

ANALYSIS OF PAKISTAN'S SERICULTURE INDUSTRY IN HISTORICAL PROSPECTIVE

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Abstract

Sericulture, as a cottage industry, can play an important role in the well-being of deprived rural populations and eventually foster the growth of the economy. The Pakistan sericulture industry experienced abundant growth and progress during early decades of independence. Currently, however, this industry is almost defunct. Acknowledging the importance of the issue, this study explores past experience to formulate policy to stabilize the sericulture industry of Pakistan. This study is based on qualitative data. Primary data was collected from stakeholders involved in different activities of the sericulture industry. For better understanding of this sector, primary data was also supported by secondary data from relevant literature. Results of the study indicate that although the sericulture industry was historically profitable, which with the passage of time it has collapsed due to several reasons; it can be reinstated with more attention and commitment.

Key words: sericulture, rural development, employment opportunities

INTRODUCTION

The cottage industry holds an important position in both the rural as well as urban set up of Pakistan. The significance of sericulture lies in its huge capacity to absorb the labour force, especially women and the youth. It produces a variety of goods and is helpful in lessening the import burden. After the independence of Pakistan, sericulture was marked as an important cottage industry and special attention was given to it. Till the era of 1990s, sericulture remained a flourishing and profitable form of entrepreneurship in Pakistan. At that time, it was a supportive occupation and that provided a supplementary source of income to poor communities involved in sericulture. After 2000-2001, the decline of this industry began due to several reasons explored in this study [2].

Currently, the productivity and efficiency of cocoon yield in Pakistan is very low. In comparison to Pakistan, sericulture is flourishing in neighbour countries like China, India, Bangladesh, and states in Central Asia and Africa as they have a clear vision and focus to promote this sector. To develop sericulture these countries have established separate

sericulture boards, (Central Silk Board India, Bangladesh Silk Board) [3] directorates, research centers and educational institutes, and there is a strong coordination between governmental, non-governmental, international welfare and development organizations (International Sericulture commission (ICS), BRAC) [8].

Pakistan's annual domestic cocoon demand of 750 metric tons is met by imports from China, Iran and Central Asian states (Sabir, 1997, as cited in Ahmad and Shami, 1999), verified by author during KII with Ghulam Sabir (Deputy Director Punjab Sericulture Department) [13]. In this study, a comprehensive literature regarding the status of sericulture industry in Pakistan is sighted.

The main objective of this study is to present an updated insight into Pakistan's sericulture industry and existing infrastructure, with the following specific objectives:

- (i) Identify major reasons behind the decline of the sericulture industry and main constraints in its progress in view of past picture of sericulture in Pakistan;
- (ii) Collate facts about the current and actual status, and infrastructure of Pakistan's

sericulture industry by interviews of sericulture stakeholders.

Sericulture is considered as an effective foundation for the efficient use of scarce resources. The sericulture industry is also considered as a tool for poverty alleviation as it offers various self-employment opportunities. It can save foreign exchange, and help to reduce urbanization and its related problems. It requires low investment and simple technology, but well planned infrastructure (Geetha and Indira, 2011) [4].

Promotion of sericulture may cause multi-dimensional benefits in Pakistan like effective utilization of resources, opportunities for employment generation, meeting the local needs and exports, rural development, checking migration from rural to urban areas, positive impacts on climate (Neeraja *et al.*, 2014) [11] and unlimited opportunities and benefits of sericulture eco-system development (Hungar *et al.*, 2016) [5]

In 1947, the sericulture department was established as a wing of the forestry department. The sericulture department was established in Punjab in 1947, in Khyber Pakhtunkhwa (KPK) in 1952, in Baluchistan in 1959 and in Sindh in 1975. Since considerable efforts were made in the past to promote the sericulture sector in Pakistan, there is a reasonable amount of existing sericulture infrastructure waiting for revival. Moreover, the climate, geography and socio-economic conditions of Pakistan are highly suitable for mulberry cultivation and silkworm rearing (Singhal *et al.*, 2010) [15].

The main reasons behind the deterioration of this industry include lack of attention and interest of state, old and less productive silk seeds, lack of standardized conditions and infrastructure, inappropriate rearing sheds, and lack of advancement in policies, research and technology (Ahmad and Shami, 1999) [1].

MATERIALS AND METHODS

This is a qualitative and descriptive research study where primary data was collected from different localities of Pakistan through a structured questionnaire. Key informant

interviews (KIIs) and focus group discussions (FGDs) were conducted with stakeholders of the sericulture sector, including sericulture experts, officials, farmers, reelers and traders. For analysis, understanding and elaboration of research objectives, secondary data from various reports, articles, magazines and publications was also considered. Primary data collection of KIIs and FGDs were conducted as mentioned below.

Table 1. Respondents of primary data

Respondents	KIIs	FGDs
Sericulture officials	25	3
Sericulture experts	5	0
Farmers	100	5
Cocoon reelers and traders	5	0
Total	135	8

Source: MS thesis of the author, Muhammad Farooq Hyder.

Twenty-five KIIs were conducted with sericulture officials from 11 localities of Pakistan including Lahore, Kasur (Changa Manga), Sargodha, Mandi Bahauddin, Sarai Alamgir, Multan, Faisalabad, Chechawatni, Hyderabad, Peshawar and Muzafarabad. To gauge farmers' opinions on this industry, 100 KIIs were also conducted through convenient sampling format from six localities. These six localities of Changa Manga, Chechawatni, Faisalabad, Mandi Bahauddin, Sarai Alamgir and Muzafarabad have seen massive silk worm rearing activities in the past and, to some extent, are also currently involved in this sector. In comparison to the past, however, there are very few farmers who are still engaged in such rearing activities. Out of 100 farmers questionnaires, 40 interviews were conducted from Changa Manga, 20 from Chechawatni, 15 from Faisalabad and 10 from Mandi Bahauddin, 5 from Sarai Alamgir and 10 from Muzafarabad. This unbalanced ratio of interviews is due to the least availability of respondents. For the purpose of analysis, descriptive statistics are used and elaborated with through tables.

RESULTS AND DISCUSSIONS

Qualitative results, after detailed FGDs with eight focal groups are arranged in four sections. The first section describes the

historical picture of sericulture industry, followed by reasons for decline, constraints of the industry, and the current status and infrastructure of Pakistan’s sericulture industry. Both KIIs and FGDs have informed the following results.

Historical Depiction of the Booming Sericulture Industry

Experts, officials and farmers, during the FGDs, indicated towards a *booming period* of the sericulture industry. This was a growing industry till 1995 and one in which thousands of families were engaged. After the mid-1990s it started moving towards a decline, struggling till 2000, after which a quick decline is observed.

About two decades ago, sericulture was a fruitful occupation in Pakistan for both farming and non-farming families. In Kashmir, Gilgit and Baltistan and the four provinces, silkworm rearing was supporting thousands of families. Around 35,000 to 40,000 families were engaged in this part time activity, from which about 15,000 families were from Punjab alone (Jamali, 2010) [9]. There were hundreds of reeling units in Changa Manga, Lahore, Chechawatni, Multan, Hyderabad, Karachi, and Swat. Quality of domestic cocoons was considered better and superior to imported cocoons of neighboring countries such as India, Bangladesh, Sri Lanka and Central Asian states as mentioned Mian Muslim, Ex-Senior Research Officer, Punjab Sericulture Department. At that time against a domestic cocoon demand of 500 metric tons, the domestic cocoon production was 300 metric tons. In Pakistan during 1980 to 1990, domestic demand of silk seed packets was about 45,000 packets as affirmed Ghulam Sabir, Ex-Deputy Director, Punjab Sericulture Department

This huge demand of silk seed was fulfilled by the government sericulture department and private companies.

(i)*Quality silk seeds* were available and had good production results. Domestically prepared varieties of silk seed were provided by the sericulture department. Although there was great demand for both domestic and imported seed varieties, quality of Pakistani bivoltine silk seed was considered better and

superior to imported silk seeds. According to sericulturists engaged in the KIIs and FGDs, domestic seed production was less than market demand, making it a competitive environment for seed buyers.

Varieties of imported silk seed were provided by private silk fiber reeling groups. The largest share among imported seed providers was that of Gulmerg Silk Company. Korean silk seed variety named “DPR” was considered best for production and was provided by Gulmerg Silk Company and other groups. For cocoon production, about 37,000 packets of imported silk seed were distributed by reeling groups during this booming period (Najam, 2016) [10].

(ii)*Rearing benefit* was a large source of income generation; two to three months of silkworm rearing activity was enough to fulfill basic needs of life for a year. For example, silkworm rearing can support the purchase of wheat for a whole family for an entire year, or bear education or marriage expenses of children in a year, to construct or repair houses, to repay loans or to buy cattle.

Table 2. Utilization of rearing benefits

Benefits	Utilization
Marriage Expenses	25 %
Purchase of Wheat	30 %
Purchased Cattle	9 %
Domestic and Educational Expenses	16 %
Clear the Loans	12 %
Construction and Repairing of Homes	8 %

Source: MS thesis of the author, Muhammad Farooq Hyder.

(iii)*Employment opportunities* were provided to thousands of families who were involved in silkworm rearing activities during the booming period.

Table 3. Number of families involved in sericulture

Punjab	KPK	AJK	Sindh	Baluchistan	Total
15,000	4,000-6,000	6,000	1,500	300-500	26,800
-	-	-	-	-	-
20,000	-	8,000	2,000	-	36,500

Source: Jamali, 2010. Punjab Sericulture Department, Directorate of Sericulture, AJK [9]

Silkworm rearing, silk reeling, weaving units and cocoon production activities were an

additional and seasonal source of income for these families.

Reasons of Decline

Reasons involved in the decline of this industry drawn from KIIs and FGDs point towards the *lack of government interest* as the primary reason of decline. The sericulture department in Pakistan is working in all provinces, sericulture extension centers exist at district levels and the government is spending a huge annual budget. However, instead of consuming this budget on development of sericulture, it is allocated to salaries and allowances of sericulture officials. The ratio of development to operational expenditure, and the ratio of revenue to budget of sericulture industries are both close to zero.

Destruction of the Pakistani parent (P-1) silk seed is another major reason of decline. Silk seed obtained from pure parental lines is called P-1. The preparation of P-1 is a complex, long and difficult process, taking almost 8 to 10 years. Mian Muslim, a committed and hardworking man who served in the sericulture department as a senior research officer and retired in 1999, introduced 11 different varieties of P-1 (PAK-1, PAK-2, PAK-3, PAK-4, M-101, M-103, M-104, M-107, S-1, PFI-1, PFI-2). In terms of quality and quantity of cocoon production, these varieties have pronounced results. These parent varieties were prepared according to requirements of different climatic zones and were capable to produce more than 40 to 50 kilograms of cocoons, per packet, across areas of Pakistan. Unfortunately, after Mian Muslim's retirement, despite preserving and further improving these parent varieties, the sericulture research department mixed-up and destroyed these parent varieties. Now, Pakistan does not have a single parent variety and there is a high mortality rate in old, mixed and poor quality silk seeds. While under the sericulture development plan from 2006 to 2011 Pakistan imported silk seed from Bulgaria, this seed was not able to produce the desired results. It was observed that after the fourth sleep, mortality rate of silkworms is very high. This high mortality rate makes it inevitable for sericulturists to leave this sector. *Decrease in*

mulberry areas also contributed to the decline in this industry. Changa Manga, Chechawatni and Guttwala/Faisalabad were considered as main places of mulberry plantation in Punjab. Data collection for this study included visits to these forests, where it was discovered that the forest once having countless mulberry trees is now converted into bared ground. Unfortunately, mulberry as well as other types of precious trees could not be preserved and were stolen by timber mafia. The forest Changa Manga no longer exists and the name refers only to a plane ground without trees. Situation of Chechawatni and Guttwala/Faisalabad forests is similar and approaching towards the same end.

Before the *dissolution of Union of Soviet Socialist Republic (USSR)*, Gulmerg Silk Company and some other reelers distributed almost 37,000 packets of imported silk seed per season. In December 1991, USSR was dissolved into 15 countries. To support the economies of these newly established Central Asian Muslim states, the government of Pakistan opened a duty free route for trade. Due to long-lasting war, these countries had a sizable stock of silk cocoons. These states started exporting these cocoons at very cheap prices and Pakistan became a big cocoon market for these Central Asian states. Due to reduction in prices, profit margin decreased and local sericulturists lost their interest in silkworm rearing but the cocoon reeling industry saw high profits. After stabilizing these Central Asian states invented new markets for their cocoons and prices of imported cocoons rose. Consequently, profit margin of reeling units started to shrink. Due to low production of domestic cocoons and high prices of imported cocoons, reeling units started facing a shortage of cocoon supply and gradually these reeling units closed down. (Derived from KIIs and FGDs).

Constraints of the Pakistani Sericulture Industry

To know the constraints behind the progress of Pakistani sericulture industry, it is important to compare infrastructure and policies of other progressive silk producing countries in the region. Data collected in the detailed FGDs

have identified the following gaps in Pakistan, in comparison to other countries.

(a) Pakistan sericulture industry is not a priority of state as a cottage industry because there is a *lack of advanced research* to determine sericulture potential. There is also a lack of technology, training and techniques to improve sericulture practices in Pakistan.

(b) There is a *lack of specialized work force* in Pakistan, which is a crucial element for this industry. Top silk producing countries in the region, like China, India and Bangladesh, are promoting general as well as specialized education in different fields of sericulture sector from school to the university level. This strategy has produced a specialized workforce for the sericulture sector. In Pakistan, on the other hand, there is no institute or research center which can focus on the development of sericulture specialists.

(c) There is *severe deficiency of governance* on the sericulture industry in Pakistan. The sericulture department is working as a wing of the forestry department, which has only a marginal interest in the industry. There is a barrier between policy making and implementation of these policies due to the lack of check and balance, regulatory authority or specialized researchers and graduates in this department. On the other hand, advanced silk production countries in the region have established separate directorates of sericulture; such as the Central Silk Board (CSB) in India and the Bangladesh Silk Board (BSB) in Bangladesh which deals with matters related to sericulture.

Due to the welfare oriented nature of the sericulture industry, several non-governmental organizations (NGOs) are also playing a remarkable role in this sector in different countries of world. These NGOs are contributing in terms of funding in the areas of extension, training, micro-financing, research and technology. With the help of NGOs sericulture is providing 8.6 million jobs in India and 0.86 million in Bangladesh, but in Pakistan this figure is miniscule. In Pakistan, yet there is a *lack of interest in NGOs* to contribute to the development of sericulture in Pakistan.

(d) *Climate diversity* and its' impact on silk production is another constraint. Currently climate change in Pakistan has led to a prolonged summer season, shortened winter season, higher weather intensity, shorter duration of rains, disturbance in the monsoon schedule, and greater occurrence of uncertain and heavy rain falls. These changes in the climate have a significant impact on silkworm rearing which needs to be mitigated through adopting coping strategies and preventive measures.

Opportunities in Pakistan's Sericulture Industry

In this section existing infrastructure of Pakistan's sericulture industry is explored and classified in three parts.

(i) *Cocoon production*, In silkworm rearing, cocoon production is measured against one packet of silk seed and it is considered as a basic tool to measure the success or failure of farmer's efforts. While there can be variation in the weight of silk seed packets, a standard silk seed packet has an average weight of 16 onuses, consists of 40,000 eggs. The sericulture department recommends that if a family consists of five to six members, then they should rear at least two packets at a time, and three to four packets in a season. During data collection almost all of the farmers responded that they can easily rear two to three packets in a season.

Table 4. Cocoon production remarks

Remarks	Breakeven	Average	Normal/Good	Attractive
Production (KG)	15 – 20	20 – 25	25 – 30	>30

Source: MS thesis of the author, Muhammad Farooq Hyder.

In the current scenario, cocoon production ranging from 15 to 20 kilograms, per packet, is considered the breakeven point. Production ranging from 20 to 25 kilograms is considered average production while production ranging from 25 to 30 kilograms is considered normal and, to some extent, good production. More than 30 kilograms of cocoon production, which is not difficult to attain, is considered attractive production. Historically, Pakistani farmers were easily able to produce more than 30 kilograms of cocoons. Farmers reported that

due to good quality of silk seed they were able to produce more than 40 kilograms of cocoons. Moreover, some Pakistani parent (P-1) varieties prepared by Mian Muslim, like S-1, PFI-1 and PFI-2, gave a record production of over 50 kilograms of cocoons. In the past, regarding per packet cocoon production, satisfaction level of farmers was high and about 84 percent responded that they were able to produce an average of 30 to 35 kilograms of cocoons due to good quality of silk seed.

Table 5. Per packet production in 2013-2015

Production (kg)	0-5	5-8	>8
Results	85%	13%	2%

Source: MS thesis of the author, Muhammad Farooq Hyder.

Currently, 100 percent of farmers are dissatisfied with production results. During the 2013 rearing season, about 2 percent of respondents produced less than 8 kilograms cocoons from one packet of silk seed and about 13 percent produced between 5 to 8 kilograms, while around 85 percent were not able to get any yield as all of their silkworms died during the fourth stage.

Table 6. Cocoon rates

Nature	In Punjab	In AJK
Wet	Rs. 550 – 700	RS. 350 – 500
Dry	Rs. 1,500 – 2,000	RS. 1,350 – 1,500

Source: MS thesis of the author, Muhammad Farooq Hyder.

Cocoons are classified in terms of wet and dry cocoons. After drying, the weight of a cocoon drops to a third of the wet weight. For instance, 10 kilograms of wet cocoons drop to approximately 3 to 3.75 kilograms after drying and the rate of cocoons also increases with this ratio. In the past, when this industry was booming, the price for good quality wet cocoons was about Rs. 200 to 250 and for dry cocoons was about Rs. 600 to 800, per kilogram. These rates were satisfactory due to lucrative production results and high value of money. Currently, rates of good quality wet cocoons range from Rs. 650 to 800 and dry cocoons from Rs. 1,850 to 2,100, per kilogram.

While this is still a reasonable rate, due to fewer yields it is not that profitable.

Currently in Pakistan, AJK silk seed varieties are considered more reliable than any other local variety. The relevant department in AJK has assured farmers that if standard rearing requirements are fulfilled then their silk seed varieties are capable of producing up to 20 to 25 kilograms of wet cocoons, per packet. According to this estimation, farmers or families who will rear four packets of silk seed can earn up to Rs. 50,000 to 60,000 in a one and half month's activity. This amount can support the farmers in a better way.

Table 7. Rearing experience

Experience (Years)	20 – 30	30 – 40	>40
Percentage	35%	45%	20%

Source: MS thesis of the author, Muhammad Farooq Hyder.

Table 7 describes that about 35 percent of farmers from the sample have 20 to 30 years of experience; about 45 percent have 30 to 40 years of experience while about 20 percent have more than 40 years of experience. Farmers attached with sericulture in the past are more willing to adopt this profession again as they are aware of the economy and benefits of sericulture.

(ii) *Silk seed varieties*. In Punjab silk seed production laboratory Murree has a production capacity of approximately 5,000 silk seed packets. The production capacity was about 4,000 packets in AJK, but due to massive damage in the 2005 earthquake this capacity has been decreased to 1,600 packets. Therefore, current total silk seed production capacity of Pakistan is about 6,600 packets. The three silk seed varieties used for rearing are mixed and old varieties of Punjab, imported Bulgarian variety and a variety of AJK.

-*Mixed and old variety of Punjab*. In past, Punjab had 11 different parent (P-1) varieties but unfortunately these profitable varieties were destroyed as a result of departmental negligence. Due to the carelessness of laboratory staff during seed production processes, these parent varieties were mixed up with each other. Now, seed of these mixed

varieties is considered a failure because it is old, less resistant to disease and has poor production results.

Table 8. Punjab silk seed varieties

PA K-1	PA K- 2	PA K- 3	PA K- 4	M -	M -	M -	M -	S -	PF I-1	PF I-2
				1	1	1	1	1		
				0	0	0	0	0		
				1	3	4	7			

Source: MS thesis of the author, Muhammad Farooq Hyder.

-Imported Bulgarian variety. Under the sericulture development plan 2006 to 2011, the Punjab sericulture department imported a variety of the Bulgarian silk seed to further produce silk seed. However, this variety was not able to produce desired results. Experts and farmers declared this variety unreliable as it has less resistance and production, and a high mortality rate.

-AJK varieties. According to the department of sericulture in AJK, they have 23 types of parent silk seed varieties which, under standardized conditions, are capable of producing about 25 kilograms of wet cocoons, per packet. While in the past varieties of AJK silk seed were considered good, due to the lack of advancement, innovation and technology, production results of these varieties have decreased. Still, AJK seeds are better than other available seeds and capable of further improvement.

Table 9. AJK Silk Seed Varieties

PTK-1	PTK- 2	KP- 1	KP- 2	KP- 4	#106	#112	#113
OWC- 1	K-1	K-2	Y3- 6	KP- 3	#133	J- 101	#124
JAM- 119	JAM- 120	SJ	Y5- 6	-----	8-J	C- 102	#115

Source: MS thesis of the author, Muhammad Farooq Hyder.

(iii)*Moriculture.* Cultivation of mulberry is called moriculture. In this section, available mulberry varieties and their characteristics are discussed. Genetically, mulberry belongs to the *Morus* family and the species and varieties common to rearing purposes in Pakistan are *Morus alba*, *M. alba linn*, *M.laevigata* and *M. latifolia*. Both *M.laevigata* and *M. latifolia* are nutritious and have high protein broad and succulent leaves which positively impact

cocoon production as more than 70 percent of proteins in the cocoon are derived from mulberry leaves as mentioned in the Official Report of AJK Sericulture Department, 2012.

Mulberry is mainly propagated by grafting, cutting, seed sowing and tissue culture. Proper time of plantation for rooted plants is December to January while for cutting plantation it is from February to middle of March. In Pakistan available mulberry varieties can be classified into three general categories – tree type variety (Desi Toot), grafted variety, and bush type variety (imported).

-Tree type variety. This local variety is also known as “Desi Toot.” In comparison to other imported varieties, this local Pakistani variety has different features which make it unique. For instance, it does not require particular care and can be cultivated under diverse environmental conditions. Leaves of this variety have more protein with comparatively richer nutrients. Silkworms that eat leaves of this variety spin fine quality of cocoons and these cocoons have more weight. Shoots of this variety are more strong and flexible. Plants of this local variety grow into a huge tree, producing a strong and demanding timber. This feature is can also be considered as a drawback because leaves picking from such huge trees is difficult for women and children.

-Grafted variety. In grafted varieties *M.laevigata* and *M.latifolia* are more useful and produce thick, nutritious and broad leaves along with edible fruit. The seeds produced by these varieties are not fertile and cuttings have poor rooting ability. Therefore, propagating these varieties through normal vegetative methods like cuttings or layering cannot be practiced. In this case bud and cleft grafting is the procedural protocol for its propagation. Phyto-hormones can also be used to promote vegetative propagation as mentioned in AJK Report, 2005.

-Bush type variety. Sericulture department has introduced several imported bush type varieties like Japan-early, Japan-late, Ever-green, Latifolia, Punjab-1, Punjab-2, and different varieties from China, Korea and Sri Lanka. Early sprouting, fast growing and easy picking of leaves are three main features of these bush

type varieties. After picking of leaves, leaves regrow and mature for feed in two to two and a half months. Sprouting of these varieties starts early and due to availability of leaves, silkworms can be reared in the desired time. These varieties grow into bushes, making it easy for women and children to pick. Aside from mulberry varieties, the area under mulberry plantation is decreasing day by day and there is a strong need for re-plantation and preservation of existing jungles. In spite of local tree type mulberry plantation, department is promoting imported bush type plantation.

Table 10. Area under Mulberry Plantation (Hectors)

Punjab	Sindh	AJK	KPK	Baluchistan	Total
600 - 800	150 - 200	100 - 150	-	-	850 - 1150

Source: Punjab Sericulture Department, Directorate of Sericulture AJK, Dawn, 2001.

Currently, the area under bush type mulberry plantation is about 600 to 800 hectares in Punjab, about 150 to 200 hectares in Sindh, and about 100 to 150 hectares in AJK. In KPK and Baluchistan there is no specific area allocated for mulberry plantation, and only recently in KPK is the Non Timber Forest Product Department developing huge mulberry nurseries for experiment purposes as affirmed by Pakistan Forest Institute, Peshawar [12].

(iv) *Sericulture extension centers and silkworm rearing areas.* Previously sericulture activities were being performed massively in different areas and cities of Pakistan. Province wise localities of sericulture extension centers and silkworm rearing areas are mentioned below.

Punjab. In Punjab, sericulture extension centers are operating at the district level. Areas where silkworm rearing activities were performed massively in the past and also familiar currently, are Changa Manga, Kasur, Faisalabad, Chechawatni, Samundri, Sarai Alamgir, Khushab, Daffar, Mona, Gujranwala, Mandi Bahauddin, Toba Tek Singh, JhalChakian, Kamalia, Rajana, Jhang, Gujrat, Multan, Jaranwala, Head Faqirian, Rawalpindi, Sangla Hill, Qadir Abad, Taxila, and Kassowal. While in these areas land for mulberry plantation has also been allotted to the department extension centers, it is

insufficient and cannot fulfill the demand as needed.

AJK. Sericulture industry is an old and substantial source of income for the rural poor of AJK. Climate and soil of this region has great heterogeneity and diversification. Muzafarabad, Bagh, Poonch and Sudhnoti districts are hilly, whereas Kotli, Bhimber and Mirpur are partially hilly and partially plain. Conditions here are highly favorable for silkworm rearing in both spring and autumn seasons. Rural poor of AJK have less opportunities of employment and rearing season provides an economic incentive for these people. The 2005 earthquake drastically impacted AJK sericulture, damaging infrastructure and seizing rearing and silk seed production activities. Moreover, the filature unit was completely destroyed, negatively affecting livelihoods of about 900 families attached with sericulture.

To extend economic incentives, the AJK sericulture department is promoting (*M. laevigata*) and (*M. latifolia*) and have six mulberry nurseries in Afzalpur, Dhamal, Gorah, and Patikka with the capacity to produce about 0.6 million mulberry saplings annually. Although the AJK sericulture department has strengthen itself in different disciplines of research and technology, it is still lagging in standard requirements. Still, the AJK department has capacity for the development, multiplication and maintenance of pure lines of silkworms. Across all districts of AJK, department have 14 seed cocoon production and egg preservation centers. Annual silk seed production capacity for commercial purposes is about 1,600 packets which are distributed in spring and autumn. These packets are supplied to the government and private sector in different areas of Pakistan. Per packet cocoon production capacity of AJK silk seed is about 10-25 kilograms, which is unsatisfactory and very low in comparison to neighboring countries. Department of sericulture, Muzafarabad also planted about 68,500 mulberry saplings in 477 educational institutes of AJK.

In *KPK*, the sericulture department head office is located in Peshawar and sericulture

extension centers are located in different districts. In the past sericulture activities were performed extensively in the districts of Dera Ismail Khan, Peshawar, Mardan, Swabi, Katlang, Swat, Mengora, Matta, Char Bagh, Dir, Garam Chashma, Haripur, LondKhar, Kohat, Para Chanar, Bannu, Miran Shah, Waziristan, Gilgit/Baltistan, Chitral and Kalash valley. Now, KPK silkworm rearing activities are a story of the past and people have forgotten it.

Sindh. In Sindh, sericulture was initiated on an experimental basis in 1975 at the Miani forest. After successful experimentation it is now extended to Ghotki, Sanghar, Sukkhar, Tharparker, Mirpur Mathelo, Khipro, Naukot and Hyderabad districts. Silkworm breeding center is working at the Miani forest. It provides technical know-how and distribute silk seed to the sericulture extension centers. In Sindh, imported and local silk seed varieties are used for silkworm rearing. Sindh Forestry Department (SFD) has produced more than 10,000 kilograms of cocoons during the last two decades [14].

Two to four crops can be harvested during spring and autumn seasons. However, due to low production sericulturists are not interested in rearing and these rearing activities are shrinking down to a few localities. Provincial secretaries for forest, wildlife and environment stressed the need for development of sericulture as an independent industry like China, Japan, India, Russia and Korea.

Baluchistan. Several areas of Baluchistan are suitable for sericulture and the department of sericulture in Baluchistan executed and conducted several successful experiments in Ziarat and Kalat agencies in the past. Currently, the sericulture department exists here, but is not functional.

In past Changa Manga, Chechawatni, Multan, Peshawar and Muzafarabad were the main cocoon markets and have declined due to limited activities. Now, during the season minimum amount of cocoon trading activities are seen in Changa Manga. Historically, there were hundreds of operational reeling units in Changa Manga, Multan, Karachi, Muzafarabad, Peshawar and Swat valley. Instead of selling cocoons a huge number of

farmers preferred to reel their cocoons. These cocoons were reeled with the help of traditional hand type *charkha* and electric motor machines, allowing farmers to earn 30 to 40 percent more money. Along with home based reeling, there was a separate silk reeling industry in Pakistan in which thousands of people were engaged.

With the passage of time and due to the shortage of cocoon availability, majority of reeling units have been closed with few operational reeling units working in Changa Manga, Multan and Karachi. While in the past the department of sericulture Muzafarabad had its own silk reeling filature unit with advanced technology characteristics, this was damaged in the 2005 earthquake and has not been repaired since. (Hyderabad: Promotion of cottage industry urged. (2001, December 3) [6].

CONCLUSIONS

Results of the KIIs and FGDs indicate that sericulture in Pakistan was once a remunerative occupation but due to several reasons and with the passage of time, this industry in Pakistan is near to demise. Results also indicate that promotion of the sericulture industry in Pakistan is not a difficult task but one that requires intention and commitment. It was also proved that promotion of sericulture requires very low capital and is supportive for employment generation.

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