

**I. S. C.**  
**INTERNATIONAL**  
**SERICULTURAL COMMISSION**

**MEMORANDUM**  
**ON THE PROBLEMS**  
**OF SERICULTURAL DEVELOPMENT**

2010

## PREAMBLE

The aim of the present memorandum is to define a framework incorporating all the requisite conditions for any serious attempt at sericultural development.

The need to define this framework springs from the numerous requests and interrogations received by International Sericultural Commission from various sources : silk-producing countries who wish to develop their sericulture, non-producer countries anxious to diversify their agriculture, international organisations who in turn are requested to finance sericultural development projects.

This memorandum is not aimed at supplying answers for each particular project or to replace the relevant specific studies which have to be carried out in every case. It is a basic statement of all the elements which have to be taken into account when beginning to envisage the setting-up of a development project.

Throughout, the present Memorandum deals with *Bombyx mori* ('mulberry') silk, i.e., the most widely-used silk in the world.

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## 1 🐛 A NATURAL MATERIAL OF HIGH ECONOMIC VALUE

Silk is a natural material, with a long tradition. It is a beautiful material, the most glamorous of all textile fibres.

Silk is the prime material for fabric creation because of its properties of fineness, strength, lustre, feel and its outstanding dyeing affinity : at the same time, it is a material endowed with high qualities of comfort (absorption of humidity and antallergic property) making it ideal for use in women's and men's underwear.

Silk-production is limited to a few thousand tonnes, whereas the other natural fibres (cotton, wool) and man-made fibres are produced in hundreds of thousands or even millions of tonnes. This is what gives silk its high economic value, both in its own right and through the value added by its further processing.

It follows that silk products, through their typical nature or their high standing, can and should be exempt from the demands of competition between fibres.

The relatively high value of silk is due to the fact that sericulture and the various processing operations are labour-intensive. It is also a naturally economical material with low energy needs, a fundamental preoccupation in these times. Silk is basically non-polluting, compared with other fibres, thus enabling it to meet the current ecological requirements.

## 2 🐛 SUPPLY AND DEMAND OF SILK : THE WORLD MARKET

### 2.1 PRODUCTION

World production of fresh *Bombyx mori* cocoons in 2008 can be estimated at about 900.000 tonnes.

As for raw-silk production, world tonnage in 2008 was estimated at roughly 120.000 tonnes.

It is also to be noted that China alone produces 98.000 tonnes of raw-silk, i.e. 81% of total world production. With four other countries, Brazil, India, Uzbekistan and Thailand, we reach 98% of the world production.

It is extremely difficult to forecast how production will evolve in the main producer-countries. Recent trends have been as follows :

- increased production in China and India,
- declining production in the Republic of Korea and Brazil,
- almost extinction in Japan.

## **2.2 CONSUMPTION**

Actual consumption of silk in the various countries is also difficult to determine, because account has to be taken not only of imports and use of raw-silk but also of imported thrown-silk yarns and grey fabrics.

It is quite certain, however, that India, Japan and China remain the world's largest consumers, while India is the world's largest importer of raw silk.

We consider that Western Europe, United States and now Japan can be grouped together as consumer countries which produce no raw-silk but are major consumers of raw-silk, silk yarns and fabrics.

## **2.3 TRADE**

The definition of the world market is a problem which offers no easy solution.

In a general way, the world market for any commodity can be defined as a market on which there are several suppliers and a world price. As far as silk is concerned, the problem is a little more complicated because the standard prices for raw-silk are in fact governed by China, the chief exporting country.

### **⇒ COCOONS**

The world cocoon market involves only a handful of countries. The main importers of cocoons are Japan and the Republic of Korea and the main suppliers China and Brazil.

### **⇒ RAW SILK**

The countries which play an active role in the world silk market are :

- raw-silk exporting countries : China, Brazil and Uzbekistan,
- raw-silk importers : India, Italy, Japan and France.

The exchanges in the fields of cocoons and raw-silk therefore involve only a very small number of countries in the world. This means that is a very narrow and very fragile market, for which all the traditional methods of forecasting and planning are extremely haphazard and problematical.

### **⇒ DEVELOPMENT**

The foreseeable development of silk policies in each of these countries raises a certain number of questions, among which :

- the development of production in China and China's export policy, particularly in terms of price, its exports of silk products (quality raw-silk, finished products and fabrics). These orientations are also strongly affected by increased liberalisation in China. One of the early results of the evolution of the Chinese economy has been the substantial growth of domestic consumption and domestic processing which now absorbs about 90% of China's silk production.

- trade of ready-made clothing is dominating more and more international trade of silk products.

There are several very important elements which lend support to this reflection :

- for the time being, there is a good overall balance between world supply and demand of raw –silk. Will this still be true tomorrow ?
- China's selling price is very cheap (22 €/kg of raw silk).
- then even if a new producer country succeeded in feeling raw-silk, this silk could not hope to be of international trading quality before many years. It takes a long time to master the agricultural and industrial processes because of their novelty and their specificity.
- consequently, even if the user-countries would like to diversify their supply sources, they will not be able to count on these new producers before a number of years.

In conclusion of this analysis, ISC believes that countries developing sericulture have to take a very careful look at the world market when they decide they want to export appreciable quantities of silk products which meet international standards (raw-silk, spun-silk yarns and, to a certain extent, grey fabrics).

If, on the other hand, the objective of these countries is to satisfy or develop a domestic market, at least initially, then the situation is obviously quite different.

### **3 ➡ ONE SINGLE CRITERION VALID FOR DEVELOPING COUNTRIES : THEIR INTRINSIC INTEREST**

ISC consider that finally the only criterion to be taken into account in efforts to develop sericulture is the intrinsic and carefully-measured interest of the developing country concerned, i.e., in the first instance the chance to improve the living standards of the rural population through the development or the creation of a domestic demand for silk products. The opportunity to improve the trade-balance through the export of raw-silk or finished products should come in a second phase because of the quality demands of foreign markets and because of overwhelming weight of China in trade.

The country concerned ought then to reflect on :

#### **3.1 THEORITICAL POSSIBILITIES**

These are very numerous, given that :

- Most countries in the tropical or sub-tropical belt (South-east Asia, Africa, America) have a climate which allows for silkworm rearing and for certain areas several rearings per year or even non-stop rearing.
- The cocoon and raw-silk are products with a high economic value, capable of procuring additional cash income to the numerous and poor rural populations.

### **3.2 PRACTICAL POSSIBILITIES**

The practical aspects show some major limitations on the theoretical possibilities.

#### **⇒ AGRO-CLIMATIC CONDITIONS**

As we have said, tropical climates may appear at first sight to be more advantageous for sericulture because it is possible to have production all the year round.

It must be stressed, however, that these conditions are especially favourable for mulberry cultivation but according to the season and the altitude they may be a disadvantage for silkworm rearing. The high temperatures and humidity found in these regions are not conducive, under the rearing conditions usually practised by the farmers, to good results with the most highly-performing races in terms of silk quantity and quality.

It is therefore necessary to take into account the local climatic and agronomic conditions (nature of the soil, relief, etc.) in order to adopt the appropriate silkworm strains or to limit rearing to specific areas and seasons.

#### **⇒ POPULATION**

When sericulture is to be set up in non-traditional areas, the social and cultural aspects of the local population have to be taken into account.

Silkworm rearing requires a certain number of qualities or conditions such as attention to detail, diligence and also a time factor which may not be compatible with certain traditional habits or activities.

It is also very important to take into account the activities of women, who often form the majority of the sericultural workforce.

A minimum of material conditions have to be available, such as the availability of specific rearing premises, protected from the other activities of the farmer and his wife.

#### **⇒ OTHER EXISTING ACTIVITIES AND GEOGRAPHICAL LOCATIONS**

Sericulture is to be developed in areas where no other major activities are possible.

Silk development can be particularly profitable in areas far removed from consumer markets or ports, where food products are consumed locally and where 'industrial' crops are non-profitable given the high transport costs, which often exceed the value of the product.

It is also very hazardous to envisage sericulture as a mono-product.

#### **⇒ EXISTENCE OR NOT OF A HANDICRAFT TRADITION OR A TEXTILE INDUSTRY**

This is an important and prohibitive factor, except in cases where this production is a completely new activity. The existence of a processing circuit, i.e., leading to a

domestic market for the raw material, means that the project can come into being without being immediately faced with the demands of the international market.

## 4 🐛 A COMPLEX AGRO-INDUSTRIAL PROCESS

Silk appears to be a simple material to produce but in fact nowadays it involves a complex agro-industrial system requiring the mastery of advanced technologies.

Countries wishing to develop sericulture ought to take the following factors into account :

### 4.1 SERICULTURE

#### ⇒ MULBERRY CULTIVATION

- pedological and climatic conditions ;
- appropriate varieties ;
- growing techniques, density of plantation, height of growth, pruning forms, irrigation, soil-maintenance, manuring.

#### ⇒ GRAINAGE AND SILKWORM REARING

- *Search for appropriate cross breeds*  
According to the specific needs and the objectives of the project, a choice has to be made between univoltine, bivoltine or multivoltine races of silkworm, single hybrids or polyhybrids.
- *Grainage management*  
If the promoters of the project wish to manage the production of commercial-hybrid grains (silkworm eggs), i.e., grainage, there are several points to bear in mind :
  - ✓ upstream research and development to create and select parental races from a substantial genetic stock, because the parents of commercial hybrids are not available on the market. This work can only be achieved in the long term ;
  - (management of the maintenance of the genetic stock and parental races ;
  - (management of the sanitary control of the grains produced ;
  - (management of the preservation and treatment of the eggs, as well as the organisation of their distribution and incubation ;
  - (finally, the heavy equipment and high-level qualified personnel required.
- *Rearing*  
The rearing of the silkworms requires highly specific technical conditions to provide for an excellent sanitary environment because of the extreme sensitivity of silkworms to pathogens (fungi, bacteria, viruses, parasites...).  
In addition, this stage of the process must be based on a rigorous organisation which will depend on the options dictated by seasonal climatic conditions, by the agricultural calendar of other crops, by the need to raise the young worms in collective nurseries, by the possibility of otherwise of carrying out overlapping rearings, etc.



#### ⇒ COCOON HANDLING

The collection and stifling of the cocoons presupposes a careful organisation in view of the very short time available for use after cocoon-production. Stifling is an important technical step for ensuring quality and requires appropriate equipment and technology.

The storage of cocoons after stifling requires precise physical conditions (especially in terms of temperature and humidity) and premises which are sheltered from various predators (insects, birds, reptiles...).

#### ⇒ REELING

The reeling of cocoons can be done using manual, semi-automatic or automatic basins. The technical option has a direct effect on the quality of the yarn production, on investment costs and on the type of reeling-mills concerned (artisanal or industrial). This choice is obviously dictated by the final objectives decided for the raw material but also by the quality of cocoons available.

#### ⇒ SILK CONDITIONING

The producer-countries must have at their disposal the human and material resources required to test and classify raw-silks. The classification must be carried out under strict conditions and with the grades defined as international standards. The classification of cocoons must also be in keeping with the standards which will be drawn up by ISC on the completion of the work of ISC's committee of experts.

#### ⇒ TREATMENT OF SILK WASTE

In the reeling of cocoons, a certain amount of waste is produced. The producer-country would be well advised to consider treating this silk waste and, if the quantities justify it, going as far as carding and combing spun-silk or silk noil yarns. These facilities can be integrated into the initial project.

### 4.2 SILK PROCESSING

⇒ The increasing use of modern equipment in the industrialised countries (e.g. warping and high-speed looms) demands very high-quality raw-silk, minimum 3A grade.

⇒ The use of less sophisticated machines, but with a plentiful and experienced labour-force, makes it possible to use lower-grade silks.

### 4.3 BY-PRODUCTS

It may be worthwhile to integrate a certain number of by-products into sericultural-development projects :

- pupae and mulberry for human or animal feeding,
- cosmetic products from the oils and creams derived from pupae and larvae,
- pharmaceuticals (blood glucose level, high blood pressure,.....)
- use of the silkworm as a bio-technological tool,
- etc.

## **5 🐛 SOME IMPERATIVES**

### **5.1 TRAINING**

It is absolutely vital to train as quickly and completely as possible native teachers in the various sericultural disciplines. Although the contribution of foreign experts is indispensable at the outset, the effort can only succeed if local staff have been trained in time, otherwise the efforts undertaken risk being nullified once the start-up team has left. In fact, it is not in 5 years or 10 years but in the space of one generation, that the real success of a silk operation can be judged.

### **5.2 RESEARCH**

No sericultural development can function durably without a research back-up. The qualitative and quantitative improvement of production and all innovation depend on research activities.

In order to reach these objectives, there must be :

- the necessary equipment and premises,
- training of research-workers and technicians,
- cooperation with research institutes and universities which have more basic objectives,
- cooperation with international sericultural-research organisations.

### **5.3 DISSEMINATION OF TECHNIQUES**

The dissemination of techniques among producers (farmers) is a fundamental element in the success of a sericultural-development project.

This involves :

- setting up a system of regular training-courses for groups of farmers.
- organising follow-up activities for farmers and specialises staff. This makes it possible to transfer techniques and new knowledge, to supply recommendations and also to collect information and data from the producers.
- the creation and the running of a pilot centre for demonstration purposes aimed at the farmers.

## 5.4 PROGRAMMING

It is important to distinguish between countries with a sericultural tradition, which already have a cottage industry or an industry working with silk, and countries with no sericultural tradition. In the latter case, the various stages of a rational development can be outlined as follows :

### ⇒ COUNTRIES WITH NO SERICULTURAL TRADITION

- *Experimental stage*

Objective : to determine the conditions of production and the technico-economic references (silkworm and mulberry varieties, yield of the mulberry trees, productivity of the rearings, silk-yield, working-times, etc.).

Time-span : at least 3 years in tropical areas where the vegetation of the mulberry tree is non-stop.

- *First stage of pilot rearing in a rural environment*

(at the initial stage, possibility of exporting cocoons. This outlet is limited in volume and uncertain as far as the time-scale is concerned ;

(introduction and development of scattered artisanal silk production : rudimentary basins reeling coarse silk. This non-exportable silk can be used by local cottage industries for consumption in the country or for indirect export sales to tourists ;

(establishment of throwing (twisting), hand-loom weaving, and a dyeing/printing workshop.

Time-scale : 3 years minimum.

Area of mulberry plantation : 25 ha au minimum (100 families on ¼ hectare)

Quantity of cocoons : 15 to 35 tonnes per 25 hectares.

- *Extension of rearings*

development of artisanal reeling, artisanal throwing and weaving (with dyeing and printing workshops) capable of producing and using non-standard silks.

Possible outlets : not only clothing but furnishing articles and carpets. Possibilities of exporting typical fabrics of finished articles.

As far as silk wastes are concerned, they may be exported raw or semi-finished, or processed locally for use in craft weaving, carpet-manufacture, etc.

Time-scale : 5 years.

Area of mulberry plantation : 500 ha for raw-silk production of 30 to 70 tonnes.

- Continuation of the preceding stage and, according to the level of expertise and quality reached, development of a small-scale production of standard raw-silk using semi-automatic industrial reeling. It should be remembered that some countries such as China produce highly-appreciated standard raw-silks on semi-automatic equipment.

Possible development of industrial weaving on mechanical and later automatic looms or export of standard raw-silk.

- Finally, continuation of the two preceding stages with the setting-up of automatic reeling and a high-yield modern weaving plant.

The process of developing sericulture may be speeded up according to the interest and the determination of the promoters (public or private).

## ⇒ COUNTRIES ENDOWED WITH A SERICULTURAL TRADITION

The development of this activity should perhaps begin with the development and the modernisation of local craft or cottage industries, leading to increased demand for silk. It is highly likely that the agricultural production will increase to meet this increase in demand.

Very often it is the problem of quality which is at the heart of the development of an existing production-circuit. It is necessary to go through, point by point, all the stages in the production-process and take into account the elements enumerated in paragraph 4.

## 6 INTERNATIONAL COOPERATION AND INFORMATION

The present memorandum is nothing more than a basic declaration, intended to nourish the reflection which is necessary before undertaking any serious efforts at sericultural development.

Obviously every precise and localised project must be the object of an appropriate and specific study.

This can only be achieved efficiently given the complexity of the questions raised, with the support of the different types of competence which exist in various countries.

International cooperation, bilateral but even more important multi-lateral, is indispensable on several levels. This is particularly true of research projects calling for large-scale material and human resources (including those existing in non-producing countries) and which will condition the future of sericulture. To take just one example, there is the genetic study of the quantitative characters and disease-resistance of silkworms. It is also the case for matters related to international trade.

The International Sericultural Commission among the international organisations, is beyond any doubt best equipped to serve as focal points for multilateral cooperation.

Furthermore, this cooperation must be based on a rapid and complete exchange of information covering every aspect and discipline of the silk process. ISC already plays an important role in the field of collecting and distributing information on an international level.