
Foreign Experience in Innovative Development of the Silk Industry

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Abstract: The article discusses ways to increase efficiency and manage innovation activities in sericulture abroad. Bangladesh has a long and proud history of sericulture as its agro-climatic conditions are very favorable for the development of this industry. There are numerous studies abroad aimed at providing employment in rural areas, increasing the export potential of the industry, releasing a range of silk products onto the world market and increasing its competitiveness. Work aimed at improving the technology of sericulture processes through the widespread introduction of complex mechanization and automation will reduce labor costs and improve product quality.

Key words: sericulture industries, resources, efficiency, contractual relationship, investment, export, innovation.

1. INTRODUCTION

In our country, there are favorable conditions for the development of silkworm breeding, increasing the production of raw materials. Further development of the industry will not only increase the income of silkworms, but also allow them to process cocoons at home and increase the volume of exports of semi-finished and finished products abroad to obtain products that require currency.

In particular, the yield of a box of silkworm cocoons is 50-52 kilograms, the yield is 75-78%. In developed silkworm countries, this figure is 1.3-1.5 times higher, and the content of cocoons is 93-94%. The price of quality cocoons in foreign markets is 3-4 times higher. The most pressing problem of the cocoon industry is the production of high-quality competitive cocoons and silk fibers.

2. MATERIALS AND METHODS

In this research have been used official statistics from the World Bank, financial statements of foreign and domestic commercial banks, as well as current guidelines of the World Textile Organization.

Also, by authors were used statistical grouping, induction and deduction methods of scientific analysis in the study of the development of silkworm breeding.

3. LITERATURE REVIEW

Representatives of the Western and Asian scientific community rarely consider indicators of financial security, focusing more on the assessment of its individual components: scientific works of such scientists as Kalandarovna, A.G. [1], Callahan, C. [7], Cao Yu, Chen X. [3], Umarova, G., Yusupov, S. [2], Zeng W., Koutny M. [4]; indicators of financial autonomy have been studied by a number of economists such as A. Burkhanov [5], Tursunov B.O. [6], Yildirim E. [8], Umarov S. [11], Durmanov A. [12], and others.

4. DISCUSSION

The courtyard is equipped with heating devices, door frames and electrical lighting. The building also has a 3-room incubator, leaf storage and cleaning rooms. Feeding silkworms and growing

cocoons in such worms requires adherence to specific agronomic rules. To do this, pay attention to the following:

- selection of worm-feeding units and conclusion of contracts with them;
- before the worming season, heat all rooms of the building at 25–26°C and disinfect with a 4% working solution of formalin;
- timely incubation of silkworm seeds (when 1–2 leaves are formed on mulberry branches) and its healthy and timely revival (until 4–5 leaves are formed on mulberry branches);
- weighing live worms and distributing them to the units (worm feeders);
- worms revived on the first day can not be put on worms revived on the second day;
- to provide young worms with a temperature of 26–27 °C and 65–75% humidity, adult worms with a temperature of 25 °C and 60–70% humidity, 25–26 °C temperature and 60–65% humidity during cocoon wrapping;
- ventilate the worms every 2.5–3 hours for 20–25 minutes and ensure light for 16–18 hours;

During the 25-day development period, the silkworm grows 6–6.5 thousand times larger and weighs 12–13 thousand times more. The worm multiplies several times with each leaf. Therefore, it is necessary to thin them out before each leaf, that is, to expand the feeding area. According to the rules of agrotechnics, a box worm needs a feeding area of 2 m² in the first year, 6 in the 2nd year, 15 in the 3rd year, 30 in the 4th year, 60 m² in the 5th year; [10]

- first-year worms do not germinate because they are thin and very small (uneaten leaves are not removed). The reason is that some of the worms can go out with the gonads. It is shed once in 2–3 years, 2 times in 4 years and 4 times in 5 years;
- 300–350 natural and 150–200 artificial bales per box of worms are needed for cocooning of mature worms, which should be prepared at the age of 4;
- The cocoons are placed on the worms during the packing period. Leaves are fed to malnourished worms. All worms are completely suppressed when they are full of food; - On days 7–8 of cocoon wrapping, it is determined that the cocoon has matured (turned into a worm) and is allowed to pick. Dead worms are collected before the cocoon is harvested. Then, starting from the lower seat, the handles are lifted and the cocoons in the heap are collected. The cocoons are removed from the stalks and cleaned of loose and divided into 3 groups - group I varietal, group II varietal, and group III black cocoons;
- varieties of cocoons weighing 20 kg are delivered in special boxes or baskets, varieties and varieties of cocoons in separate containers;
- all rooms of the building free from worms are cleaned and finally disinfected. In addition, 50–70 boxes of worms should be divided into small rooms and sections, where 5–6 boxes (maximum 8–10 boxes) of worms should be fed. If it is greater than this, the room temperature, humidity and ventilation cannot be kept in moderation.

However, the current period requires further expansion of work aimed at ensuring the efficient use of infrastructure resources in the industry, improving generation performance, strengthening the feed base, as well as improving the quality and competitiveness of products.

It is no exaggeration to say that the Decree of the President of the Republic of Uzbekistan dated September 2 this year "On measures to further develop silkworm breeding and karakul farming in the Republic of Uzbekistan" was an important step in this direction. The Presidential Decree "On additional measures to develop the food base of silkworms in the silkworm industry" (No. PP-4567, 17.01.2020) was adopted. According to the resolution, the land allotted for new mulberries in 2020 has been determined.

In particular, in the first quarter of this year, a total of 4,985 hectares of land will be allocated for new mulberries in the country. The resolution approved the forecast parameters for the construction of protective mulches for protection against wind and water erosion in 2020-2024 in the regions of the country, aimed at increasing productivity around reclamation facilities and agricultural lands. According to him, in total, more than 12,000 hectares of mulberry trees will be built in the coming years. Also, the main targets for the care of silkworms and the production of live cocoons in 2020-2025 were approved.

On this basis, this year it is planned to grow a total of 22,000 tons of cocoons in the country. In addition, mulberry trees belonging to the regional association "Uzbekipaksanoat" Agropilla LLC will be distributed to the population on a family contract basis from 1 hectare to 3 hectares on a pilot basis.

The major silk producing countries in the world are; China, India, Uzbekistan, Brazil, Japan, Republic of Korea, Thailand, Vietnam, DPR Korea, Iran, etc. Few other countries are also engaged in the production of cocoons and raw silk in negligible quantities; Kenya, Botswana, Nigeria, Zambia, Zimbabwe, Bangladesh, Colombia, Egypt, Japan, Nepal, Bulgaria, Turkey, Uganda, Malaysia, Romania, Bolivia, etc.

The major silk consumers of the world are; USA, Italy, Japan, India, France, China, United Kingdom, Switzerland, Germany, UAE, Korea, Viet Nam, etc.

Even though silk has a small percentage of the global textile market - less than 0.2% (the precise global value is difficult to assess, since reliable data on finished silk products is lacking in most importing countries) - its production base is spread over 60 countries in the world.

Table 1. Global Silk Production (in Metric Tonnes)

#	Countries	2018	2019	2020	2021	2022
1	Bangladesh	41.00	41.00	41.00	41.00	35.00
2	Brazil	650.00	469.00	377.00	373.00	375.00
3	Bulgaria	10.00	10.00	10.0	9.0	10.0
4	China	120000.00	68600.00	53359.0	46700.0	50000.0
5	Colombia	-	0.50	1.0	1.0	1.0
6	Egypt	1.25	1.50	2.00	2.00	1.00
7	India	35261.00	35820.00	33770.00	34903.00	36582.00
8	Indonesia	2.50	2.50	3.00	3.00	3.00
9	Iran	110.00	227.00	270.00	272.00	275.00
10	Japan	20.00	16.00	16.00	10.00	10.00
11	Madagascar	7.00	7.50	8.00	8.00	8.00
12	North Korea	350.00	370.00	370.00	370.00	370.00
13	Romania	-	0.50	1.00	1.00	1.00
14	Philippines	2.00	2.00	2.00	2.00	1.00
15	South Korea	1.00	1.00	1.00	1.00	1.00
16	Syria	0.25	0.50	1.00	1.00	1.00
17	Thailand	680.00	700.00	520.00	503.00	435.00
18	Tunisia	2.00	2.00	2.00	2.00	1.00
19	Turkey	30.00	5.00	5.00	5.00	5.00
20	Uganda	-	3.10	3.00	3.00	3.00
21	Uzbekistan	1800.00	2037.00	2037.00	2037.00	2037.00
22	Vietnam	680.00	795.00	969.00	1.067	1.067
	Total	159648.00	109111.10	91765.000	86311.00	91221.00

While the major producers are in Asia (90% of mulberry production and almost 100% of non-mulberry silk), sericulture industries have been lately established in Brazil, Bulgaria, Egypt and

Madagascar as well. Sericulture is labour-intensive. About 1 million workers are employed in the silk sector in China.

Silk Industry provides employment to 7.9 million people in India, and 20,000 weaving families in Thailand. China is the world's single biggest producer and chief supplier of silk to the world markets. India is the world's second largest producer. Sericulture can help keeping the rural population employed and to prevent migration to big cities and securing remunerative employment; it requires small investments while providing raw material for textile industries.

Some of the countries have provided more elaborate statistical data on silk industry, other than the production data given above. [9]

Bangladesh has a long and glorious history in sericulture as her agro-climatic condition is very favorable for the development of this industry. 'Bengal Silk' was very prominent all over Asia. By the early 20th century, Bengal silk was pushed out of South Asian markets, especially by Kashmir and Mysore silk. The partition in 1947 brought about a disastrous condition in the silk industry of Bangladesh, as less than 10 percent of Bengal mulberry area was incorporated into Bangladesh, the then East Pakistan. The Bengal was known as the Ganges silk in distant Italy as early as the 13th century. Bengal produced much more silk that was used locally, and it boasted a vigorous export trade of both textiles and raw silk. It was this trade which first attracted European traders to Bengal. Gradually European traders started to influence the course of this industry.

According to Banglapedia (National Encyclopedia of Bangladesh), by 1835, the British East India Company ran over a hundred filatures in the region and exported about 400 tons of raw silk. Later, private companies took over and the export trade boomed till the 1870s, when because of the epidemic silkworm diseases and technological stagnation Bengal lost most of its foreign markets and Japan emerged as a new major silk exporter. By the early 20th century, Bengal silk was pushed out of South Asian markets, especially by Kashmir and Mysore silk. By the 1930s, Chinese and Japanese silk started replacing Bengal silk even in Bengal itself. What this meant in terms of employment can be illustrated by the example of the Rajshahi district. In the 1870s, some 250,000 people derived incomes from silk production there; in 1901, the number stood at 41,000 but in 1921 it was less than 600. The partition in 1947 brought about a disastrous condition in the silk industry of Bangladesh, as less than 10 percent of Bengal mulberry area was incorporated into Bangladesh, the then East Pakistan (Banglapedia). This industry was at the verge of extinction producing little more than 100 lbs in the few villages of the Rajshahi District. At that time silk enterprises were not supervised by the government and left in its entirety to local people for the production of mulberry and silk materials. After partition, although the then East Pakistan government undertook a grand sericulture development program under which 10 sericulture nurseries, one silk pilot project and one silk research and training institute at Rajshahi were established, what was lacking was a whole-hearted effort in tapping the full potentials of sericulture and providing adequate incentives to the producers to exploit them. From 1947 to 1977 sericulture activities were looked after by organizations like

Directorate of Industries and BSCIC (Bangladesh Small and Cottage Industries Corporation). During this post-independence period the silk industry received a more focused attention in terms of capital investment, operational policy formulation, and institution building. Immediately after the independence, one of the major policy measures with respect to the silk sector of the country was imposing restrictions over the import of silk yarn and silk fabrics thus providing the long protection of the sericulture sector. Subsequently, with a view to expand sericulture throughout the country the government of independent Bangladesh decided to create a separate organization known as BSB (Bangladesh Sericulture Board) which began functioning from February, 1978 with its headquarters at Rajshahi nicknamed the 'silk city'. Since the mid-eighties, several NGOs started to promote sericulture and silk weaving among poor rural women with financial assistance from donors and technical assistance from BSB. BSB again reformed and renamed as Bangladesh Sericulture Development Board in 2013. [15]

Traditionally Bangladesh is the multivoltine zone due its tropical climatic nature. Initiation of sericulture in Bangladesh was through using multivoltine silkworm race called ‘Nistari (Indigenous)’ and using of these races in field was continued for a long time. For improving the field production, improved silkworm race was developed and introduced from 1980s. Due to exploitation of these improved silkworm races cocoon production was increased to 40-60 kg/100dfls from 20-25 kg/100dfls. These improved silkworm race are mentioned as below. (table 2).

Table 2. Information about improved silkworm race

Sl. No	Name of the Improved silkworm race	Production level/100dfls(kg)
1.	Bipul	45.00
2.	FT-B	45.00
3.	HTHHRB-3	44.00
4.	BSR-95/14	46.00

At present hybrid eggs are using in the field for high as well high as well as stable cocoon production and as result cocoon production is increased to 60-70 kg/100dfls. Details of hybrid combination with its production level are mentioned below:

Table 3. Information about details of hybrid combination

Sl. No	Hybrid combination	Production level/100dfls(kg)
	For May-June and August-September season:	
1.	(Nistari × FT- B) × HTHHRB- 3	50-58
2.	(N (1)K × FT-B) × HTHHRB-3	
3.	(Nistari × BSR-95/14 × HTHHRB-3	
	For October-November and February-March Season:	
4.	BN (M) × BB (Multivoltine) (Bivoltine)	60-70

According to Annual Report of Silk Industry Owner's Association, 2019 thirty-two private silk industries working in the country produce 2.43-million-meter silk cloth and their annual sales is 8361.10 Lac Taka. BRAC, the leading NGO in the country is still working in sericulture 1,000 women are engaged in silkworm rearing and 4,000 women in silk spinning. Nowgaon Education Development Association (NEDA) and Socheton is working in sericulture in coordination with Bangladesh Sericulture Development Board [14].

5.CONCLUSSION

In our opinion, based on foreign experience, the following proposals can be made in the field of the cocoon industry of the republic:

- creation of an innovative platform that makes it possible to receive opinions and advice from various experts of the cocoon network that develops the transfer of information;
- organization of additional production that effectively uses available resources so that cocoon growing enterprises do not reduce their material profitability due to natural factors;
- increase intellectual potential in the cocoon industry, organize educational courses on organizing clusters in the industry and managing it;
- Creation of innovative business models for entrepreneurs in the cocoon industry.

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