

## **PROGRESS OF SERICULTURE RESEARCH AND DEVELOPMENT IN PAKISTAN**

**BY**

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### **Introduction**

Although sericulture as a cottage industry has a long history in Pakistan, it has not made any real progress until recently. The main impediment was lack of technical manpower for research in quality egg production, mulberry cultivation, silkworm rearing, silk yarn technology, and cocoon and silk marketing. Other factors also played an important part in this regard. These include import policy for silk seed and raw silk and price fluctuations faced by farmers in sale of cocoons.

In the North West Frontier and Sindh provinces, all silkworm eggs are imported by the provincial government. However, in Punjab, these are imported by both Government and private agencies; AJK and Balochistan obtain their silk seed from Punjab. The silk eggs imported by private agents are generally substandard and are of poor quality, as there are no strict quarantine checks to detect pebrine disease in them. Furthermore, silk eggs are imported without any duty and there are no import restrictions on their quantity or quality of imported material. In spite of these factors, the cocoon production within the country has increased modestly from 200 metric tones of dry cocoons in 1965 to approximately 250 m/t in 1988; the latter is equivalent to about 100 m/t of raw silk. The unstable market prices are hindering the increase in cocoon production. The price of dry cocoon at the farms in 1988 varied from Rs.150/- to 210 per kg.

All policy decisions are made by the federal government which is also responsible for research and training. However, sericulture is a provincial subject and its development is the responsibility of the provincial governments. Earlier there was no institute in Pakistan to train staff in sericulture and technically qualified people were not available to develop the industry on scientific lines.

In order to improve the above situation, the Pakistan Forest Institute, Peshawar, started a FAO/UNDP Project in this field in 1984, at a total cost of Rs.18.07 million including UNDP assistance of Rs.10.922 million. The main objectives of the project are given below:-

**To establish a sericulture research and training unit**

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- to determine the most suitable set of practices for improving silk production in Pakistan including;
- mulberry multiplication, combatting silkworm diseases, silk egg production, cocoon marketing and development of demonstration material.
- hold short training courses in all disciplines of sericulture for transfer of technology to inservice staff and the farmers.

Provisions were made in the project for expert services in silkworm breeding and rearing, cocoon and silk marketing, installation of reeling machinery and cocoons and silk technology, training fellowships for Pakistani personnel and for procurement of equipment. Presently the Institute is carrying out research in such areas as breeding of parent stocks used in the production of F1 hybrid silk eggs, selection and propagation of high-yielding mulberry varieties, production of good-quality cocoons, and silk yarn testing.

A unit for research and training in sericulture was established in the Pakistan Forest Institute, Peshawar, in July, 1984 with facilities of staff consisting of one Coordinator/Director, two Senior Research Officers, two Research Officers and other supporting staff. This unit comprises of the following sub-units; silkworm breeding which consists of evolving pure lines and production of grand parents, testing for combining ability, adaptability trials and preservation of germ-plasm; mulberry cultivation including selection of new varieties, supply of improved mulberry cuttings and saplings to the field staff and adaptability trials for new varieties; silkworm pathology for research on control methods for fungal, bacterial, viral and protozoan diseases and silk reeling for the study of cocoon quality and quantity, improvement of cocoon drying and grading.

In addition to the above four sub-units, a seed production farm was created in 1988 at Pateka and Chenari in Azad Jammu & Kashmir as a sub-station of the Pakistan Forest Institute, to transfer the technology to the concerned government agencies and the farmers.

The Pakistan Agricultural Research Council is also conducting some research on evolution of pure silkworm races for the production of F1 hybrid silkseed since 1982 with the cooperation of Punjab Sericulture Department. But it has not been possible to produce silkseed for commercial rearing uptill now. Research to propagate bush type mulberry varieties has also been assigned to various provincial sericulture departments by the Council.

## **RESEARCH**

### **Evolving pure lines**

Selection of four bivoltine pure races was successfully carried out for the first time from imported silkseed through inbreeding and individual selection (to produce F1

hybrid silk eggs in the country) on the basis of racial and economic characters such as resistant to diseases, hatchability uniform molting, larval marking, cocoon shape, cocoon weight, cocoon shell ratio and number of egg per female. Under normal conditions the bivoltine silkworm eggs undergo diapause stage in a year but after research on hybernation of silkworm eggs, it has now become possible to break the diapause by applying chemical stimulation to eggs at a certain stage of embryonic nice development to get their hatching many times a year. Successful experiments were also conducted for the artificial hatching of eggs of selected lines with acid treatment. This is essential for obtaining several cocoon crops per year for boosting up cocoon production in the country.

### Production of F1 hybrid silk seed

For the first time in the history of Pakistan 1250 and 2100 seed boxes of disease-free silk eggs of F1 hybrids were successfully produced from the newly evolved pure lines in 1988 and 1989, respectively. The adaptability of the newly evolved F1 hybrid silk seed was also tested under different ecological conditions in all four provinces, Punjab, North West Frontier Sindh and Balochistan as well as in Azad Kashmir, and encouraging results were obtained.

Although the existing grainages in the country were established many years ago, none of them could produce pebrine-free silk eggs until recently. The practice of silk seed production at these centers consisted of producing F2 silk seed from imported F1 silk seeds, which are infected with pebrine to the extent of about 6%. As a result, the entire rearing area is contaminated, which causes heavy silkworm mortality and low cocoon production. This, being an improper method was stopped by the project. In addition, these grainages, situated in hilly areas could not be fully utilized due to many limiting factors such as absence of parent stock, presence of high humidity and low temperature, non-availability of mulberry leaves, lack of technical know-how, and power and water shortages. Silkworm rearing

Feeding time of the silkworm was found for different places. First feeding of the insect starts at Peshawar on 1st March, and in warm areas of Azad Jammu & Kashmir on 20th March and on 20th April in cool areas (Pateka and Chenari). In Sindh and Punjab the first feedings dates are 15th and 25th February, respectively. Autumn rearing was carried out at the Punjab Forestry Research Institute, Gatwala, Faisalabad, which is ideal for silk seed production at this time.

## Economics of silkworm rearing

Silkworm rearing is quite profitable to the farmers if improved variety of F1 hybrid silk seed is used by them. This is clear from the following calculations:

- (a) 0s 1 ha of mulberry plantation 25 boxes of seed can be reared 30 kgs of green cocoon can be produced from one box of silk seed. Total cocoon production  
 25 boxes x 30 kgs = 750 kgs green cocoons

|  |               |
|--|---------------|
| Gross income from 1 ha                                   |               |
| Price of 1 Kg of green cocoon                            | = Rs. 60.00   |
| Total price of 750 Kg green cocoons                      | = Rs. 45 000  |
| Expenditure to rear 25 boxes (25 x 1000)                 | = Rs. 25 000  |
| (including cost of silk seed)                            |               |
| Net income from 1 ha land                                | = Rs. 20 000  |
| (b) From one box of silk seed                            |               |
| Cost of one box of silk seed                             | = Rs. 200     |
| Cost of mulberry leaves for feeding one box of silk seed | = Rs. 800     |
| (including cost of leaves and labour)                    |               |
| 30 kgs x 1 box   | = 30 kgs of   |
|  | green cocoons |
| Rs. 60 x 30 kgs  | = Rs. 1 800   |
| Expenditure on 1 box (200+800)                           | = Rs. 1 000   |
| Net income from one box (1800-1000)                      | = Rs. 800     |

Note: In case farmers leaf and labour cost of Rs.800/- is totally saved.

#### Moriculture Research

After series of spacing trials it was found that density of planting has a direct effect on the yield of mulberry leaves. The spacing of 1x1 m was found to be most appropriate for quick growth and high yield of quality leaves and for better plantation management. It was also observed that the plantations with 1x1m spacing produced 54% more leaves than that with wide spacing of 2x1 m. Further, application of nitrogen at the rate of 200 Kg N after sprouting in spring and 50 percent after 20 days of leaf plucking in equal proportion, was found to increase the yield of leaves by more than 100 percent in 3-4 years old plantations.

For the sake of convenience in harvesting, culturing and improving the vegetative development, it is necessary to train mulberry plants into a certain tree shape through artificial pollarding. The following pollarding heights were found to be optimal for different types of mulberry plants:

| <u>Name of type</u>   | <u>Pollarding at</u>  | <u>Plant at</u>        |
|-----------------------|-----------------------|------------------------|
| High trunk mulberry   | : 170 cm and above    | ) Irrigated plantation |
| Medium trunk mulberry | : 70 - 170 cm         | ) and in hilly areas   |
| Low trunk mulberry    | : 30,60, cm           | ) Plain area. Agric    |
| Trunkless mulberry    | : The stem at/or      | ) land.                |
| (ground mulberry)     | near the ground level |                        |



Selection of parents by experts



New rearing techniques to trainees



*Farmers mounting matured silk worms*

*Cocoons in improved type of cocoonage*



*Moths emerging from pupae*



An early high yielding bush type mulberry variety was also selected through varietal trial. A total of 2.0 million saplings and cuttings of the improved variety were distributed among the farmers for propagation of mulberry plants.

### **Inservice training**

The number of skilled and semiskilled staff engaged in sericulture activities in Pakistan is a little over 200. This is not sufficient for increasing silk production in the country. However in order to increase the competence and technical knowledge of existing staff in all aspects of sericulture, inservice training courses were organized several times by the Institute, under the project and 83 staff/scientists and more than 200 farmers were trained. In addition two persons one from Sindh and another from Azad Jammu & Kashmir received Ph.D degrees in the field of sericulture. 11 personnel from all provinces also received short training in China and South Korea in various disciplines of sericulture.

### **Conclusions**

It is imperative that qualified persons supervise all operations of sericulture, from the development of new silkworm varieties to the production of disease free F1 hybrid eggs. For this purpose, training of staff engaged in different aspects of silk production will have to be arranged in the country to improve their competency and technical knowledge. The Pakistan Forest Institute has developed such facilities in recent years. Rearing technology can be developed in model farms that are well equipped with facilities such a modern rearing sheds, racks and trays, cocoon frames, and deflossing machines. Multiple crops of cocoon should be promoted through extension and credit programmes.

For the expansion of sericulture in the country, large scale mulberry cultivation is essential on private as well as on state land. The provincial governments should expand their programme of raising of quality mulberry stock in the nurseries, and streamline the measures for distribution of seedlings to the farmers. Mulberry plantations should be raised in Punjab, Sindh, North West Frontier, Balochistan and Azad Jammu & Kashmir to expand its cultivation.

At present, sericulture operations are carried out at the provincial level only. There is no central planning and monitoring unit at the federal level for formulating a national plan for the development of sericulture, which, with the cooperation of the different governmental departments could coordinate and monitor production, processing, marketing and the trade of silk and silk products. Current practice of importing with silk eggs and raw silk are possible only because of absence of a central controlling authority.

The marketing of cocoons and their by-products is complicated process. There is no grading and pricing system, and quality control does not exist at present. The absence of an inspection authority for controlling production and marketing of cocoons, silk yarn and other by-products is the main cause of the disorderly marketing of sericulture products. For quality control, the government should adopt a cocoon inspection policy

similar to that practised in China, Korea and Japan.

The duplicacy in sericulture research particularly in highly technical areas should be avoided in the country and a committee should be constituted to determine and assign specific researchable areas to different research organizations in the country.

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