



# Skill, Abilities and Competencies Implicated in Tasar Reeling Practices: Quantification through Time Study and Work Measurement

Kiran Malali B<sup>1\*</sup>, Nanjunda Shastry<sup>1</sup>, Subas Naik<sup>1</sup> and Gokarneshan N<sup>2</sup>

<sup>1</sup>Central Silk Technological Research Institute, Central Silk Board, Bangalore, India

<sup>2</sup>Department of Costume Design and Fashion, Dr. SNS Rajalakshmi College of Arts and Science, Coimbatore, India

## Abstract

Silk production is largest generator of rural employment in India. Tasar culture is a forest based activity uniquely suited to the economy and social structure of central India. On an average 250 crore number of cocoons are solely harvested in India to achieve 2,980 MT of Tasar Silk. Particularly Tasar Reeling process is a dependant community livelihood activity predominantly adopted by tribal women folk to support their family. Skill capitalizes the entire conversion process particularly in the area of cocoon cooking, deflossing and reeling - an inherited proficient means of extracting silk from cocoons. An attempt to document and quantify the inherent skill, ability and competencies of traditional Tasar reelers was made through time study and work measurement approach. The reeling exertion was split into small units called 'elements', are timed and analyzed to determine standard and normal time by adopting Westinghouse system of performance rating. Simultaneously feedback on posture implications, stress related concerns, reeler's general health & hygiene were discussed for wider prospective of Tasar reeling activity.

**Keywords:** Casting; Cocoon cooking; Deflossing; Denier; Khaan; Reel ability; Thigh reeling

## Introduction

Out of 31,906 MT of total silk produced in India, contribution of 2988 MT comes from Tasar sector. Tasar culture is a forest based activity suited to the economy and social structure of central and eastern Indian regions. Tribals involve predominantly in Tasar culture as a part of tradition and for remunerative income. Tasar silk as a textile fiber has uniqueness for its natural rusty color and exclusive handle value. Commercially reelers go for soap and soda method to soften cocoons and adopt thigh reeling process for production of Tasar silk. Productivity average of 85 grams/reeler confines daily income to less than 100. Usage of cocoonase by Prasad et al. [1-3] for cocoon cooking was investigated and established. Thigh reeling, the conversion process corroborated by Kiran et al. [4] elaborates on posture which constrains reelers with fatigue and highlights the importance of hereditary skill attributing factors [5] averred that, work study is a management tool that can be applied in production formulation. Its essence lies in seeing operations done procedurally, in the best way possible, timorously and by the most skilled individual. Work study improves an entity's competitiveness and the entire production process through techniques that optimize production [6-8] also opined that work study results in increased production by improving efficiency, workflow, work layout and the time standards that are applied in the processes involved. With the objective of component quantification of skill, abilities and competencies involved in traditional Tasar reeling practices, this case study was commenced covering important traditional reeling clusters of Odisha state.

## Material and Methods

The task of Tasar reeling activity was divided conveniently in to sub activities and elements. The timings of each element were recorded using modern contrivances like camcorder, stopwatch and scales. The study covered representation of two major reeling clusters covering ten traditional women reelers in the age range of 22 to 55 years for five continues days. Primary data including reelers name, age, family back ground, cocoon cooking recipes followed and hands-on experience were ascertained. Entire production process was recorded and analyzed for the following facts. The

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### \*Correspondence:

Kiran Malali B, Central Silk Technological Research Institute, Central Silk Board, Bangalore, India, E-mail: kiranbmalali@gmail.com

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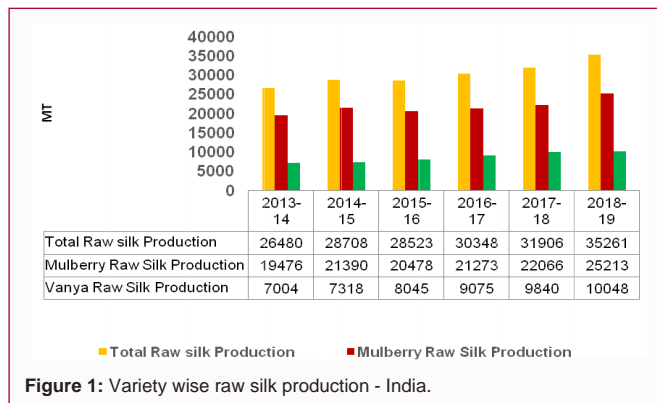
**Table 1:** Westinghouse Performance Rating Table.

Effort Ratings		
+0.13	A1	Excessive
+0.12	A2	Excessive
+0.10	B1	Excellent
+0.08	B2	D
+0.05	C1	Good
+0.02	C2	Good
0.00	D	Average
-0.04	E1	Fair
-0.08	E2	Fair
-0.12	F1	Poor
-0.17	F2	Poor
Condition Ratings		
+0.06	A	Ideal
+0.04	B	Excellent
+0.02	C	Good
0.00	D	Average
-0.03	E	Fair
-0.07	F	Poor
Consistency Ratings		
+0.04	A	Perfect
+0.03	B	Excellent
+0.01	C	Good
0.00	D	Average
-0.02	E	Fair
-0.04	F	Poor
Skill Ratings		
+0.15	A1	Super skill
+0.13	A2	Super skill
+0.11	B1	Excellent
+0.08	B2	Excellent
+0.06	C1	Good
+0.03	C2	Good
0.00	D	Average
-0.05	E1	Fair
-0.1	E2	Fair
-0.16	F1	Poor
-0.22	F2	Poor

silk yarn produced was also assessed for quality consistency.

### Time Study

Duration of the principal task depends on several factors, such as its nature (simple or complex), operator fatigue or stress, properties of material being handled and devices and working environment etc. [9]. To arrive at approximate real process time of a task, entire process was recorded covering all the ten reelers for successive three days using camcorder. Time study was conducted using a stop watch by measuring each element operation and were recorded. Time readings are arrived for every worker during different periods of the day and



**Figure 1:** Variety wise raw silk production - India.

were averaged. The cycle time or the observed time is converted to normal or basic time by multiplying it with the operator performance ratings using the standard Westinghouse performance factors. This system considers four factors: (a) Skill (b) Effort (c) Condition and (d) Consistency. The actual timings are compared and matched with one of the ratings in each of the above four factors, which are summed up for finding total ratings depending on each of the case. This is added (or subtracted) to unity to find the rating factor percentage. On multiplying the actual (observed) time with performance rating factor, to arrive at normal or basic time. The standard time is then calculated by adding the allowances of 9% (as per ILO) to the normal time (Table 1).

### Results and Discussion

The findings of this case study reveals the intricacies involved in the process of thigh reeling - the process of converting cocoons in to value added Tasar silk. Out of the eight identified elements under the job of thigh reeling, E1, E2 and E4 elements are considered as most vital and significant as they encompass skill, abilities and the transformed proficiency - competencies. It is apparent from (Figures 1-4) and the results that, these E1, E2 and E3 elements have direct bearing on productivity and the entire process gets attenuated with the age factor over the years i.e. the adopted and inculcated skills at the younger age gets transformed in to competency, results in optimized productivity. It is also evidenced from (Figures 1-4) that, the age factor has direct bearing on E4 element - Filament finding and cocoon casting, critically influencing capabilities and commitments of reeler. It is evidenced that, E4 element have direct impact on yarn quality. It is established that, reeler's increasing age and the attributes like visionary setbacks and general health disorders have direct



**Figure 2:** Tasar Thigh Reeler.

**Table 2:** Determined values for individual work elements [Job].

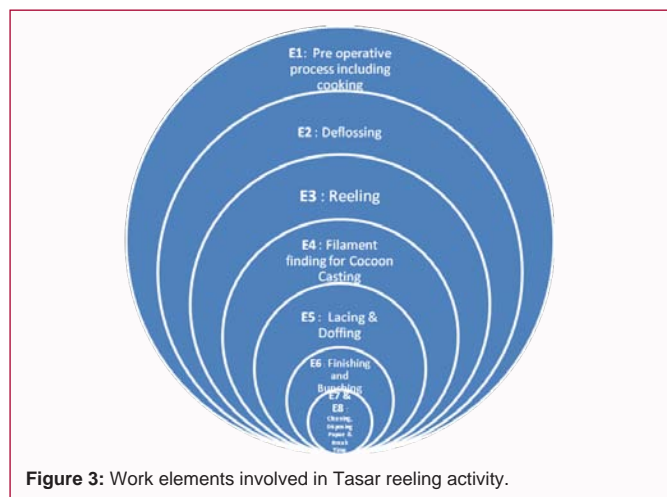
**Table 2a:**

Task Description [Element Name] in Minutes.	
E1: Pre operative process including cooking	E5: Lacing and Doffing
E2: Deflossing	E6: Finishing and Bunching.
E3: Reeling	E7: Cleaning and Disposing Pupae
E4: Filament finding for Cocoon Casting	E8: Break includes lunch, rest & Nature call etc

**Table 2b:**

Reelers Name	Age	E1	E2	E3	E4	E5	E6	E7	E8
R1 Gopalpur	22	74.3	54	223	73.3	10.7	8.7	10.3	65
R6 Fakirpur	24	71.3	46.7	243.3	81.7	8	8.7	10	66.7
R7 Fakirpur	35	63.3	37.7	200	75	9.3	10.7	10.7	75
R8 Fakirpur	36	56.7	36.7	185	65	5.3	9.3	8.7	61.7
R2 Gopalpur	38	62.7	40.7	241.7	100	10	8.7	8	80
R3 Gopalpur	40	66.7	44.7	245	106.7	9.3	9.3	10	85
R9 Fakirpur	45	70	41	258.3	96.7	9.3	10	8.7	88.3
R10 Fakirpur	50	63.3	48.3	246.7	141.7	11.7	11.7	10.7	123.3
R 4 Gopalpur	52	63.3	40	241.7	113.3	14	12.3	12.3	115
R5 Gopalpur	55	65	46.7	235	145	10	10.7	10	100
Performance rating factor in %		120.8	126.8	126.9	117.9	121.6	125.4	130.5	127.3
Average Observed time		65.7	43.6	232	99.8	9.8	10	9.9	86
Normal Time=Observed time` Rating factor		79.33	55.33	294.4	117.7	11.88	12.54	12.96	109.5
Standard Time (Assuming allowance 9%)		87.17	60.8	323.5	129.3	13.05	13.78	14.25	120.3

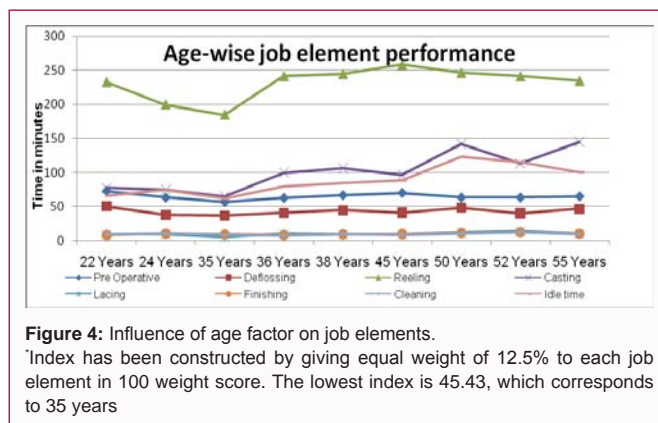
- Average production was recorded in the range of 85 to 96 grams/10 hours/Reeler.
- Average yarn denier 77.6d.
- Average weight of winding device was app. 380 grams.
- Average length of yarn produced was in the range of 10,250 to 10,800 meters.
- Right hand movements [Clock wise with thumb pressure] 29,000 to 29,500 times/Day.
- Synchronized left palm moments/Meter of yarn were in the range of 2.8 to 3.0 times.
- Average reeling speed 20 to 22 meters/minute.



**Figure 3:** Work elements involved in Tasar reeling activity.

bearing on yarn quality and productivity. Gradual increase in age over 50 years, restrain productivity and also append physical ailments such as back pain, osteoporosis and vertebral fractures etc.

The results in (Table 2a, 2b) clearly indicate that all most all the reelers covered under this case study perform well within the standard time - peak performance being at the age range of 35 to 36 years exhibiting inherited - inculcated proficiency skills. Since thigh reeling is only the accessible livelihood activity - attributing factors



**Figure 4:** Influence of age factor on job elements.

Index has been constructed by giving equal weight of 12.5% to each job element in 100 weight score. The lowest index is 45.43, which corresponds to 35 years

such as inherited talent, passion, contentment, painstaking mind-set, occupational reverence, attitude, eagerness to earn, supporting needs, opportunities, sentiments etc have a great command over the entire reeling process, which is evidenced by the sizeable difference between observed and standard time.

### Conclusion

These inputs become point of reference in evolving appropriate technology for reeling Tasar cocoons as well as for designing customized device reassuring improved productivity thus assuring higher income for thigh reelers. Observations on reeler’s physical

ailments and surveillance covered under this case study will help in understanding the intricacies and impediments involved in thigh reeling process, to formulate and strengthen capacity building programs to keep the reeling activity alive. Thereby giving scope for technocrats to explore and enlarge technology packages to strengthen prospective augmentation of reeling activities to meet the increasing demand for Tasar silk.

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