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Pandemic of Covid-19 and Sericultural Enterprise

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Abstract: *The pandemic through corona virus (COVID-19) made the lockdown protocol all over the world, which affected most of the sectors of human life including the economic growth and development. The sectors of the economy are the recipients of the hard hit through COVID-19 and sericultural sector is not an exception for this influence. The present attempt deals with assessment of the economic influence of COVID-19 on usefulness (profitability) in sericultural practices in Pune District of India. The preliminary data on cultivation of mulberry and rearing of larval instars of silkworm, Bombyx mori (L) were elicited from the sample farmers selected randomly from selected taluka places of Pune districts of Maharashtra state. The schedule of semi-structure was followed for the collection of the primary data (number of farmers and area of mulberry cultivation) through the discussion through the google meet. The secondary data on quantitative status (yield of the silk cocoon and prices) was collected through silk board (central and state) for the year: 2018; 2019; 2020 and 2021. Statistical analysis of the data revealed that, the cost on mulberry cultivation and rearing of silkworm larvae for commercial silk has remained same for the year: 2018; 2019; 2020 and 2021 (during pre-COVID-19 and COVID-19 periods). The drastic variations in gross returns (in the form of income) accrued was exhibited during the respective periods. This was due to drastic changes, such as closing the significant cocoon markets (of higher prices, like Ramanagara cocoon market of Karnataka state), decreased price) for the silk cocoon and inconvenience in travelling to reach market. The lockdown made to stop the reeling the silk from cocoon by the commercial reeling units. This was resulted into incurring double loss. Sericulture farmers have not recovered the cost of production of Rs. 19377.60 and forgone Rs. 12621.99 per crop of hundred disease free laying (DFLs).*

Keywords: *COVID-19, Silk Cocoons, Moriculture, Sericulture.*

I. INTRODUCTION

The pandemic of COVID-19 is viral disease caused by corona virus. The corona virus is scientifically recognized as, "Severe-Acute-Respiratory-Syndrome-2" (SARS-CoV-2). This viral pathogen was identified firstly through the outbreak in Wuhan city of the country China, in the month of December of the year: 2019. All the attempts to control COVID-19 there are reported as failed. This situation was allowed the corona virus to spread worldwide with significant speed. On the day 30 January, in the year: 2020 the "World Health Organization" (WHO) used to declare a "the Public Health Emergency of International Concern". On the day 11 March, in the year: 2020 the "World Health Organization" (WHO) used further to declare a "the COVID – Pandemic". As per the record of 7 April, 2022, the pandemic of COVID – 19 had caused more than four hundred ninety-five million persons affected by the disease of COVID – 19 and about six million deaths through the disease of COVID – 19. Isn't it a deadliest in history? The symptoms of corona disease (COVID -19) appeared to range from undetectable to deadly. The fever, cough of dry nature and fatigue are common symptoms of disease of COVID – 19. There was severe illness more likely in elderly patients of COVID – 19. The pathogens of disease COVID – 19 deserve capacity of fast transmission through the breathing of the patients. When the people are in close proximity, the risk of breathings in close proximities of the air contaminated with "COVID – 19" was the most significant. The contaminated fluid reaching close to the eyes, nose and mouth of healthy person was also responsible for the transmission of "COVID – 19" disease. Infected persons are typically contagious for 10 days, and can spread the virus even if they do not develop symptoms. Mutations have produced many strains (variants) with varying degrees of infectivity and virulence (Zoumpourlis, *et al*., 2020).

Since December, 2020, the vaccines against "COVID – 19" disease have been approved. The vaccines against "COVID – 19" disease have been widely distributed all over the world. The preventive measures for the "COVID – 19" disease include: masking over mouth and nose; social distancing; improved ventilation; filtration of the air; etc. The

quarantining the symptomatic persons serve to control the transmission of "COVID – 19" disease. Use of monoclonal antibodies and novel antiviral medicines serve to treat the patients of "COVID – 19" disease.

According to the Office of the Commissioner (23 November 2020), the treatment for the COVID-19 disease include: use of "Monoclonal Antibody", Antiviral drugs of novel quality and the efforts towards controlling the symptoms of this disease. Interventions through the government include: restrictions on travelling, lockdown protocol, restrictions on the business, controlling the hazards at work places and to trace the contact with infected persons.

The pandemic of the COVID – 19 exerted the triggered and severe disruption for the social and economic sectors all over the world. The largest global-recession, disruption in chain of supply, panic buying, shortage of widespread supply (example: food supply) were the significant influences caused through the pandemic of COVID – 19- disease. The agriculture-based practices like sericulture are also influenced by the pandemic of COVID – 19 – disease.

The sericulture is integrated well with the system of farming. It has the capabilities of continuous (throughout the year) earning or generating significant income for the farmers. According to Hanumappa and Erappa (1985), the sericulture requires minimum capital investment. Sericulture provides the employment for a complete year (continuous twelve months). China is the first country for the highest production of raw silk. India stands second in raw silk production. Rearing of silkworm larvae through the use of leaves of mulberry in India is for about agriculture land of about 1, 91,893 ha. For the year: 2006 – 2007, the Indian mulberry silk production was reported 16525 MT. There was export of silk goods for the year: 2006 – 2007 and earned US$ 737.76 in year 2006-07 (Anonymous, 2007). The advent of new bivoltine double hybrid (double cross breed) race (variety) of silkworm and innovative technology of moricultural practices and rearing methods made the sericulture productivity changing at fast rate with an upward trend. Changes in the nature of commercial views, influence of global warming, pandemics of diseases like COVID – 19 are influencing the cost of production, quantity of production and quality of production are the major factors to be considered for all the sectors of occupations. In this regard, it is imperative to understand the economics of sericulture. Awareness and motivation among the sericulture farmers is highly essential. Such type of catalysis is going to motivate the new farmers to take up sericulture and increase their income. Some of the earlier studies tried their best to find out the economic prospects in sericulture (Anonymous, 1989, Ravindran *et al*., 1993, Lakshmanan *et al*., 1996). The present attempt was aimed to carry out the analysis of sericultural economics with reference to the influence of pandemic COVID -19 – disease.

II. MATERIALS AND METHODS

The study was completed through the steps like, selection of region, collection of the data and statistical analysis of collected data. The agricultural land under the cultivation of mulberry and number of farmers busy in the rearing of silkworm larvae for commercial silk, both are significant in Pune districts of Maharashtra state at Indian national level, which made to select purposely for the present attempt. Pune districts of Maharashtra state stands first both in mulberry acreage and production of mulberry silk cocoon in the country (Anonymous, 2019). For the purpose to assess the influence of COVID-19 induced lockdown on usefulness (in the form of profit) of sericultural enterprise, the essential primary data with reference to: resources used in the cultivation, production of silk cocoon through the rearing the silkworm larval instars, number of crops (harvesting the leaves of mulberry, *Morus alba* L. and number of cycles of the rearing the silkworm larval instars) taken per year, number of DFLs (Disease Free Layings) used for each crop and yield (in the form of quantity of silk cocoons) were obtained from farmers (group of selected farmers. The sample size: 100 farmers) through focus tele discussion through the google meet through the Krishi Vidnyan Kendra, Baramati, office of Central Silk Board and Maharashtra State Silk Board (at Malegaon Tal. Baramati Dist. Pune – 413115). The basic tools of statistics (Zulfiqar Ali and Bala Bhaskar, 2016; Manjunatha *et al*., 2018) and the technique for budgeting the enterprise were employed to assess the profitability of sericulture enterprise (Chinnappa *et al*, 2020). The primary data collected were relevant (or pertinent) to the crops of mulberry, *Morus alba* (L.) and production of silk cocoon through rearing of larval instars of silkworm, *Bombyx mori* (L.) for the year: 2018; 2019; 2020 and 2021 (during pre-COVID-19 and COVID-19 periods). In order to measure (or to gauge) the influence of pre-COVID-19 and COVID-19 periods, data on cost of production (in the form of money) and the returns (in the form of money) during the same months of the agricultural year: 2018; 2019; 2020 and 2021was elicited from the same sample of selected farmers of Pune districts of Maharashtra state. Further, the secondary data on advents of silk cocoons and prices of the silk cocoons of bivoltine (pure race) and double hybrid (race of crossbreed) in Maharashtra state and the market at Ramanagaram of Karnataka state was collected through the Krishi Vidnyan Kendra, Baramati, office of Central Silk Board and Maharashtra State Silk Board (at Malegaon Tal. Baramati Dist. Pune – 413115) Central Silk (Silk Bulletin, 2020). For the purpose to obtain consistency in the results, attempt on collection of the data was in triplicate set (three sets of samples for present attempt include: Baramati Taluka, Daund Taluka and Indapur Taluka).

The materials and techniques section should include enough information to allow all operations to be replicated. If numerous procedures are presented, it may be separated into heading subsections. (Size 10 & Regular)

III. RESULTS AND DISCUSSION

The results on the attempt to analyse the influence of pandemic of COVID – 19 on sericultural enterprise are summarised in tables (Table- 1, 2 and 3) and presented in fig. 1. The variable cost and fixed costs for the mulberry cultivation are the two different types of expenditure considered in present attempt. The variable cost (expenditure in Rs) against human labour, bullock labour, use of farm yard manure (FYM), use of fertilizers and the use of plant protection chemicals in present attempt of analysis was found recorded Rs. 15850; Rs. 5700; Rs. 24000; Rs. 12000 and Rs. 1600 respectively (Table-1 A). The total variable cost (TVC) for the mulberry cultivation in the region selected in the attempt was Rs. 69150 (Table-1 A). The heads of expenditure with reference to fixed cost for the production of leaves of mulberry, *Morus alba* (L) considered in present attempt include: Depreciation (Rs); Interest on Fixed Capital (Rs); Rental Value of land (Rs); Total Fixed Cost (TFC) (Rs); Total Cost (TC) (Rs); Total Yield of Mulberry Leaves (Kg) and Cost Per Kg of Mulberry leaves (Rs) and found recorded: Rs. 8089; Rs. 12220; Rs. 16800; Rs. 37109; Rs. 93309; 24656 Kg and Rs. 3.75 respectively (Table-1 B). In the irrigated region (Baramati Taluka and Indapur Taluka), the cost of production (both, variable and fixed) of leaves of mulberry was lower in comparison with rainfed region (Daund Taluka), sample selected for the study in present attempt. The unit cost of production (both, variable and fixed) of leaves of mulberry was lower under the irrigated condition as compared to the rainfed condition. However, the gross returns, net returns were more under irrigated condition over rainfed condition with higher being among big farmers over medium and small farmers. In cocoon production, the total cost of cocoon production was lower with rainfed farmers as compared to irrigated farmers with lesser among small farmers category over medium and big farmers category. The unit cost of cocoon production was lower under irrigated farmers over rainfed farmers with least being among medium farmers over big and small. The heads of expenditures for labours for the rearing the larval instars of silkworm, *Bombyx mori* (L) considered in the present attempt include: expenditure for rearing the third instars; expenditure for rearing the fourth instars; expenditure for rearing the fifth instars; Transfer of mature fifth instar on mountage (chandrake) (OR Spreading the Mountage on mature fifth instar; Harvesting the silk cocoon and grading; Cleaning the bed; Disinfection of the Rearing House; Total Cost of Production for Labour and recorded Rs. 540; Rs. 1080; Rs. 2700; Rs. 360; Rs. 720; Rs. 270; Rs. 270; Rs. 5940 respectively Table- 2 A). The heads of expenditures for the rearing the larval instars of silkworm, *Bombyx mori* (L) considered in the present attempt include: Larvae after the Second moult (Chawki worms) (DFL); Bleaching powder (Kg); Detol (Lit); Astra (gm); Vijetha (Kg); Leaves of mulberry (Kg); Lime (Kg) and total expenditure and recorded Rs 2300; Rs. 225; Rs. 600; Rs. 600; Rs. 600; Rs. 2486; Rs. 75 and Rs. 6886 respectively (Table-2B).

Total cost of production in sericulture enterprise for the pre-pandemic period (Year: 2018); pandemic period (Year: 2019 and 2020) and post pandemic period (Year: 2021 and 2022) for Pune district was found reported Rs. 29066. The cost of production was found remained constant for all the three periods (pre-pandemic; pandemic and post-pandemic) of the study. The yield of silk cocoon (Kg) for the pre-pandemic period (Year: 2018); pandemic period (Year: 2019 and 2020) and post pandemic period (Year: 2021 and 2022) for Pune district was found reported 120 Kg. The yield of silk cocoon (Kg) was found remained constant for all the three periods (pre-pandemic; pandemic and post-pandemic) of the study. The price of silk cocoons per Kg was found fixed in Maharashtra (Rs. 400 per Kg silk cocoon). The price of silk cocoons per Kg was found fixed in Karnataka state was variable. It depends on the quality of the silk cocoon. The price of silk cocoon in Karnataka state is ranging from Rs. 200 to Rs 1600 (per Kg silk cocoon). The well esteemed Ramanagara silk cocoon market is one of the significant markets for silk cocoon in Asia. Location of this Ramanagara silk cocoon market is 40 km away from Bangalore. The Ramanagara silk cocoon market is towards Mysore. The record of the silk cocoons sold each day in this market is about 40,000 Kg to 50,000 kg (on an average). This is the silk market of authority of Karnataka government. This market use to welcome the silk city to Ramanagaram, between Sholay Hill and another Sri Sri Ravana Siddheshwara Betta between the two hills, on the banks of the Arkavati river. It deserves the historical background, which appears to be the due to the traditional silk industries established during the political period of Emperor Tipu Sultan of Mysore. The Farm of Coconut has been established here in about 2.00 acres of land. The significant feature of this farm of coconut lies in nurturing the farmers of silk production and the reelers of the silk. This market availed the silk work for many more families. Therefore, the Ramanagar silk market gained the accreditation of the most significant commercial centre in Asia (Anonymous, 2020). The average price of selling the silk cocoons by the farmers during the pre-COVID-19 period was Rs.400.00 per Kg. The pandemic of COVID – 19 made to lower this price to Rs. 200 per Kg of silk cocoons. while that of COVID-19 period was Rs.200.00. This was evident with attempt of studies by Niyati and Vijayamba (2020). The gross return accrued to farmers during the pandemic of "COVID-19- induced lockdown period" was the most insignificant. This situation made not even covered the total cost incurred by silk farmers and leading to face a double loss. Constraints faced by Indian farmers of sericulture during "COVID-19 lockdown period" include: (1) Crashes in price of silk cocoon due to negative psychology (unwillingness) of the reelers to purchase the silk cocoons; (2) Locks to the silk cocoon markets (The closure of silk cocoon market; (3) Closure of the rearing of silkworm larvae by the farmers. This was due to non-availability of chawki worms (2nd instar) at the government farms. Due to non-availability of the human resource (labour), the government farms of chawki rearing were closed the work during lockdown

period of pandemic of COVID - 19; (4) Inconvenience in the transport of silk cocoon from the rearing farm to the market; (5) Lockdown period during pandemic of COVID – 19 resulted into non-availability of critical inputs for moriculture and appliances essential for silkworm. rearing appliances as majority of shops were closed during lockdown (Kumaresan *et al*, 2020 & Anonymous, 2020).

IV. CONCLUSION

The attempt of studies on the analysis of the influence of pandemic of the COVID – 19 on sericulture enterprise coincided with two crops each of hundred DFLs (Disease Free Laying) concluding leading to double loss. The silk farmers, in addition to economic loss have encountered personal inconveniences at the time of marketing of silk cocoon the local market as well as to Ramanagara market. This inconvenience was due to lack of transport and frightened psychology towards the possibility of getting infected with corona virus. The farmers busy in mulberry cultivation and rearing the silkworms during the pandemic of the COVID – 19 in Pune district (Baramati taluka, Indapur taluka and Daund taluka) faced the strategy of greater expenditure and insignificant returns. Looking into the magnitude of loss, in future, the government (or the associations of silk farmers) (or both) should plan on the reasonable relief/ compensation to sericulture growers to retain their interest in sericulture enterprise. Besides, the government (or the associations of silk farmers) (or both) should plan for covering such unforeseen (unexpected) situations having negative (or non-significant) repercussions on- silk farming community under the coverage of insurance.

The work's key findings and consequences should be clearly explained in the Conclusions section, highlighting their importance and relevance.

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Table-1 (A): Variable Cost of Production of Mulberry leaves through the Maintenance of Garden of Mulberry, *Morus alba* (L).

Serial No.	Particulars of variable cost (expenditure)	Quantity	Rate (Rs)	Total Variable Expenditure (Rs)
1	Human Resource as Labours	54	300	16200
2	Resources of Bullock as Labours	06	950	5700
3	Input – Farm Yard Manure (FYM) (Quintal)	06	4000	24000
4	Input– Fertilizers (Quintal)	06	2000	12000
5	Input- Plant Protection Chemicals (Lit.)	28.125	400	11250
6	Total Variable Cost (Rs)	-	-	69150

Table-1 (B): Fixed Cost of Production of Mulberry leaves through the Maintenance of Garden of Mulberry, *Morus alba* (L).

Serial No.	Particular of Fixed Cost	Total Expenditure (Fixed Cost) (Rs)
1	Depreciation (Rs)	-08089

2	Interest on Fixed Capital (Rs)	12220
3	Rental Value of Land (Rs)	16800
4	Total Fixed Cost (Rs)	37109
5	Total Cost (TC) (Rs)	93309
6	Yield of Leaves of Mulberry (Kg)	24856
7	Cost of Production of Leaves of Mulberry per Kg	03.75

Table-2 (A): The Expenditures for Labours for the Rearing the Larval Instars of Silkworm, *Bombyx mori* (L).

Serial No.	Expenditure Particulars	Quantity	Rate (Rs)	Total Expenditure (Rs)
1	Labour Expenditure for Rearing the Third Instar Larvae	2	300	0600
2	Labour Expenditure for Rearing the Fourth Instar Larvae	3.6	300	1080
3	Labour Expenditure for Rearing the Fifth Instar Larvae	9	300	2700
4	Transfer of the mountage (Chandrika) on mature larvae for spinning	2.4	150	360
5	Harvesting the Cocoons and their grading	4.8	150	720
6	Disinfection of Rearing House	0.9	300	270
7	Bed cleaning	0.9	300	270
8	Total Expenditure for labour for rearing silkworm larvae	-	-	5940

Table-2 (B): The Expenditures towards the Inputs for the Rearing the Larval Instars of Silkworm, *Bombyx mori* (L).

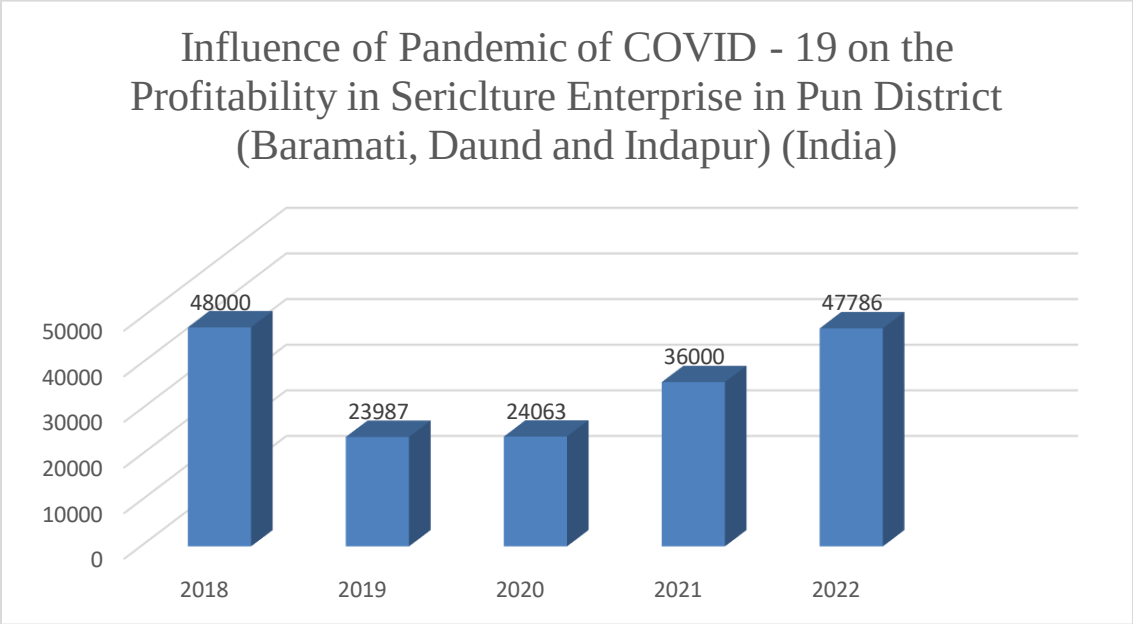
Serial No.	Inputs Particulars	Quantity	Rate (Rs)	Total Expenditure (Rs)
1	Larvae after the second moult (Chawki worms)	100	34.5	3450
2	Bleaching Powder (Kg)	7.5	30	0225
3	Lime (Kg)	7.5	10	0075
4	Decol (Lit)	3	200	0600
5	Astra (gm)	150	200	0600
6	Vijetha (Kg)	6	100	0600
7	Mulberry leaves (Kg)	2486	3.75	9322.50
8	Total Variable Cost (Rs)	-	-	20812.50
9	Depreciation (Rs)	-	-	1497
10	Interest on Fixed Capital (Rs)	-	-	6757
11	Total Fixed Cost (Rs)	-	-	8254
12	Total Cost (Rs)	-	-	29066.50

Table-3: Influence of Pandemic of COVID – 19 on Profitability (Advantageousness) of Production of silk cocoons.

Serial N0.	Particulars	Year: 2018 (Pre-COVID-19)	Year: 2019 (COVID-19)	Year: 2020 (COVID-19)	Year: 2021 (Post-COVID-19)	Year: 2022 (Post-COVID-19)
1	Total Cost of Production	29066.50 (±476.87)	29066.50 (±715.31)	29066.50 (±597.08)	29066.50 (±538.48)	29066.50 (±521.69)

	(Rs)					
2	Yield of Silk cocoon (Kg)	120 (±1.968)	120 (±6.891)	120 (±8.429)	120 (±19.786)	120 (±21.173)
3	Price (Rs) (per Kg Silk Cocoon)	400	200	200**	300*	400
4	Gross Return (Rs)	48000 (±779.49)	24000 (±391.74)	24000** (±489.68)	36000* (±447.71)	48000 (±721.84)
5	Net Return (Rs)	18933.50	-5066.50	-5066.50**	-3799.50*	18933.50
6	Cost per Kg	242.22	242.22	242.22	242.22	242.22
7	Gross Return per Kg Profit per Kg	400	200	200	300	400
8	Profit per Kg	157.78	-42.22	-42.22**	118.33*	157.78

**: P≤0.01; *: P≤0.05



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