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Present status and prospects of sericulture in the state of Odisha

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Abstract
There are more over 40 countries in the world that practice sericulture and among them, India occupies the second position after China in the production of raw silk. India is unique in the production of silk being the only country in the world that produces 5 different types of silks namely Mulberry, Tropical Tasar, Oak Tasar, Eri, and Muga. India has an 18 percent share in global raw silk production and it is also a great consumer of raw silk and silk fabrics. The high-cost labor, heavy industrialization, and the climatic restrictions imposed on the mulberry leaves' availability are responsible for the decline in the sericulture in temperate countries like Japan, South Korea, the USSR, etc., which in turn, allows the yield of only two crops per annum. However, in India, the prevailing tropical climate helps in practicing sericulture throughout the year and also yields a stream of about 4– 6 crops per annum. In Odisha, there are about 15,000 traditional families who are involved in silk rearing, and about one lakh people actively practice sericulture which provides indirect employment to an equal number of reelers, spinners, and weavers.

Keywords: sericulture, agro-industry, global raw silk production, silk rearing, status of sericulture

Introduction
Sericulture may be defined as the phenomenon or the process of raising the food plants for the silkworm for the production of silk. It can also be stated as an overall process that includes breeding and rearing of silk moths for the production of cocoons, reeling of yarn from the cocoon, and weaving of the yarn into fabric (Dash *et al*, 2018). Sericulture is a traditional, natural resource or agro-based cottage industry which requires little knowledge and expertise, requires a large expenditure of labor that help in providing profitable income source to the tribal poor in a large scale that helps in the improvement of the socio-economic status of large farming country like India (Dash et al, 2018). Almost 60 lakh people are engaged in different sectors of sericulture and it was estimated that about 11 men are engaged per day per kg of cocoon production i.e., in both on-farm and off-farm activities showing that it provides a large employment value to the rural peoples which in turn improves their livelihood (Pateriya, 2021). The different natures of silk-like unparalleled grandeur, natural sheen, and inherent affinity for dyes, high absorbance, lightweight, soft touch, and high durability make it knows as the "Queen of textiles" all over the world (Bukhari and Kaur, 2019).

There are more over 40 countries in the world that practicing sericulture but among them, India occupies the second position after China in the production of raw silk but India is unique in the production of silk being the only country in the world that produces 4 different types of silks namely Mulberry, Tasar, Eri, and Muga. A total of 86.5% of silk is produced as mulberry silk and the rest 13.5% is the production of non-mulberry silk (Dash *et al*, 2018). The list of some major mulberry silk-producing states of India are Karnataka, Andhra Pradesh, Tamil Nadu, Jammu & Kashmir, and West Bengal, and the non-mulberry silks are produced in the states of Jharkhand, Chhattisgarh, Orissa, and north-eastern states. The major Eri and Muga silk-producing states are Assam, Meghalaya, and Manipur. The present paper throws light on the development and the growth rate of the raw silk productivity in recent years in Odisha. It also highlights the plantation rate that's suitable for the sericulture and also the improvement of livelihood of the farmers.

History of Sericulture in India
According to history and tradition, sericulture was first originated in China as early as 2640 BC and is introduced by the queen of China, Hoshomin. For a long time, the Government of China considered sericulture as a national secret and it was unknown for the other countries as an industry (Ravikumar A, 2011). The knowledge of silkworms and its product reached Japan through Korea in the 3rd century AD and later into Europe (Bukhari and Kaur, 2019). According to the reports, about 400 years back the sericulture was introduced into India and till 1857 this industry was first flourished as an agro-industry with an annual production of two million pounds of silk fiber. During the period of 1857- 1895, this industry has survived the onslaught of Pebrine disease. After 1928, due to the fierce competition from advanced sericulture countries like Japan, China, and other European countries, there is a decline seen in the sericulture industry. But again, after the independence, this industry started flourishing as an agro-industry and it also helps in giving employment to over 7 million people in the country (Ravi kumar A, 2011).

History of sericulture in Odisha
According to the historical research, the Tamralipta port of Odisha is famous for the export of China and India silk goods to Egypt and Rome through the sea route by both direct as well as transit trade and this trade relationship between Odisha and Rome is justified by the remnants of Sisupalgarh and through the description of Chinese visitor Huen Tsang to Odisha. Later Romans learned the art of

sericulture from China which results in the end of the trade relationship between Odisha and Rome from around the 6th century. Several archaeological pieces of evidence that include lithographic recordings, palm leaf inscriptions, remnants of ancient structures, etc., and also the culture, tradition, and festivals observed by the present inhabitants recalling the glorious past are the proofs that Odisha had a fabulous wild silk thread long ago (Dash *et al*, 2018). The princely state of Mayurbhanj is considered to be the origin of Tasar sericulture in Odisha which received Royal patronage from the Bhanja dynasty (640- 1952 AD) (Dash *et al*, 2018; Sahu, 2015). Then it started spreading all over India and also the tribal peoples of many districts of Odisha like Mayurbhanj, Keonjhar, Sundargarh, Dhenkanal, Angul, Deogarh, Sambalpur, Jajpur, Boudh, Sonepur, and Nuapada have practiced this technique. According to the folklores and palm manuscripts of Odisha, the Tasar cocoons were collected by the Adivasis (tribal people), then it was processed by the Patras (weavers) and are then traded by the sadhabas (traders) who're traveled overseas for their trade (Dash *et al*, 2018).

According to Thomas Wardle's "wild silk of India (1880)" about 3.3 MT of Tasar was produced in the Sambalpur area and it was reported that the Modal race contributes the best cocoons. In 1910, according to the Bengal District Gazetteers, the tasar rearing was the traditional occupation of many forests dwellers and in Bonei, Bamra, Dhenkanal, Gangapur, Mayurbhanj, Narsinghpur, Nilgiri, Pal lahara, Rairakhol, and Sonepur area it is considered as one of the main Minor Forest Produce (MFPs). The mulberry sericulture in Odisha was introduced with the establishment of Mulberry Demonstration Firms (MDF) during the sixth five-year plan. During the 1940s, the former Bihar- Odisha Government introduced Eri silk culture in Odisha and was practiced by the tribal peoples of Odisha as a part of their occupation for a source of their income generation (Dash *et al*, 2018).

Status of Sericulture in India

Sericulture continues to play a major role in the economic development of various countries. In 2018, the International Sericulture Commission mentioned a list of major silk-producing countries that includes China, India, Uzbekistan, Brazil, Japan, the Republic of Korea, Thailand, Vietnam, DPR Korea, and Iran. Few other countries like Kenya, Botswana, Nigeria, Zambia, Zimbabwe, Bangladesh, Colombia, Egypt, Japan, Nepal, Bulgaria, Turkey, Uganda, Malaysia, Romania, Bolivia, etc. are also practicing cocoon production and raw silk but in very small quantities. India holds the second position in the world after China and has an 18 percent share in the global raw silk production (CSB, 2013), and is also a great consumer of raw silk and silk fabrics. The high-cost labor, heavy industrialization, and the climatic restrictions imposed on the mulberry leaves' availability are responsible for the decline in the sericulture in temperate countries like Japan, South Korea, USSR, etc., and in turn, allows the yield of only two crops per annum. However, in India, the tropical climate helps in practicing sericulture throughout the year and also yields a stream of about 4- 6 crops per annum (Bhattarcharjya *et al*, 2021). The performance of sericulture in India is given in the Table no.- 1.

The tropical environmental regions include Karnataka, Tamil Nadu, Andhra Pradesh, West Bengal, and the temperate regions includes Jammu and Kashmir who traditionally practice sericulture. More than 80% of the total area of these five-silk-producing states are under Mulberry cultivation and account for about 97% of total raw silk production in the country. India is the only country having a unique distinction of being producing all the five kinds of silk namely, Mulberry (*Bombyx mori*), Eri (*Philosamia ricini*), Muga (*Antheraea assamensis*), Tropical tasar (*Antheraea mylitta*), and Temperate Tasar (*Antheraea proylei*). Among them, the most popular variety is mulberry silk, that contributes around 79% of the country's silk production (Bhattarcharjya *et al*, 2021). The state wise production of raw silk during 2017-18 to 2019-20 and current financial year 2020-21 (Till December- 2020) are given in the Table no.-2. Among the five varieties of silk produced in 2019-20, Mulberry accounts for 70.47% (25239 MT), Tasar 8.75% (3136 MT), Eri 20.11% (7204 MT), and Muga 0.67% (241 MT) of the total raw silk production of 35820 MT. (CSB note, 2020- 21) The establishment of the central silk board Bangalore helps in increasing the trend of sericulture. Therefore, sericulture is not restricted to the traditional states only but now sericulture is showing an increasing trend in non-traditional states as well. Except for mulberry, all other varieties of silks are generally known as Vanya silks (Bhattarcharjya *et al*, 2021). The quantity and the value of raw silk imported during 2017-18 to 2019-20 and the current financial year 2020-21 (till December 2020) is given in the Table no.- 3 and the export values are given in the Table no.- 4.

Status of sericulture in Odisha

Three types of silks are cultivated in Odisha that is Mulberry, Tasar, and Eri and all these types of silk differ in their food plant, duration of the life cycle, quality of cocoon, and yarn i.e size, weight, texture, color, strength, etc. (Dash *et al*, 2018; Sahu, 2015). In rural sections of Odisha, silk cultivation has a huge potential to generate employment opportunities on a massive scale. Here, sericulture is a livelihood activity that goes around the year and provides remunerative income to the farmers. In Odisha, there are about 15,000 traditional families who are involved in silk rearing and about one lakh people actively practice sericulture providing indirect employment to an equal number of reelers, spinners, and weavers. At present, tribal and some non-tribal people under the BPL category are practicing sericulture and producing silk cocoons with the support of the Government of Odisha. There are four major identified eco-races found in Odisha as Modal, Laria, Daba, and Sukinda out of which Modal and Laria are wild eco race *Antheraea paphia*, whereas Daba and Sukindadaba are semi-domesticated eco-races of *Antheraea mylitta* D (Dash *et al*, 2018). The activities taken under Tasar sector is given in the Table no- 5 and the activities taken under Eri and Mulberry sector is given in the Table no. 6.

Tasar

Odisha has a rich heritage of Tasar culture. In 1952, Tasar culture was first started in Odisha by the princely state of Mayurbhanj under the Royal patronage of the Bhanja dynasty (Sahu, 2015). Odisha holds the third position in Tasar production in India, contributing 107 MT of Tasar in 2015-16 (Dash *et al*, 2018). In different parts of northwest Odisha, namely Keonjhar, Mayurbhanj and Sundargarh districts, Tasar rearing is one of the important traditional

occupations of indigenous communities which produce 90 percent of the total Tasar production in the state. There is more no. of the scheduled cast and scheduled tribe families practicing Tasar culture in fourteen hilly districts of Odisha such as Mayurbhanj, Balasore, Keonjhar, Sundergarh, Deogarh, Anugul, Jajpur, Boudh, Sonepur, Kalahandi, Nuapada, Nawarangpur, etc. The number of Tasar reeling cocoons produced in Odisha during 2019-20 is 1303.34 Lakhs (Odisha Economic Survey, 2020).

Eri

Eri silk moth rearing was introduced in Odisha by the erstwhile Bihar-Odisha Government during the 1940s, with the establishment of an institute at Bhagalpur (Bihar). In 1957, there were four eri rearer co-operative societies viz. Sidhal, Dampara, Bhandal, and Indupur in Cuttack district. Three eri seed stations were established by the Government of Odisha at Patangi, Khurdha, and Chandaka. In Odisha, now there are three seed stations, thirteen eri centers, and one eri co-operative society is devoted to ericulture (Sahu, 2015). Eri culture is also traditional in Odisha, but enough importance had not been given earlier for its growth (Dash *et al*, 2018). This type of silk is well known as "Ahinsa silk" as in other sericulture the pupae is not killed, as the yarn is spun after the emergence of the moth (Sahu, 2015). According to the suitability of the climate and the possibilities of adaptation of eri- culture to commercial basis, it is practicing in fourteen districts of Odisha i.e, Cuttack, Kendrapada, Jagatsinghpur, Nayagarh, Khurdha, Dhenkanal, Anugul, Sambalpur, Keonjhar, Kalahandi, Koraput, Rayagada, Gajapati, Phulbani, and Sundargarh (Dash *et al*, 2018; Sahu, 2015). During 2019- 20, about 1173 acres of the area was planted with Castor plants, and about 5.1 MT of raw silk was produced (Odisha Economic Survey, 2020).

Mulberry

Mulberry sericulture was introduced during the 8th plan. During the year 1986-87, a special Bivoltine Sericulture Development Project (BSDP) was implemented in the undivided Ganjam district, in R. Udayagiri and Mohana block covering Chandragiri, Chandiput, and Ramgiri areas, and subsequently, National Sericulture Project (NSP) was launched in Koraput district (Sahu, 2015) Mulberry sericulture is a non-traditional activity for Odisha. It is practiced in twelve districts of Odisha such as Gajapati, Rayagada, Koraput, Phulbani, Kalahandi, Sonepur, Deogarh, Sambalpur, Nayagarh, Khurdha, Keonjhar, and Mayurbhanj (Dash *et al*, 2018; Sahu, 2015). During 2019-20 about 68 acres of the area was planted with Mulberry plant and the total raw silk production is 2.12 MT (Odisha Economic Survey, 2020).

The total raw silk production in Odisha is 137.55 MT in which Tasar position is highest i.e., 130.33 MT, Mulberry silk produced in very low amount. It is seen from the table that Tasar accounts for 94.76%, Eri and Mulberry account for 3.70% and 1.54% respectively (Odisha Economic Survey, 2020)

Discussion

Along with India, Odisha is also unique in the production of three varieties of silk that include Tasar, Eri, and Mulberry. In Odisha, the suitable climate and also the participation of the cooperative sector helps in increasing the trend of sericulture. Sericulture is considered the most appropriate labor-intensive agro avocation which is best suited for the economic development of the rural and tribal people belonging to BPL category. Various measures can be taken for the development of the sericulture that may include the establishment of the proper storage system, the establishment of the proper marketing system, more awareness program should be organized that provide the rural people that should include seminar or training or demonstration programme for the prophylactic measures to prevent disease and also disease management, district-wise skill development programme for pre and post cocoon sector and provision for advance technologies, organizing plantation programme of the host plants, training and motivate the farmers for the increasing the development of the sericulture and also their economic status, etc. All these measures will also act as a major factor for the protection of our culture, heritage, and socio-cultural values. Sericulture has been identified as a promising tool for poverty alleviation with increasing employment opportunities and a great contributor to the state GDP.

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Table 1: Performance of Sericulture Sector (India)

Particulars	2015-16 Achmnt.	2016-17 Achmnt.	2017-18 Achmnt.	2018=19 Achmnt.	2019-20 Achmnt.	2020-21	
						Target	Achmnt. (Apr- Dec. 2020)
Mulberry Plantation (Lakh ha.)	2.09	2.17	2.24	2.35	2.39	2.54	2.47
Raw silk Production: (in MT)							
Mulberry (Bivoltine)	4613	5266	5874	6987	7009	8375	4556
Mulberry (Cross breed)	15865	16007	16192	18358	18230	19125	11842
Sub Total (Mulberry)	20478	21273	22066	25345	25239	27500	16398
Vanya (in MT)							
Tasar	2819	3268	2988	2981	3136	3740	1156
Eri	5060	5637	6661	6910	7204	7500	6273
Muga	166	170	192	233	241	260	202
Sub Total (Vanya)	8045	9075	9840	10124	10581	11500	7631
Grand Total	28523	30348	31906	35468	35820	39000	24029

(**Source:** CSB, 1st Jan 2021)

Table 2: State-wise raw silk production during the Last 3 Years (2017-18 to 2019-20) and Current Financial Year 2020-21 (till December-20) in MT. (In India)

Sl. No.	State	2017- 2018		2018- 2019		2019- 2020		2020- 2021	
		Target	Achmnt.	Target	Achmnt.	Target	Achmnt.	Target	Achmnt. (P) (Apr- Dec- 20)
1	Karnataka	11120	9322	10750	11592	12000	11143	12600	8483
2	Andhra Pradesh	6090	6778	7805	7481	7946	7962	8208	5520
3	Telangana	160	163	200	224	295	297	310	166
4	Tamil Nadu	2000	1984	2190	2072	2300	2154	2300	1206
5	Kerala	12	15	14	16	20	13	17	5
6	Maharashtra	328	373	415	519	630	428	475	285
7	Uttar Pradesh	300	292	340	289	365	309	354	179
8	Madhya Pradesh	230	103	160	100	165	61	80	28
9	Chhattisgarh	405	532	670	349	562	480	535	248
10	West Bengal	2590	2577	2775	2394	2900	2295	2520	298
11	Bihar	85	63	95	55	86	56	58	0
12	Jharkhand	2774	2220	2658	2375	2604	2402	2904	800
13	Odisha	140	116	148	131	150	137	160	68
14	Jammu & Kashmir	180	132	190	118	170	117	142	0
15	Himachal Pradesh	40	32	43	34	50	31	45	20
16	Uttarakhand	44	35	45	36	42	40	25	8
17	Haryana	2	0.7	2	0.7	2	1	1	0.3
18	Punjab	6	3	5	3	5	3	4.5	1
19	Assam	4705	4861	4980	5026	5395	5316	5519	5038
20	Ar. Pradesh	58	54	65	59	75	64	67	39
21	Manipur	560	388	435	464	600	504	542	313
22	Meghalaya	1070	1076	1110	1187	1220	1192	1245	999
23	Mizoram	100	83.6	105	92	130	104	113	42
24	Nagaland	770	615	633	620	682	600	649	230
25	Sikkim	17	0.001	3	0.4	1	1	2	0.08
26	Tripura	85	87	125	230	130	111	125	51
Total		33840	31906	35960	35468	38530	35820	39000	24029

(**Source:** Central Silk board, 1st January 2021)

Table 3: Raw Silk Imports

Year	Quantity (MT)	Value (Rs. In Crores)
2017- 18	3712	1218.14
2018- 19	2785	1041.35
2019- 20	3315	1149.32
2020- 21 (Till Dec- 2020)	1150	351.03

(**Source:** CSB, 1st Jan 2021)

Table 4: Exports (Rs. In Crores)

Items	2017- 18	2018- 19	2019- 20	2020- 21 (P) (Till Dec- 2020)
Natural Silk Yarn	15.66	24.72	16.77	5.75
Silk fabrics and made- ups	864.81	1022.43	982.91	326.64
Readymade garments	650.48	742.27	504.23	454.22
Silk Carpet	17.34	113.08	143.43	131.96
Silk Waste	101.19	129.38	98.31	112.30
Total	1649.48	2031.88	1745.65	1030.87

(**Source:** CSB, 1st Jan 2021)

Table 5: Activities taken under Tasar Sector

Activities	2017-18	2018-19	2019-20
Tasar Plantation (Ha)	765	845	1812
Production of Dfls (lakh nos.)	20.20	20.43	23.13
Procurement of Dfls (Lakh nos.)	5.05	5.00	5.00
Consumption of Dfls (Lakh nos.)	25.25	25.43	28.13
Production of reeling cocoons (Lakh nos.)	1,220.03	1,232.8	1303.34
Production of raw silk (est. in MT)	106	123.28	130.33
Production of silk waste (est. in MT)	19	25	-
Farmers covered (nos.)	16,041	16,514	16,531

(**Source:** Directorate of Textile, Odisha)

Table 6: Activities taken under Eri and Mulberry sector

Eri Sector	2017-18	2018-19	2019-20
Castor Plantation (Acres)	1,600	1,720	1,173
Consumption of Dfls (Lakh nos.)	1.39	1.00	0.82
Production of cut cocoons (est. in MT)	8	6.59	6.37
Production of Raw silk (est. in MT)	7	5.27	5.1
No. of farmers covered (Nos.)	3,200	3,440	2,780
Mulberry sector			
Mulberry Plantation (Acre)	102	78	68
Procurement of Dfls. (Lakh nos.)	1.23	1.03	0.65
Consumption of Dfls. (Lakh nos.)	1.23	1.03	0.65
Production of reeling cocoons (Lakh nos.)	22.48	24.94	14.79
Production of raw silk (est. in MT)	3	2.77	2.12
Production of Silk waste (est. in MT)	0.3	0.28	-
No. of farmers covered (Nos.)	1,717	1,216	-

(**Source:** Dept. HT & H, Odisha)

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