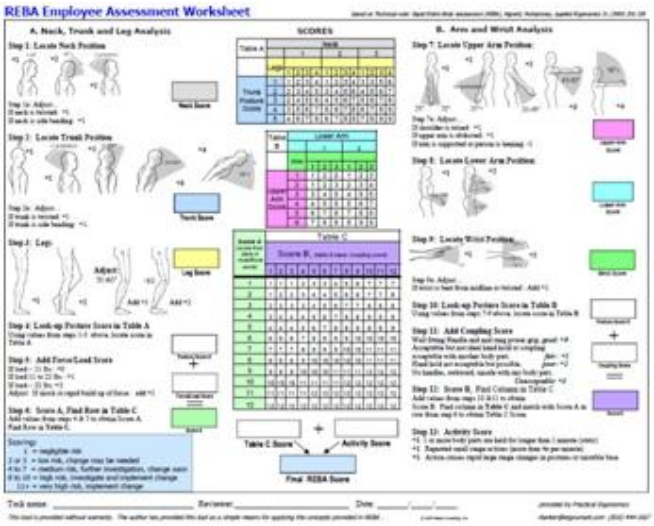
METHODOLOGY OF PROJECT REBA TOOL

The Rapid Entire Body Assessment tool employs a methodical methodology to assess the upper and lower musculoskeletal systems for potential biomechanical and MSD risks related to the employment task under consideration.

To assess necessary or desired body position, forceful exertions, type of movement or activity, repetition, and coupling, use the one-page worksheet.

The following goals guided the development of REBA:

1. To offer a basic posture analysis system that is attentive to musculoskeletal risks in various tasks.
2. To split the body into discrete parts for evaluation in relation to postures and movement planes.
3. To offer a grading system for muscular activity brought on by steady, unstable, dynamic, or quickly changing postures.
4. To take into account coupling as a significant factor in the handling of loads.
5. To provide a result at the action level that also conveys urgency.
6. To offer a simple, time-, effort-, and resource-efficient assessment tool.

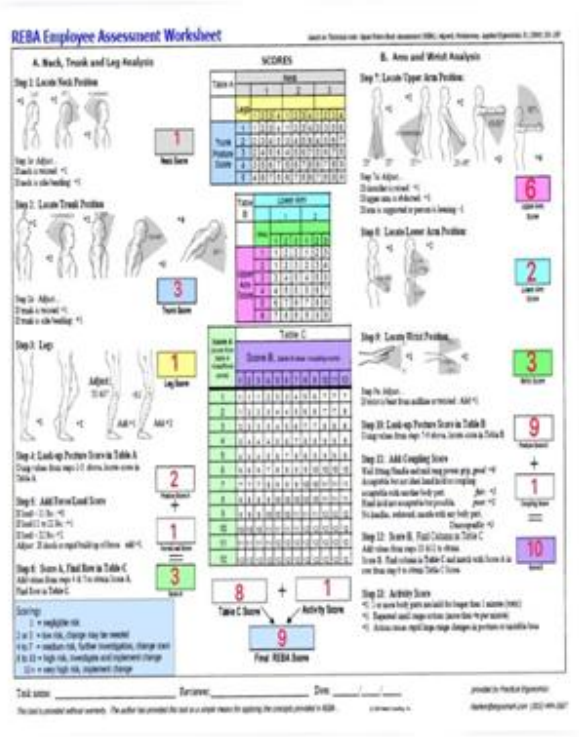


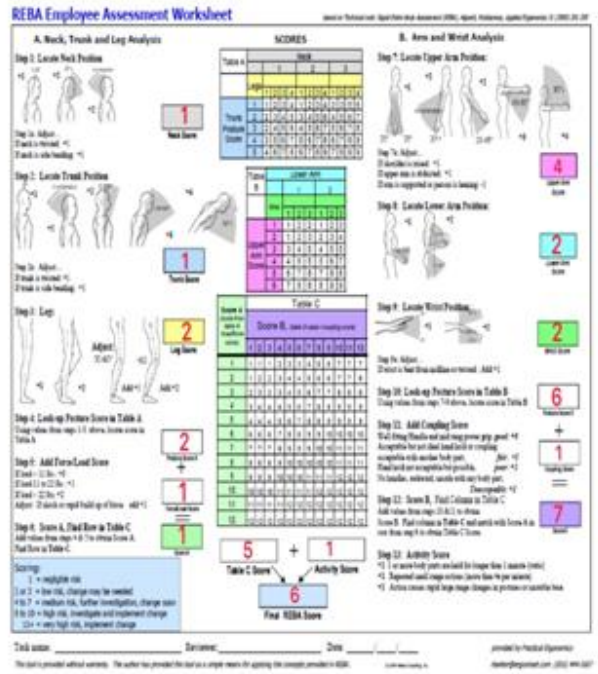
CUTTING POSTURE

Image 1

Image 2

EXPERIMENTAL SETUP





PARETO'S PRINCIPLE

The methodology includes that the problem definition which Ergonomic factors faced by women in Tea Estate According to Pareto's Principle, sometimes referred to as the 80/20 rule, roughly 80% of effects result from 20% of causes or inputs. Vilfredo Pareto, an Italian economist who noticed this trend in wealth distribution and discovered that roughly 20% of the people in Italy held 80% of the land, gave the idea its name.

Beyond economics, Pareto's Principle has been used in numerous situations and fields over time. It implies that the majority of results or outcomes in many circumstances are caused by a small number of inputs or causes. Here are a few instances from many fields where Pareto's Principle can be seen at action

Business: Approximately 20% of a company's clients or products account for 80% of the sales of that company. Similar to this, 20% of the consumers or products may be the cause of 80% of the issues or complaints.

Time management: Pareto's Principle, which states that 80% of results or productivity originate from 20% of the tasks or activities, can be used to time management. One can increase their efficiency by concentrating on the things that matter most and have the most impact.

Project management: It is frequently noted that 20% of a project's tasks or activities produce 80% of the project's value or progress. Project managers can enhance the performance of the entire project by identifying and prioritizing those crucial tasks.

WOMEN ROLE PLAY IN TEA ESTATE

SECTORS	GENDER	ESTATE 1		ESTATE 2		ESTATE 3	
		frequency	%	frequency	%	frequency	%
Land preparation	Male	88	51.4	92	21.7	83	51.6
	Female	12	5	8	16.5	17	5.8
	Both	25	42.5	12	61.6	14	42.8
Pruning of tea crop	Male	125	94.2	78	66.7	256	61.6
	Female	12	1.4	14	3.6	6	1.4
	Both	24	37	91	29.7	12	37
Taking of green leaf to buying	Male	46	6.5	91	66.7	24	6.5
	Female	12	36.2	4	3.6	98	36.5
	Both	23	57.2	41	29.7	154	57.2
Plucking of tea leaf	Male	12	8.7	21	15.2	19	8.7
	Female	26	35.5	27	19.6	100	35.5
	Both	18	55.8	86	62.2	158	55.8
Distribution	Male	34	13.8	6	20.9	38	13.8
	Female	07	15.2	21	12.3	42	15.2
	Both	12	71.0	111	84.3	196	71.0

Table 1

WOMEN ROLE PLAY AND INVOLVEMENT

Therefore women role play are classified and obtained in Gradually focused on several sectors mainly are collected and general frequency and obtained the data for three tea estate tabelated above and data are probably obtained

gardens.The sectors are mainly focused are by several factors overall percentage.

1. Land preparation
2. Pruning of tea crops
3. Taking of green leaf to buying
4. lucking of Tea leaf
5. Distribution

Mainly the project focuses on the women labor development

The 80/20 rule may not always represent an exact ratio, but the basic idea is the same: a small number of causes or inputs have a gradual growth and disproportionate influence on the results. Individuals and organizations can prioritize their efforts, resources, and time for optimal success by understanding and using Pareto's Principle

BRAINSTROMING TECHNIQUE

Examine concepts and programs that support female emancipation and enhance the standard of living for women employed on tea estates.

Programs for Developing Skills: Create career-focused training courses to help women become more proficient in fields including organic farming, entrepreneurship, tea processing, and packaging.

Give women training in marketing, communication, and financial literacy to help them launch their own firms or take part in value-added activities.

Encourage the establishment of a women's cooperative so that women may work together to process, package, and market tea. This will provide them more negotiating leverage and financial success .

For fair salaries and better working conditions for women, form relationships with businesses or consumers who are interested in promoting fair trade.

Resources and Access to Finance:

Partner with microfinance or financial institutions to offer low-interest loans, opportunities for savings, credit, and loans that are especially suited to tea estate women.

Facilitate access to resources needed for the production, processing, and sale of tea, such as land, tools, and machinery.

Wellness and Good Health:

Establish regular health fairs and education campaigns that focus on topics unique to women's health, such as nutrition, hygiene, and reproductive difficulties.

To assist working women and give their kids a secure and . nurturing environment, open a daycare facility or creche.

Reading and Education:

In order to improve women's access to knowledge, give them the power to make educated decisions, and generally improve their well-being, support literacy programs and adult education projects.

Create educational funds or scholarship programs to support the education of the offspring of tea estate workers, with a focus on women.

A powerful method for coming up with concepts and answers for various problems or projects is brainstorming. Although there is no inherent gender difference in brainstorming processes, some methods may be more advantageous for women, particularly in fostering inclusivity and making sure their opinions are heard. Here is a brainstorming method designed to promote active involvement and a variety of viewpoints:

Setting the scene for affinity brainstorming in

step one

Create a welcoming and secure environment where everyone feels appreciated and respected. Make it clear that all suggestions are welcome and will be given careful consideration.

Step 2: Identify the Problem

The problem or objective you wish to address during the brainstorming session should be stated in clear terms. Ensure that everyone engaged has a clear understanding of it.

Step 3: Generating Quiet Ideas

Silent concept generation should come first. Give every participant Give each person a specified period of time (e.g., 10-15 minutes) to record their thoughts separately on sticky notes or cards. Activate participants' innovative and expansive thinking

Step 4: Presenting Your Ideas

Invite people to take turns offering their ideas one at a time after the silence period. At this point, refrain from judging or criticizing; instead, concentrate on allowing everyone to openly express their ideas.

Clustering and grouping in Step 5

Create categories or clusters by combining related topics. Common themes and prospective areas of concentration can be found using this technique.

Step 6: Debate and Improvement

Promote free dialogue about the grouped concepts. Permit participants to expand on each other's ideas, pose queries, and look for clarification

Step 7: Prioritization or Voting

Use a fair electoral process (such as ranking or dot voting) to determine which concepts are the most well-liked or promising. This process aids in prioritizing the ideas that will be expanded upon.

Action Plan, Step 8

Create an action plan based on the suggestions with the most votes or the highest priority. Establish roles and deadlines for execution.

Step 9: Support and Follow-Up

Make sure that participants receive the assistance and materials they need to successfully execute the ideas they have chosen, and that progress is monitored.

By fostering an environment that is welcoming and encouraging, everyone will have an equal chance to contribute. Instead than focusing on the people giving the ideas, the quality of the ideas is the main concern. This strategy emphasizes teamwork and open communication, which can help any group, especially women, to take advantage of their unique viewpoints and strengths.

DISCOMFORT FACED

Following the day's work, the following table displays the the discomfort faced by women are examined totally respondents' overall scores of 5 on a scale of 5 (discomfort). It is critical to address these issues and establish

Eight individuals gave tea plucking a moderately heavy (3 point) and welcoming workplace environments for women in the seven subjects gave it a light (2 point) assessment, resulting in a range tea sector. The well-being and comfort of women

of pain scores between 2 and 3. Therefore, on a psychophysical level, engaged in tea leaf plucking can be improved by picking tea leaves was determined to be a work that was either light or assuring access to basic utilities, ensuring workplace fairly heavy. For pluckers between the ages of 35 and 45, safety, offering suitable training and protective Kishtwaria et al. (2004) observed a heavy and stressful workload. equipment, promoting gender equality, and improving The following table lists the participants' ratings of the subjects' workplace safety.

27 different body parts' discomfort on a 5-point scale. Subjects rated the neck as having the most discomfort (2.6), followed by the upper back (2.53), right wrist (2.53),

right upper arm (2.54), left wrist (2.47), lower back (2.47),

left shoulder (2.47), and midback (2.40). general discomfort felt in the neck

S.NO	BODY PARTS	PERCEPTION SUBJECT										Mean	SD
		1	2	3	4	5	6	7	8	9	10		
1	NECK	2	3	3	2	3	2	3	3	2	3	2.60	0.51
2	LEFT ELBOW	2	1	1	1	1	2	2	1	2	1	2.60	0.51
3	RIGHT ELBOW	2	2	2	2	2	2	2	2	2	2	2.20	0.51
4	LEFT WRIST	1	2	2	2	2	3	3	3	3	3	2.20	0.51
5	RIGHT WRIST	3	3	2	3	3	3	2	3	3	3	2.20	0.51
6	KNEES	3	2	2	3	3	2	3	3	3	3	2.60	0.51
7	ABDOMEN	3	3	2	2	3	3	3	3	2	2	2.30	0.51
8	LEFT HAND	2	2	3	3	3	3	3	3	2	2	2.30	0.51
9	RIGHT HAND	3	2	2	2	3	3	3	2	2	2	2.60	0.51
10	RIGHT SHOULDER	3	3	3	3	2	2	2	3	3	3	2.60	0.51
11	LEFT SHOULDER	3	2	2	3	2	3	3	3	3	2	2.60	0.51
12	HIP	3	3	3	3	2	2	3	3	2	2	2.60	0.51
13	THIGHS	3	2	2	3	1	3	2	3	3	2	2.60	0.51
14	ANKEL	2	3	2	2	3	2	3	3	3	3	2.60	0.51

Table 2

EXPERIMENTAL SETUP

The degree of discomfort that participants felt overall By using, the respondents were able to rate how much effort or discomfort they were feeling, which is useful for understanding how they felt.

The researchers were able to pinpoint particular body parts that were more prone to discomfort as a result of the working posture by gathering data on many different body locations.

The overall goal of this study was to measure the connection between working posture, felt exertion or discomfort, and the particular body parts impacted. The gathered information would offer perceptions into the ergonomic features of the workplace and maybe serve as a guide for enhancements to lessen discomfort and support better working conditions.

The main source of the body part discomfort was the repetitive hand movements in bending position when plucking while carrying the load of the basket with plucked tea leaves on the back. The comfort of female employees engaged in tea leaf plucking can be improved by adopting plucking gloves, which are projected to decrease finger injuries, increase the gripping power of fingers to tea leaves, and minimize the energy needed to separate leaves from the tea bush.

After the tea break, the employees begin plucking, which continues until the bamboo basket they are carrying is completely loaded with green leaves. The leaves must be transported to the weighing room by the female staff. Once the leaves have been weighed, the plucker takes a 45–60 minute lunch break. During the lunch break, the subjects' heart rates drop from the working heart rate level.

Tea leaf picking resumes after the lunch break. The subjects' heart rates start to rise once more, and they continue to rise steadily throughout the tea leaf plucking. The pluckers return to the weighing room at the end of the workday.

After that, each subject changes into their work attire, gathers their basket, umbrella, tiffin box, and

1.Time Interval adopted
2.Physiotherapy Exercise
3.Basket Usuage
4.Cutting Technique
5.Brainstroming

Analyze the duties that women employees in tea farm s perform, such as picking tea leaves, moving objects, using machines, or packing. Examine the tasks' physical requirements, duration, and repetition.

Examine how women employees move and hold themselves while performing their jobs. Examine whether the postures are long-lasting and whether they entail strong or repetitive actions that could result in musculoskeletal issues.

Examine the design and layout of the workstations, paying particular attention to the seating configurations, work surface heights, and equipment placement.

Make sure the workstations may be adjusted to accommodate the anthropometric traits of female employees.

Tools and Equipment: Examine the shears, baskets, and other equipment that women workers use, as well as any machinery. Take into account the handle, grip, and weigh

The repetitive hand movements in bending posture while plucking while carrying the load of the basket with plucked tea leaves on the back were the main cause of the body part discomfort. By using plucking gloves, which are anticipated to reduce finger injuries, boost the clutching power of fingers to tea leaves, and reduce the energy needed to separate leaves from the tea bush, the comfort of female employees involved in tea leaf plucking can be improved and continue to your home, which is referred to as a backward (return) excursion. When the plucker arrived home, he was instructed to unwind for 15 minutes.

SNO	BODY PARTS	PERCEPTION SUBJECT										Mean	SD
		1	2	3	4	5	6	7	8	9	10		
1	NECK	1	2	2	2	2	2	2	2	2	2	2.40	0.51
2	LEFT ELBOW	2	2	3	2	2	2	2	2	2	2	2.40	0.51
3	RIGHT ELBOW	2	1	2	2	2	3	1	2	1	2	2.40	0.51
4	LEFT WRIST	3	2	3	3	2	2	2	1	2	2	2.40	0.51
5	RIGHT WRIST	1	2	3	2	2	1	2	2	2	2	2.40	0.51
6	KNEES	1	3	3	2	2	2	2	2	2	2	2.40	0.51
7	ABDOMEN	2	2	3	2	2	1	2	2	2	2	2.40	0.51
8	LEFT HAND	2	2	2	2	1	2	1	2	2	1	2.40	0.51
9	RIGHT HAND	3	3	2	2	3	2	2	2	1	3	2.50	0.51
10	RIGHTSHOULDER	2	2	2	2	2	2	2	2	2	3	2.50	0.51
11	LEFT SHOULDER	2	2	2	2	3	1	1	1	2	2	2.50	0.51
12	HIP	2	3	2	2	1	2	2	2	2	2	2.50	0.51
13	THIGHS	3	2	3	3	3	2	2	2	2	2	2.50	0.51
14	ANKEL	1	3	1	2	2	2	2	1	2	2	2.50	0.51

Table 3

IV. SCOPE OF WORK

This project describe the discomfort factor faced by women in tea estate while Plucking of the leaf and their routine work postures and also by which it can be implemented over data resolving technique .

V. RESULT

Therefore the above project examine the discomfort faced by women in tea leaf plucking and innovative ideas have been given at its working concepts are also developed for various changing factors and ergonomic concepts are deeply developed in the project visualising

VI. CONCLUSION

The ergonomic assessment of tea leaf plucking by representative female workers in an Indian tea garden managed by a private enterprise found that it is light to moderately heavy work. The workers felt the most pain in their necks, wrists, backs, and upper arms as a result of the repetitive hand movements that come with bending over and carrying a basket of freshly picked tea leaves on the back. Implementing ergonomic solutions, such as reducing the amount of picked tea leaves carried in the basket and ensuring enough rest during the workday, can lessen the work-related stress experienced by female workers.

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