

An analytical study on determinants of income generation in rural sericulture sector of West Bengal

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Abstract

Objectives: Sericulture, being low capital intensive, suits landless farmers and low-skilled artisans. This paper will focus on land productivity and technical efficiency of marginal artisanal classes and will measure their impact on income generation in the sericulture sector of West Bengal.

Methods/Statistical analysis: Statistical analysis begins with analysis of income trends from raw silk at national and state level with the help of secondary level data. For primary survey four sericulture rich villages in Malda district has been chosen, where 60 silk-artisan households were selected using stratified random sampling for enquiring about their livelihood and income generation. Simple linear regression technique has been used using OLS method to estimate the statistical models based on apriori hypothesis.

Results: The paper tests the statistical significance all income generating factors of the sericulture industry including land productivity, labour productivity, technological efficiency. Analysing the nation wide data set, the paper finds the area of mulberry cultivation and price of reeling cocoons are significant determinants in generating income in sericulture. However, primary data analysis collected from Malda district of West Bengal exposes that man days creation for this avocation and technical efficiency are significantly influencing income generation in rural sericulture sector while cost of implants has a serious detrimental impact on revenue generation by the silk artisans in West Bengal.

Conclusion/Application: Intensive approach for balanced regional development can help to survive this dying industry in West Bengal. Farmers, whose generation based expertise is helping the industry to sustain, should be enthusiastically supported with institutional help.

Keywords: Sericulture, Income generation, Raw-Silk, Poverty, Income-Inequality, Migration

JEL Classification: R 20, R 30, O15, Q12

1. Introduction

Being low capital intensive agro-based sector, sericulture generates a continuous stream of income within rural India throughout the year. It ensures secured livelihood to more than 7.5 million persons in and across 59 thousand villages over India, including its allied activities [1]. In the face of rising poverty and inequality with the advent of globalization, sericulture has become one of the promising and ideal rural income generating sectors due to its minimum gestation period and maximum employment generating potential with quick turnover. It unambiguously ensures a dependable livelihood to a large section of low-skilled poor peasants and artisans. The objective of this paper is to derive the determinants of income generation in the rural sericulture silk sector of West Bengal.

In [2] showed that West Bengal being one of the principal originators of silk-industry in country has successfully raised its raw silk production during 1980-2004 with a positive annual growth rate of 4.16 percent and the annual growth in mulberry area during the same period has been 1.83 percent, which implied a growth in land productivity with the passage of time. This higher growth in level of raw silk production compared to that of mulberry cultivated area is also indicative of a vertical growth of sericulture in West Bengal instead of horizontal extension.

Sericulture is practiced in few concentrated regions of West Bengal compared to other traditional silk producing states (e.g., Karnataka, Andhra Pradesh, Tamil Nadu and Jammu & Kashmir) which is evidential from its highest number of sericulture families per village ratios (i.e., 48.9% in West Bengal). In Karnataka, Andhra Pradesh and Tamil Nadu, sericulture activity is more dispersed through out the state which is reflected through its sericulture families per village ratios, i.e., 14.29%, 13.32% and 5.26% respectively [3]. Therefore spatial concentration is one of the special characteristics of West Bengal which would lead to uneven development of a specific region due to this livelihood.

In the post globalised era (1991- 2010) rural income and employment generation has received top priorities to combat with increasing trend of inequality and poverty [4]. In sericulture, the entire range of activities generate a moderate flow of income and creates employment opportunities for a substantial section of low skilled marginal rural inhabitants who would otherwise remain unemployed or disguised employed in vast agricultural sector. The entire sub sectors include (i) Silkworm Rearing Sector; (ii) Cocoon Sector; (iii) Post Cocoon Sector. These sectors are farm-labour based and fall under the cottage and small scale sector. In silkworm seed sector, mulberry cultivation creates employment on farm. The silkworm rearing sector uses mulberry leaves as input and this creates large scale employment and income earning capacity for the family of mulberry growers [5]. Reeling activity is mainly undertaken in rural or semi-urban areas and that also generates a stream of income and employment. Thus the artisanal silk industry creates large scale income generation opportunities in the rural and semi urban areas accelerating the economic growth of the area. The objective of this paper is to derive whether this income generation is the result of land as well as labour productivity, while we know that besides productivities there exist other factors which may significantly influence income generation in sericulture-families. We will illustrate the national scenario in the beginning to measure the nature of association between input productivities (specifically land and labour) and income generation in order to assess whether the employment generation is productivity driven. Then we will focus on regional analysis, specifically on the sericulture-rich districts of West Bengal. Our main test hypothesis is whether input productivities have any significant role to influence the process of income generation. In the core section we will reconcile whether our nation based result is consistent with the field survey result done on the Malda district of West Bengal. Our primary survey data has been collected from four sericulture rich villages of Kaliachak Blocks in Malda district. Malda having 74 percent production share occupies the leading rank in the state of West Bengal where Kaliachak blocks are enriched in sericulture and silk reeling, which justifies the reasons of choosing this region as primary survey area.

Sericulture in West Bengal still remains an unimproved rural based activity dependent on low-skilled labourers, compared to those of other traditional silk producing states like Karnataka and Andhra Pradesh mostly due to their productivity differentials. Experts in this field opined that there exists a significant gap in productivity at farmers' level and yield potential in West Bengal [6]. Major reasons for low acceptance of the technologies were identified as inadequate linkage between scientist and farmers which are not being in consonance with the farmers' need and compatibility with the total farming system. Corporate entry in this sector is still a distant dream and the authority support is at barely low level much from its deserving threshold which resulted into this productivity gap at farmers' level and yield level. The obvious outcome becomes exodus of sericulture-artisan from the sector and looking for alternative employment opportunity.

However, the opportunity lies with this sector is in its income effect associated with the large section of downtrodden artisans who could in turn generate a large spillover effect over the society as a whole. Low gestation period and quick turnover makes sericulture ideal for poor and marginal rural inhabitant. Poverty and income inequality can be harnessed if expansion of sericulture can be sustained in the rural sector. It has been observed that in sericulture 57% of its final value is flown back to the primary producers [7]. Again the price spread of sericulture goods accounts 48.4% for the mulberry farmers-silkworm rearers, 17.7% goes back to reelers & twistors and 12.3% goes back to weavers and dyers [8]. Thus sericulture supports in promoting the growth of income level of the excluded group and justifies our prioritization of analysis in the realm of creating productive improvement and income generation. A vast literature in this specific areas have been found, where several researchers from different parts of the country derived almost equivalent conclusion, i.e., sustainable income generation capacity of sericulture always fares better than other alternative food or cash crops. In [9] showed selected few areas of Tamilnadu to make a comparative income analysis of mulberry crops vis-à-vis other competing crops like, paddy, sugarcane, turmeric, gingerly and groundnut in that area. Labour was the prime input in mulberry cultivation as well as silkworm rearing. It

occupies around 55% of the total rearing cost. Therefore, as a whole they explained the share of labour cost in total leaf production and rearing cost is 50 percent. Given this situation if the labour productivity is raised the consequences of that rise would be reflected on the rise in level of income generation. The study also revealed 'net income' and 'benefit-cost ratios' of mulberry crops vis-à-vis other crops. Addition to that, mulberry-cultivation requires comparatively less area of land for farming and comparatively low graded-land is able to generate good productivity which ultimately turns into good profitability. Therefore we can infer that sericulture is cultivated with using more land-productive technology.

Similarly, at Virbarha region in Maharashtra a study was conducted in two villages on the economic viability of sericulture across other crops like paddy, soyabean, and sunflower [10]. The comprehensive report reveals that sericulture has its edge over other crops, when flow of income generation is the consideration for sustenance of any crop. Though Khobana and Dhapewada was not the traditional belt of sericulture in Maharashtra, mulberry proved its higher productivity (i.e., land productivity) with consistent income generating potentials. The mulberry crop efficiently utilized sub-soil moisture of deep soils in dry period and its income started after three months of plantation with optimum production from second year onwards and sustained income continued up to 15-20 years. In marginal lands with protective irrigation, farmers fetch higher returns from sericulture than other traditional crops and also generated employment for more than 170 days. Therefore productivity is not only higher in terms of greater output but also with use of inferior lands.

The beneficial outcome of this productivity led income generation flows more in favour of the farmers and artisan group whose assembly line location is much lower in this vertically integrated silk industry. According [11], roughly 30 percent of the value of a printed silk saree is added by the primary cocoon producer whose location is almost at the bottom stage of the entire silk industry. The silk processing accumulates value of 10 percent or more and 12.5 percent is accrued by the weaver leaving 22.5 percent to the printing. Thus total cost of production accrues to 75 percent while 25 percent is accrued by the traders. Thus sericulture has the potential to steer pro-poor growth in a developing economy. According to another study [12], out of total share of income distribution in the sericulture sector, 54.6 percent share is captured by primary producers like farmers, silkworm growers. Unlike other vertically integrated industry there is no trickle-down but flow-down effect in this sector. They illustrate how despite being the early staged contributor in the production process, the share capturing capacity of the farmers ameliorates the condition of the rural poor in the country. The study infers the percentage share of income earned by the farmers, traders, reelers & twistors and weavers are 54.6, 17.8, 15.3 and 12.3 percentages respectively. The average income of silkworm rearers or farmers depends upon the area of land holding, rearing of silkworms, technology adoption and available infrastructure. The study shows that they get a substantial income of Rs 15,000 to 20,000 per year, if they strictly follow the advocated technologies in time. In tropical states of the country, the silkworms are reared through out the year and the income flow will be round the year and at regular gaps. Mulberry cultivation by farmers and cocoon production by rearers create a large scale employment for family members in the rural India. Most of the times it has been found that rearers have their own field of mulberry cultivation. However, there are also instances of non-mulberry growers taking up cocoon production alone as full time occupation [13]. They buy leaves from mulberry growers and use them as raw material for cocoon production. Therefore in their cases the income generation will be related more with labour productivity instead of land productivity.

The reeling activity involves a large semi-skilled labour force in rural or semi urban areas. The income generation opportunities emerged through this sector helps to combat the rural poverty on one hand and prevent the involuntary migration of rural people to the urban areas on the other [7]. Now, this poses a relevant research question as prevention of rural to urban migration may lead to surplus labour in agrarian sector whose consequential impact would be disguised unemployment and decline in labour productivity.

In India, sericulture operations are confined to small and medium scale farms mostly with the holdings ranging from 0.5 acres to 2 acres [14]. The small and marginal farmers are more associated with sericulture because its inherent labour intensive technology and the need of adequate personal care required for silkworm rearing operations. This automatically ignites the age-old debate, i.e., farm-size and productivity. It has been observed through several studies that the nature of operation makes it suitable for small farmers only, both in terms of productivity and cost efficiency. The cost of production of cocoon was more for the large farmers (Rs 100.61 / kg of cocoon) than that of small scale rearers (Rs 93.48/ kg of cocoons). Large scale farms produce less quantity of cocoons bearing almost same level of expenditure due to problems in management. As a matter of fact, the expenditure

incurred on labour by the small farmers was comparatively more than that of large scale rearers. But that labour force is mostly family labours, which protects the small scale rearers against high market wage rate on one hand and make their process of production more care intensive on the other. The studies conducted earlier [9,15,16], indicated more involvement of family labour. High returns to family labour and efficient management in silkworm rearing are the key aspects of success for small-scale Sericulturists.

In [17] explained that the income generation process of the silkworm rearers are threatened by some significant supply-side constraints, which includes several types of inefficiency starting from technological inefficiency, cost inefficiency, labour inefficiency and market inefficiency(including both product market and factor market. Their study also reveals that caste and social participation of the respondents have a highly significant relationship, while knowledge of the farmers has significant relationship with constraint faced by them in sericulture.

There also exists some conventional reservation among the farmers that acts as the barriers in the path of income generation. Large farmers irrespective of their size of holding keep their irrigated fertile land for food-crops. Only marginal and reclaimed land was taken up under mulberry in the initial stage. Cattle grazing have been found to be one of the important difficulties in sericulture. Indian Tribal and Cattle grazing farmers confine their cattle only in the rainy season. After the harvest season they loose their cattle, which pose menace to mulberry plantation. Besides the relative low productivity of cultivable land the large farmers also face above type of externality issues within their own group which inhibits their income growth in sericulture and reinforces the inverse relation between 'farm size and productivity'. In [13] has shown another dimension of labour productivity which is responsible for the income generation in sericulture in the villages of Andhra Pradesh where the traditional occupational patterns in the villages have been dismantled.

Comparatively less significant research work has been done regarding income generation issues in sericulture of West Bengal. In [18] studied the mulberry cultivation pattern of Malda district in West Bengal and revealed a grimy picture. They have commented that technological inefficiency has blocked the income generation growth in sericulture, where scarcities of underground water and unpredictable rainfall have enhanced the problem for mulberry cultivation. The quantity and quality of mulberry leaves produced by the majority of the farmers in the district remains sub-standard. They commented that productivity led growth is possible through introduction of high yielding varieties, application of fertilizers and irrigation. In [19] have shown how sericulture can be used as a tool for economic development in Malda district. They estimated the income generation through silk reeling in Malda district during 2008, 2009 and 2010 was Rs.11.16 crore, Rs. 14.80 crore and Rs. 24.08 crore respectively. Thus income generation has almost been doubled within three years through sericulture in Malda district.

2. Objective and Methodology

A gap in research work on income generation issues in sericulture has been observed, especially during the phase of post globalization period (1990-2000), which will be addressed in this paper. Period of globalization has shaken the sericulture sector in all traditional silk producing states, including West Bengal. The annual growth rate of silk production has abruptly declined in all leading states including West Bengal mainly due to inflow of cheap silk yarn in the market. But the first decade of the present century (2000-2010) has experienced a revival in growth pattern of those industries almost through out the nation where performance of West Bengal is better than all other leading states. This drives our research interest to find out the significant income generating factors in West Bengal. From the angle of microeconomic foundation our hypothesis is that the income growth in sericulture of West Bengal can be attributed to land productivity and artisanal efficiency along with other factors. Therefore we intend to boil down our research interest into that specific issue.

After tracking the productivity influence on income generation this paper would legitimately suggest some restructuring policies required for filling up the gaps (if any) and thereby boosting up the income growth in artisanal silk sector of West Bengal.

The technical analysis will be initiated through describing the trends of Income generation from raw silk, reeling cocoon and silk fabrics at national level. It will be studied with the help of secondary level data published by the Central Silk Board as well as DGCI, Calcutta. Then the same issues will be analysed for West Bengal. As analytical tool the analysis will hinge on diagrams and CAGR (compound annual growth rate) to compare and study the growth patterns between pre-and post globalization phases.

The core study will delve into cross-section analysis of sericulture household living in Malda district. Malda produces 74% of state production and therefore it alone captures the nature and composition of income generation of the state as a whole. The paper will attempt to determine whether productivity (both land and labour) has any significant role to play in income generation of artisanal silk sector over this region. Few sericulture rich villages of Kaliyachak Blocks have been chosen, since mulberry cultivation in Malda district is mostly localized in Kaliyachak-I, Kaliyachak-II blocks comprising 90% of the total mulberry cultivation area. Kaliyachak-I itself occupies 61% of the total cultivated area under mulberry in the district [18]. Twenty percent of total sericulture farmers of the district live in this block [20]. Stratified random sampling is done to choose four sericulture rich villages namely Sujapur, Gayes Bari, Mothabari, and Jotkabil from Kaliachak block-I & II. Fifteen households involved with sericulture activities have been chosen on an average from each village using stratified random sampling. Thus total 60 households constituted the sample size of our study. Respondents (usually head of the silk artisan family) were randomly taken from those sericulture rich villages, who were asked several questions regarding their livelihood and income generation. Simple linear regression technique will be used using OLS method to estimate econometric models which have been built up on the basis of our apriori hypothesis. The econometric models would attempt to verify whether income generation from artisanal silk sector of West Bengal is significantly influenced by productivities along with other factors.

3. Income generation trends in Indian sericulture (1983-2011)

Globalisation of Indian economy in 1991 virtually reduced and removed barriers between national borders and free flow of silk and silk yarn has eroded the position of domestic industry. Reeling industry was hard hit as the Chinese silk yarn was both cost-efficient and qualitative. According to a study report [21] India imported raw silk from various sources to meet its requirements for production of silk fabrics. These imports were necessary to meet domestic as well as export demands for various silk products. In 1990-91, the domestic sector contributed around 89 percent while 11 percent demand of silk fabrics industry was mitigated by imports. By 2001-02 this import share in total raw silk availability in the country raised to 21.2 percent. This rising trends in import dependence in turn affects large section of sericulture farmers and artisans and that spoils their process of income generation through sericulture. The cheap raw silk import not only reduced the domestic price of reeling cocoon and raw silk but it also offset the impact of factor productivities on income generation from sericulture. The year 1994-95 has recorded highest import of raw silk in India when 27 percent of domestic demand is met by imported raw silk (See Table-1).

Table 1. Import Share in Domestic Consumption in Post Globalization Decade (1990)

Year	Domestic Raw Silk Production (MT)	Raw Silk Imports (MT)	Import share in Domestic Consumption (%)
1990-91	12560	1598	11.29
1991-92	11763	2076	15.00
1992-93	14168	2768	16.31
1993-94	13691	4892	26.33
1994-95	14579	5403	27.04
1995-96	13909	4149	22.98
1996-97	14126	2911	17.09
1997-98	15236	2346	13.34
1998-99	15544	2827	15.39
1999-00	15214	5008	24.75
2000-01	15857	4713	21.96
2001-02	18395	4950	21.20

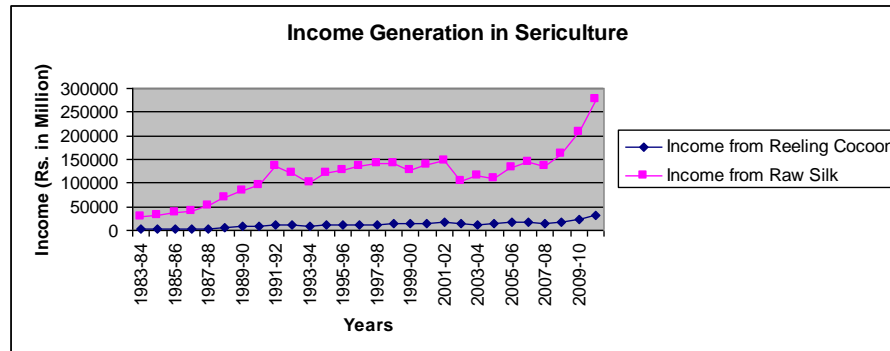
Source : Central Silk Board , Bangalore (1993, 2003)

The raw silk (whether domestically produced or imported) is transformed to soft-silk by dyeing and printing on it and ultimately the silk-fabric is being sold as a final product to the consumers in the market. Since the research interest of this study is confined within land productivity and artisanal efficiency in silk industry, the vertical spectrum of silk industry above the production of raw silk is beyond the scope of study of this paper. Again raw-silk is placed in higher assembly-line than reeling cocoon in the vertical spectrum of the Industry. Therefore it can be assumed that value of raw silk is inclusive of the value of reeling cocoon. Comprehensive and simultaneous data on price and

output of raw-silk is available for 1983-2011 from secondary source (CSB, 1999, 2003, 2003, 2007, 2012). The aggregate data will be dissected into two phases (i) Pre Globalization Period; (ii) Post Globalization Phase.

The comprehensive trends of income generation both from raw silk and silk cocoon including pre and post liberalization period is depicted in Figure 1. Value of reeling cocoon production which reflects the income of mulberry growers and silkworm rearers has maintained a more or less steady horizontal trend without much fluctuation compared to that of raw silk. Value of raw silk is basically accrued to silk reelers.

Figure 1. Income Generation Trends in Sericulture in India (1983-2011)

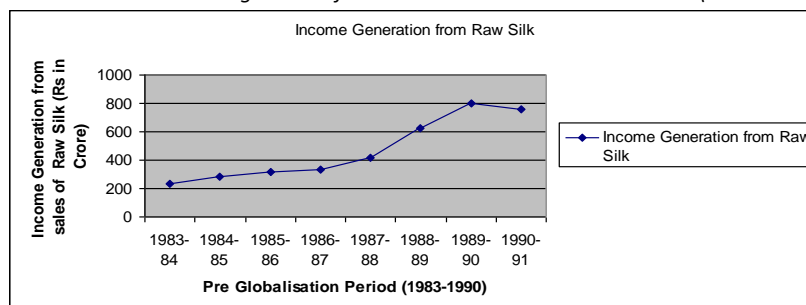


Source : Central Silk Board, 1999, 2003, (<http://indiandsilk.kar.nic.in/rti/CO/SericultureStatisticsInIndia.pdf>)

Now if we focus on the production growth pattern of reeling cocoon in pre liberalized period (1971-1990) we observe an annual growth of 7.06 % of reeling cocoon while the post-globalisation phase only experiences 1.05% of annual growth rate in production of the same. Now our point of analysis is whether this declining trend in production is due to globalization or productivity related issues are also hidden with that. Growth in raw silk production in post globalization phase (1990-2010) indicates India’s increasing dependence on imports (especially from China). However the land productivity growth and labour productivity growth within 1995-2010 is 5.19 and -0.82 percent annually. The land productivity reflects technological efficiency (like high yielding mulberry seeds, fertilizers) is effective but that fails to raise the production level in desired target. Negative labour productivity implies accumulation of greater numbers of labour force in the sericulture sector. Therefore higher employment is not indicative of greater prosperity. Higher amount of labour force with little amount of production of raw silk would actually result in further immiserization. Poverty is the definite outcome of this negative productive led income growth. This lowering of growth rate coupled with negative labour productivity unambiguously signifies destitution of the reelers in the country. Sericulture farmers and reelers in the country have often observed to launch nationwide protest against duty-free import of raw silk from China. The sericulture farmers always expressed their fear that liberal imports would ultimately result in crash in prices of the cocoon as well as raw silk in the domestic market and hence their income generation would be stunted.

The income generation through sales of raw silk has maintained a positive rising trend with 18.1% of annual growth rate in income in the pre-liberalization period (i.e., during 1983-1990) (Fig 2), while slight fluctuating income generation path is observed during 1990-2005 (Fig 3). Studying the diagrams the fluctuation in income generation could be speculated as attributed by ups and downs the price of raw silk during the same period (Fig 4).

Figure 2. Trends of Income Generation through sales of Raw Silk in Pre Liberalization Period (1983-1990)

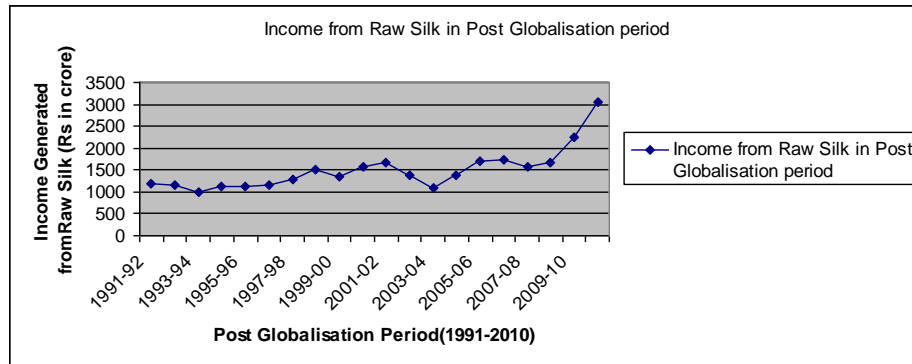


Source : Central Silk Board, 1999, 2003, (<http://indiandsilk.kar.nic.in/rti/CO/SericultureStatisticsInIndia.pdf>)

CAGR (1983-1990) = 18.1% growth in income generation from raw silk

From the year 2005 onwards the income generation in sericulture has taken a positive trend (Figure 3). The year 2005 is benchmarked as abolition year of Multi Fiber Agreement (i.e., the quota constraint faced by the developing economies to export their textile and readymade garments to developed nations). The post globalization phase as a whole experiences an annual growth of 5.1% in income generation from raw silk which is substantially lower than that of pre-liberalisation era. This signifies how the globalization has hit the production cum income generation of the cocoon and reeling sector. Therefore whether production of reeling cocoon and raw silk is adversely affected by low labour productivity and cheap flow of importable silk (cocoon, yarn, raw-silk) in post globalisation period in India, that needs to be tested. Now, if we concentrate on the trends of raw silk production between pre and post globalization period we can experience the similar growth pattern. It exhibits a growth rate of around 10.58% in the pre liberalization period and 2.28% in post liberalization period.

Figure 3. Trends of Income Generation through sales of Raw Silk in Post-Liberalization Period (1991-2010)



Source : Central Silk Board, 1999, 2003, (<http://indiainsilk.kar.nic.in/rti/CO/SericultureStatisticsInIndia.pdf>
CAGR (1991-2010) = 5.1% growth in income generation from raw silk

The price of raw silk similarly exhibits the similar trends. In post globalised phase, the price is being governed by competitive international prices which pulls down the rising trends of domestic prices of raw silk. This is why the rate of growth of raw silk prices in post globalization phase is lower (2.7%) than the previous phase (9.8%). However, the rising trend in price of raw silk is observed from 2005 onwards, which is benchmarked for abolition of Multi Fiber Agreement (MFA). Abolition of MFA was expected to increase the market of the developing economies in developed market, which shifts Chinese focus from Indian market to other developed market. India remained significant importer of raw silk in the world during the phase of post globalization sharing 17.06 percent of global import in 1995 and 28.5 percent during 1999. (See Table -1) and in 1999, around 44.85 percent of Chinese Raw Silk Export was destined to India [21]. This enormous volume of silk was exported to India at a much lower rate (US \$ 19.65/tones) than it was exported to the developed destination like Italy (US \$ 21.15) and Japan (US \$ 21.66). All these keep a downward pull in prices of raw silk during the phase of post-globalisation. We have experienced rally against these Chinese dumping in several times in these post globalization phase. Before 1998, Chinese yarn was restricted to the exporters against their entitlement related to their actual exports. Permission of silk yarn by Indian Government from Oct 1998 onwards led to a 30 percent fall in domestic prices of reeling cocoons and silk yarn [22].

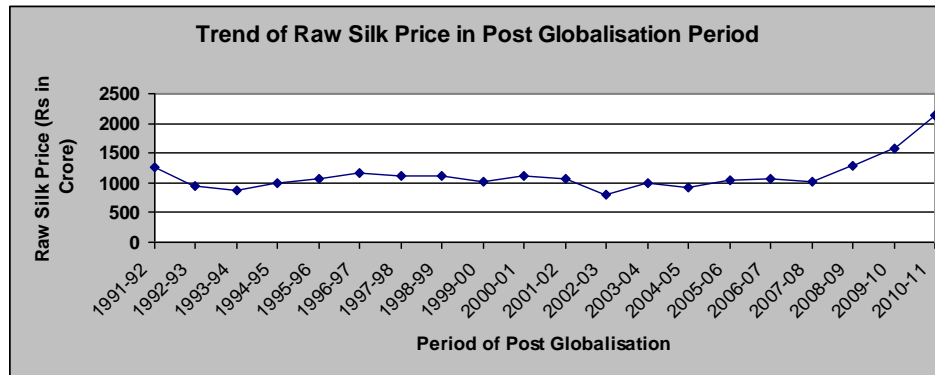
Table 2. Trends of Raw- Silk Import from China

Years	Price (Mn US \$)	Price (Rs in Cr)	Volume of Import (MT)	Share of Chinese Raw Silk in Total Import
2006-07	143.63	649.90	5318	95.6
2007-08	180.64	727.38	7839	98.9
2008-09	194.78	895.78	8316	99.0
2009-10	192.43	913.07	7097	96.7
2010-11	199.27	907.86	5519	95.2
2011-12	213.85	1024.79	5159	90.9

Source: Central Silk Board (Indian Silk, Annual Report 09-10, 10-11, 11-12) [23]

This rate of fall in prices have been aggravated to 40 percent during 2000 and 2003 when imported price of Chinese raw silk fell from US \$ 24.5 /kg to US\$ 13.5/kg. This disrupted the domestic prices of raw silk and reeling cocoon in India. The farmers and reelers were the most affected segments due to increase in volume of cheap imported silk. Dumping of Chinese silk was established and the Government of India imposed anti-dumping duty for the international silk grade 2A or below in the year 2003 and that was effective for the period of five years. China cleverly handled this issue and started exporting twisted yarn and silk Garde above 2A [24]. The silk rearers and reelers were worst affected by these rise in imports of raw silk with undercut prices.

Figure 4. Trends of Raw Silk Prices in Post Globalisation Period (1991-2010)



Source : Central Silk Board, 1999, 2003, (<http://indiansilk.kar.nic.in/rti/CO/SericultureStatisticsInIndia.pdf>)
CAGR = 2.7%

A sunset review has been taken up for continuation of anti-dumping duty on import of raw-silk in 2008. Accordingly anti dumping has been further continued with an enhanced reference price of US \$ 37.32 per kg and this has been effective up to Jan 2014. All these measures boosted the artisanal silk industry of India as it shows a reviving period of growth during 2001-2010. With the abolition of MFA, China has also found expanded developed market to export their silk and silk product which ultimately boils down to lowering the growth rate of Chinese raw silk import in India (See table -2). Rise in price level has saved large section of poor peasants and artisans whose sole livelihood rests on income generation through selling of reeling cocoons and raw silk.

The production trends in raw silk may depend upon host of factors like area of mulberry cultivation, amount of reeling cocoon production, price of reeling cocoon as well as amount of raw silk imports. Analysing the available time series data on mulberry area, amount of reeling cocoon production and others we can deduce the correlation of those parameters with income generation from raw silk.

Analysing the time series date, it has been derived that except mulberry cultivated area, all other factors including price of reeling cocoon, import volume of raw silk, quantity of reeling cocoon production and number of persons employed through sericulture bear a significant positive correlation with income generated by production of raw silk (see table -3). Indian silk industry has excess demand for raw silk. The volume of production falls short of volume of demand or consumption. Therefore import volume is expected to raise the level of income generation in artisanal silk. On the other due to increase in level of land productivity (through using high yielding variety mulberry seeds, better technology and improved silk hybrid) the income generation and land area possess negative relation. This is what we call vertical extension of industry. Reeling cocoon whether in terms of price or quantity sold, bear a direct relation with income generation from raw silk. Chinese dumping in the first decade of globalization depresses the domestic price of reeling cocoon and thereby income generation of raw silk was also affected. Lastly the persons associated with the industry possess a direct relation with income generation through raw silk.

Table 3. Degree of Association of Income Generation of Raw Silk with other Factors

Factors Associated with Income Generation from Raw Silk	Correlation Coefficient	
	Spearman R	Kendall R
Price of Reeling Cocoon	0.92**	0.813**
Import of Raw Silk	0.579**	0.397**
Mulberry Area	-0.217	-0.148
Reeling Cocoon Produced	0.805**	0.661**
Number of persons employed	0.512*	0.412*
Labour Productivity	0.754**	0.640**
Price of Raw Silk	0.95**	0.847**

Source : Author’s calculation

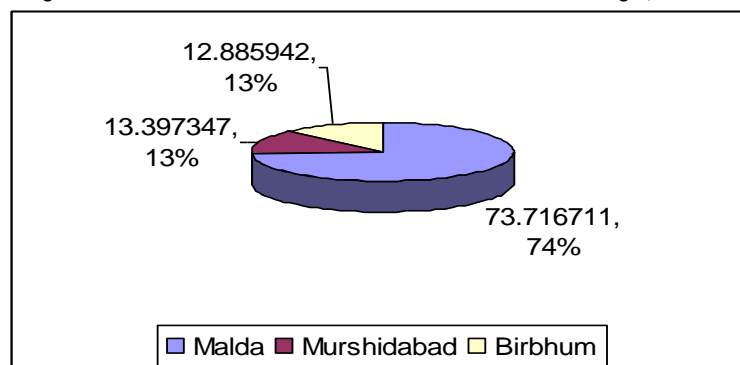
* significant at 0.05 level, ** significant at 0.01 level

4. Income generation by artisanal silk industry in West Bengal

The trends of income generation from sericulture at national level in the post globalization period have helped us to determine the sensitive factors which have a strong association with the import quantity of raw silk and price and output of produced reeling silk in different parts country. This section will specifically deal with the income generation trend in sericulture of West Bengal, which is also the focus region of our analysis. In West Bengal sericulture is historically clustered around few districts where backward and tribal people have practiced this livelihood over generations. The strange fact is that the entire gamut of sericulture which involves rearing, reeling, weaving and trading are not evenly allocated in each silk producing district. For instance Malda is renowned for raw silk production and reeling, but beyond this artisanal work the district is not specialized in further value-added chain in production. Similarly Murshidabad is famous for silk weaving rather than production and reeling. Malda, Murshidabad and Birbhum jointly produce around 99 percent of state raw silk and reeling cocoon [25]. Within this producers-trio, Malda is the dominant leader producer in mulberry raw silk and reeling cocoon. In 2000-01, Malda produced around 74 percent share of the state raw silk production, while share of Murshidabad and Birbhum was almost equal , i.e., approximately 13% share of state production (Figure. 5). Not only that during 2001 to 2011 Malda’s raw silk production jumped from 1035 MT to 1389.56 MT, while performance of Murshidabad and Birbhum reflected a lackluster performance during the same period (Figure.6 & 7). Similar is the case for production of reeling cocoon and Malda’s superiority in production of both reeling cocoon and raw silk has been well established.

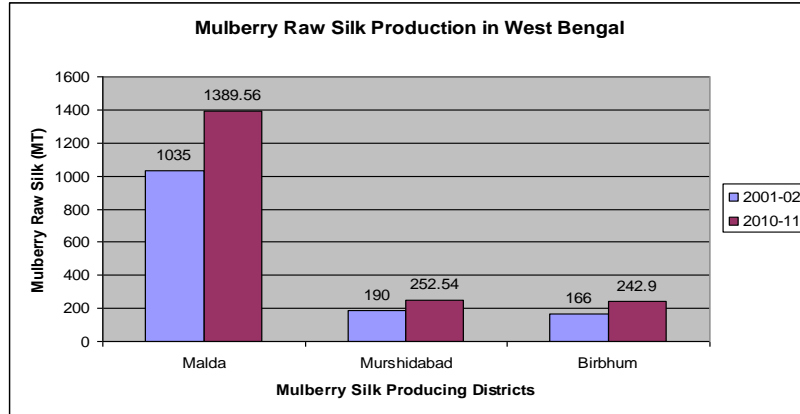
The issue pertinent with our analysis is the impact of globalization in this artisanal silk industry. We have seen that the long hands of globalization did not leave its grip from this traditional industry. The cheap silk yarn from China, Korea and Japan flooded this regional market in 2003 which resulted into sharp decline in the price of reeling cocoon. Malda cocoon market witnessed a steep decline in the rate of cocoon from Rs.100/ kg to Rs. 40/kg within two years [26]. The huge inflow of exotic high grade silk yarn from China at a very low price level (which was buffeted by hidden subsidy) had in-turn uprooted a large portion of mulberry cultivation and 30-40% of mulberry field were planted with mango trees [20].

Figure 5. District wise share Raw Silk Production in West Bengal, 2010-11



Sources: Directorate of Sericulture, Government of West Bengal. (25)

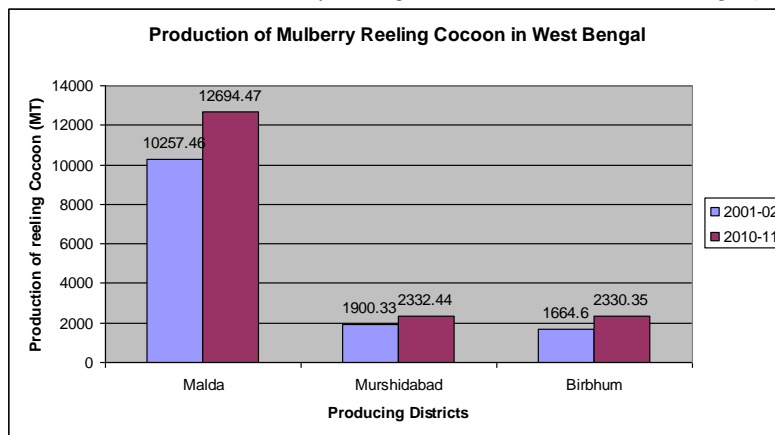
Figure 6. District wise Growth in Mulberry Raw Silk Production in West Bengal (2001, 2010)



Sources: Directorate of Sericulture, Government of West Bengal. (25)

Malda district contributes 70% share of the state production in raw silk and 7% share in national production, according to 2002-03 statistics profile of West Bengal. Sericulture is the main stay of local people dwelling over this Gangetic plain.

Figure 7. District wise Growth in Mulberry Reeling Cocoon Production in West Bengal (2001, 2010)



Sources: Directorate of Sericulture, Government of West Bengal. (25)

5. A Case study in two sericulture rich blocks of Malda district

In this section we propose to construct two different models, one with continuous predictors and other with continuous and categorical predictor. We have selected four sericulture villages, two from each blocks of Malda district, i.e., Kaliyachak Block-I and another from Kaliyachak-II. Kaliyachak Blocks I and II are both predominantly rich in raw silk production. We randomly picked-up thirty sericulture household from each block and thus sixty respondents were chosen using stratified random sampling. The response received from them against our structured survey-questionnaire helped us to tabulate data for carry out the regression analysis. Econometric Models have been built up on the basis of our prior hypothesis. Applying OLS on the income generation equations the coefficients are regressed and the significance of the coefficients have been checked. The estimated coefficients of two models have been illustrated in Table 4.

5.1. Interpretation of estimated coefficient of model-1

This model deals only with continuous variables and the significant F-statistic ensures about the ‘goodness of fit’ of the model. Adjusted R-Squared indicate that 37% data variations of income generation can be explained by the data variations of the assumed explanatory variables. The estimated coefficients highlight two important points. The

first is regarding the statistically significant relation between 'mandays' and 'Income generation'. One day rise in working days can raise the level of income by 46 units. However, rise in cost of implements may reduce the level of income by the sericulturists.

Table 4. Coefficient Table Dependent variable: Income from Raw Silk

Estimated Coefficient	Model-1	Model-2
Constant	6053.36	20335.59**
Man-days	46.217 (12.14) **	43.389 (11.43)**
Wage Share of Male Worker	47.824(48.48)	42.096(48.35)
Cost of Implements	-54.361 (46.37)	-88.346 (43.97)*
Credit Received (by Silk Artisan)	0.11 (0.42)	- 0.019 (0.39)
[Age=0]* [Technical Access=0]	-	-11820.4 **
[Age=0]* [Technical Access=1]	-	-12137.0*
[Age=1]* [Technical Access=0]	-	-11133.1**
R Squared	0.41	0.536
Adjusted R Squared	0.37	0.467
F (df)	8.82(50)**	7.77(47)**

** sig at 0.05 level; * sig at 0.01 level;

5.2. Interpretation of estimated coefficient of model-2

This model deals with continuous variable as well as categorical predictors (or dummy variable) and running OLS in glm (general linear model) we find statistical significance i of interaction effect between 'age' and 'technological access', along with other significant influence of the continuous variable like, 'man-days' and 'cost of implements'.

We assume the age of the principal earner in the household as '0' when he is found young (which means more productive) and below 45 years of age, while '1' otherwise, when he is found more experienced but less productive. In this situation his role would be one of knowledge (which she gains through experience) transformation. On the other hand, technological access would be assumed as '0' when no basic training is received by at least a member of the household and '1' otherwise.

The significant relationship between (age)*(technological access) indicates,

- (i) Addition in 'young but untrained labour unit' in household actually earns less than Rs 11,820.40 amount annually, compared to 'trained and matured labour unit' in household.
- (ii) Addition in 'trained but young labour unit' in household also earns less compared to that of 'trained and matured labour unit' by Rs 12,137/= amount annually.
- (iii) Similarly, addition in 'untrained matured labour unit' in the household also earns less relative to 'matured and trained labour unit' in the household by Rs. 11,133/= amount annually.

This comprehensively reveals that maturity / experiences and technological access are more return generating compared to any other combinations.

The continuous variables, man-days and cost of implements bear a significant statistical relationship with Income. Rise in man- days by one day have the capacity to raise the annual income level by Rs 43.39, while rise in cost of implements/machinery may reduce the annual income by Rs. 88.35 amount.

6. Conclusion

The income generation process in rural sericulture has revealed the dynamism of the process of earning within the rural inhabitants. Area of mulberry cultivation and price of reeling cocoons have been deduced as significant explanatory variables for upward rising slope in the 'income generation curve', while price of raw-silk and import quantity as well as export earnings are responsible for growth in silk fabric income and silk fabric production respectively. In other words, we can say both imports of raw silk and export earnings of silk industry influence the silk-fabric production in statistically significant way. Our primary analysis in the most sericulture rich district of West

Bengal exposes that number of man-days generated from different phases of silk-worm rearing actually influence the total income generation, which is very much logically justified. Similarly cost of machineries and implements have a detrimental effect on income generation and matured and technologically enriched labour force can always generate higher level of income compared to all other matching alternatives.

Concluding section calls for certain policy suggestions. Under the Directorate of Sericulture certain annual targets are adopted by the planners. However, problem lies in regional bias outlook, which made the sericulture popular and prospective in Karnataka only. Income from sericulture as a whole depends upon area of cultivation, price of reeling cocoon, price of raw silk, import quantity and export earnings. However, studying the variables in West Bengal we find only number of mandays can help to raise the level of income generation from sericulture. A more intensive approach in balanced development can help to remove this regional bias. Sericulture is becoming a dying industry in West Bengal, while its prospect is rising at national level. Farmers, whose generation based skill and efficiency is helping this cottage based agro-industry to survive despite regional inequality, must be provided with adequate institutional support. Then only this age-old traditional sector can regain its past glory.

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