SILK WORM.

SERICICOLE INDUSTRY; ITS ADVANTAGES;
AND HOW IT CAN BE INTRODUCED
INTO AUSTRALIA.

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"La soie c'est de l'or."

"Silk is Gold."

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THE SILK WORM.

CHAPTER I.

SERICICOLE INDUSTRY; ITS ADVANTAGES.

THE lands have been unlocked, and, though the rush on the plough may not be so extensive as some persons imagined, yet, there can be no doubt but many will avail themselves of the facilities afforded to agriculture by the new land bill.

It may be expected that most of the new agriculturists, being short of capital, will hasten to grow the quickest produce, in order to obtain the quickest return, and what now occurs both in Canada and California, will likewise occur in this colony: our markets will be overstocked with hay, potatoes, wheat, &c., and the farmer will be unable to get rid of his produce, or will be obliged to dispose of it at a price disastrous, both to himself and the colony.

It is therefore the duty of all who are concerned in the welfare of this country, to provide for, and encourage a great variety of cultures, so that, if the farmer is not paid by one he may be paid by another; and such produce should be specially encouraged, the demand for which, is, as it were, unlimited, and the price of which, is accordingly less apt to vary.

But even supposing the market would keep in a normal and satisfactory state, would it not be a good policy to vary and multiply the productions so as to improve the condition, not only of the farmer but of the commonwealth, by supplying our labour and commerce with new aliments, and enabling us to have something besides gold to give in exchange for the manufactured goods, for which we must for years to come depend upon the old country.

This has already been understood by some practical economists: the culture of the vine, for instance, begins to be carried on to a great extent, and many vinicole companies have lately been

formed, in order to carry it on a still larger scale.

Of the foreign agricultural industries, which might be easily and profitably imported into this colony, the one which is the least influenced by the fluctuations of the market, and, consequently, the most desirable, is (to use the technical appellation) *the education of the silk worm*, or the sericulture, or the sericicole industry.

To give an idea of its importance, and of the advantages which it confers, both on the silk worm breeder and on the community, it suffices to say that France produces above £6,000,000, and besides imports above £2,000,000, total above £8,000,000 worth of raw silk; and the item of silk in all its different branches enters for the stupendous proportion of one-sixth ($\frac{1}{6}$) in the total figure of the commercial transactions of France.

England goes farther still; she does not produce raw silk, but her imports, which in 1850 were 6,000,000 lbs., reached in 1859 the figure of 10,000,000 lbs. (I)

Let us add that the price of raw silk averages from £1 2s. to £1 6s. per pound (II), and we shall have the figure of about £15,000,000 worth of raw silk imported in one year into England. (III)

So far for the advantages derived from the industry by the country; let us now see what are the private ones derived in France, 1st by the grower of the mulberry tree; 2nd by the breeder (educator) of the silk worm, and 3rd by the reeler of the cocoons respectively.

1st. One acre of land planted with mulberry trees in full growth, yields 8,000 lbs. of leaves, which are sold at, at least 2s. 6d. per cwt., so that the farmer may depend upon an annual return of £10 per acre (IV) besides the enhanced value accrued to his land, which is not less than twice or three times its primitive value, so that one acre of agricultural land, averaging from £30 to £40, when under common crops, will, when planted with mulberry trees, be worth £60, £80, and even £100.

2nd As for the breeder, out of one ounce of *seed* (V) (out of which about 30,000 worms will be hatched), he is expected to get 120 lbs. of cocoons, which he sells at the rate of at least

(I) The export of wrought silk from home to Australia, amounted in 1859 to £139,000. The exports of the same from London only, to Victoria, only, were in the same year £31,000, exclusive of the silk-woollen and silk-cotton tissues.

(II) The figures £1 2 or £1 6 represents the average price of silks of all qualities, and from all countries; but the price of French or Italian silks (which might and should be produced in Australia), averaged for the last three years above *thirty shillings* a pound, exclusive of the *novi* extra superior quality, which averaged *forty shillings* a pound.

(III) The loss and waste or damaged silks are not included in the foregoing figures.

(IV) The average return of land in France is from £3 to £4 per acre.

V) A technical appellation for eggs of silk worms.

1s. 6d. per lb., total £9. 30,000 worms will have consumed 2,000 lbs. of leaves, say £2 10s. worth, and thus the breeder will have a gross return of £6 10s. per ounce of *seed*.

3rd The reeler clears one pound of reeled silk out of 12 lbs. of cocoons, for which he has paid about 18s., and we have seen that reeled or *raw* silk sells at from £1 2s. to £1 6s. per lb.; then he has a gross benefit of, from four to eight shillings per lb. of raw silk. (1)

If each of the three distinct branches realizes such satisfactory benefits, we may easily calculate what the total benefit must be, when they are combined in the hands of one person, or one company, as is often the case.

Now, what hinders us from benefiting ourselves and the colony by such advantages as those afforded by the silkworm industry? many causes operate, most of them however rather seeming than real: These causes are; 1st ignorance; 2nd prejudices, or difficulties arising from ignorance; 3rd want of capital; 4th slow return; and 5th dearth of labor.

1 *Ignorance*. As silk is not, and never has been, produced in any of the three kingdoms, very few british subjects have a distinct idea of the method and advantages of silk growing: I happened to meet with some amateur silkworm breeders in this colony, and I could not help smiling at their utter ignorance of the matter, both theoretically and practically: one of them was speaking to me in pompous terms of his sericicole establishment, and, when I asked how many thousand worms he had, he stared at me, quite bewildered, and answered he had 72 (not 72,000) but as 40 died, he had only 32 left.

And when enquiring how he treated the cocoon and the chrysalis, I learned that he unmercifully stripped every chrysalis of its silk, thus exposing those intended for seed, to perish before the transformation, or to be transformed into weak crippled moths, incapable of re-production!! A very promising establishment. (1)

Another, with a paternal solicitude, worthy of better success, endeavoured to persuade his moths to take some food, which they obstinately refused to do, and he had the grief to see them die suddenly and simultaneously, of self-starvation, as he thought, and without leaving any posterity behind them, as the good man had thrown away the eggs, which he had mistaken for dung. (11)

(1) Let us not forget that French and Italian raw silk sells at not less than £1 10s., that is to say, about one sixth more than the above price.

(I) The cocoons intended for reproduction should be kept entire. The silk worm is lost as *regular* silk but is used as *loss*, as will be seen hereafter.

(11) The moth of the silk worm does not eat: it lives only a few days, sometimes only a few hours, and dies almost immediately after the reproduction.

In a word, people do not know, and cannot possibly know what silkworms are, how they should be trained, fed, and treated; how to deal with the cocoons, the chrysalis, or the eggs; how to reel the silk, &c., &c., and in fact all this is a science, and, if not a very difficult, at least a pretty nice and minute one, which requires a careful and constant attention and a good deal of practice, industry, and dexterity.

How can this ignorance be removed? A merely theoretical teaching either oral or written would not be sufficient; a practical training is likewise required, which could be only obtained in a model sericicole establishment, formed either by the government or by a company which would go to the expense of it.

Thus people do not care about an industry which they are not conversant with, and which they could not, in fact, as individuals carry on *at present* with any chance of success.

2nd. Prejudices, and apparent difficulties. I heard so many and such frivolous objections expressed, that it would be waste of time to attempt to review them all; I will only say I am prepared to answer any objection which may be proposed. Yet I think proper to meet at once the two main objections. Where to find mulberry trees? Would they thrive in the colony? Where to find silkworms? Would they thrive in the colony?

The mulberry tree is a very hardy plant, which grows everywhere: where the vine thrives, the mulberry tree will thrive also. It may be propagated either from seed, layers, or cuttings; when of a certain age it requires very little care, and in this country it grows more easily, rapidly, and luxuriantly than in France or Italy.

There are now round Melbourne (as I have ascertained), a number of plants of mulberry trees, quite sufficient to have a good start with: three thousand plants might be procured and planted this very year, if wanted.

As for the silkworms, I heard say they might be found in the wild state in this colony; yet I would not recommend them until they have been thoroughly tested; but nothing is more easy than to get seeds, either from Europe, Bengal, or China. (I)

If in past ages, when communication was so slow and surrounded with so many difficulties, silkworms were imported from China and Persia to France and Italy, surely in our days they might be imported into Australia.

But would they thrive in this colony? Why not? They thrive through the whole Empire of China, in Persia, Turkey, Greece, Italy, France, Germany, Spain, Algeria, Brazil, etc., but

(I) At six months' notice I could procure any quantity of seeds which might be required.

especially in the south of France and Italy, the climate of which is much like that of Victoria. I have seen some samples of silkworms in this colony; where they came from is more than I can say, but one thing is certain, whenever they were well treated, they were thriving very well, and the silk was of a very good quality.

3rd. *Want of Capital.* We have seen how the common farmer is *at present* forcibly prevented from embarking in this new industry: besides the obstacles already stated, there is another: we have seen that the silkworm industry may be exercised either separately or cumulatively: now let us suppose a farmer quite conversant with the planting and training of mulberry trees: he will plant and train them; but to whom shall he sell his leaves if there is no breeder to buy them? Or another would start as a breeder; but wherewith shall he feed his worms, if there are no mulberry trees, or how can he have his cocoons reeled, if there is no reeling factory? Or another again might have the whole apparatus of a reeling machinery; but of what avail will it be to him if he has no cocoons to reel? It is therefore obvious that, until the industry has spread over the country, and has become popular and familiar to the farmers, it can be undertaken only with its three branches cumulatively, and they require a capital, the amount of which frightens the bravest, especially when they consider the slow return.

These two obstacles, again, may be overcome only either by a public institution or by a company, the members of which, venturing each a small investment, might wait patiently for the result, however slow it might be, with the prospect, earlier or later, of a highly remunerative return; and also because the expenses always weigh comparatively less on a larger establishment than on a smaller one.

4th. *Slow Return.* But would the return be so slow as is generally thought? No! in France a mulberry tree begins to be stripped of its leaves when five years old. In this colony it grows so rapidly, so luxuriantly, that it might be stripped in the third year; but let us take a medium and say four years; it would be still slow. But let us look at our different enterprises, at the return of the vinecole industry, for instance: has not the vine grower to wait four or five years for any remuneration of his labor and outlay? Why should it not be the same with the silkworm industry? If we never begin we shall never have it; it is precisely because it is slow that we must set to work without delay.

We have seen that we should have to wait four years; but if

it were objected that we are too sanguine in our hopes, that the mulberry tree might be injured by such an early stripping, I would suggest to recur to an expedient resorted to in France, not only by the hasty grower, but by most of the growers, and which, rather expensive in France, where the value of an acre of land averages from £30 to £40, would be no consideration here, where the price of land (£1 per acre) is comparatively nominal. The suggested expedient consists in planting the mulberry trees, partly for *trees of full growth*, and partly for *shrubs*, so that we might soon have with the *shrubs* plenty of food for our successive educations of silkworms, and at the same time should leave our *trees* to their free and full growth, without being injured by a premature stripping.

5th *Dearness of Labour*. This is an obstacle, and a serious one indeed. But is not labor equally dear for every branch of industry? And yet does not every branch of industry thrive when conducted wisely, soberly, and patiently? Why should the dearness of labor be an obstacle to the silkworm industry more than to any other, if it can be demonstrated by facts and figures that, making an allowance for the difference in the cost of labor, the scheme would in the end still give a fair return.

And in fact, the dearness of labor is to a great extent compensated by the cheapness of land: let us not forget that here we pay only £1 for what in France they have to pay £30 or £40. Let us make a fair allowance for fencing, grubbing, clearing, ploughing and planting, and we shall still find a balance of 50 per cent in favor of the cost price of land in this colony. And let us further consider that the more we advance, the dearer land, and the cheaper labor will be.

We hasten to add a consideration; it is, that the main labor is required only for a period of about sixty days every year, and just at a time when there is no call for labor (from Oct. to Dec.) when people are idle, and would be very glad to find employment.

The greatest part of the labor is performed by lads and lasses, for whom it is more an amusement than a task.

Yet the question of dearness of labor is a hard one, which I would not like to decide myself, but would rather leave to the judgement of those who may read these lines. I will content myself by showing what the outlay, annual expenses, and annual return are in France for a given area of land, for a given quantity of seed, and so on; and then with these data it will be easy to draw a comparison between France and Victoria, and ultimately to find out whether the latter could benefit by the industry as well as the former.

Should the answer be in the affirmative, I would beg to give a

few hints for the formation of a sericicole company : this will be the subject of the third chapter.

But should the answer be in the negative, I would still advise to commence at once (either at the expense of the government, or by means of public subscription), a model sericicole establishment, and would beg to state the motives which should lead to the adoption of such a measure : this will be the subject of the fourth chapter.

CHAPTER II.

PALMACHRISTI SILKWORM ; AND JAPANESE SILKWORM.

ALL what preceedes refers to the mulberry tree silkworm *Bombyx mori* ; but two new silkworms have lately been introduced and acclimatized in Europe, namely the castor oil or palma christi worm, *Bombyx cinthia*, and the japanese worm *Bombyx japonica*.

At different periods, during about a century, it had been stated by various silkworm breeders that the silkworm might feed on some other plants, and it had been stated also, that some other caterpillars might yield a valuable silk : successive experiments had been made accordingly, but had always proved a failure.

But a few years ago it was ascertained that a certain sort of silk (of an inferior quality) imported from Bengal, (or to speak more properly, from Assam) was the product of a worm which fed on the leaves of the castor oil plant or *palma christi*. It was brought to Italy, from whence it soon spread all over the neighbouring countries. The acclimatization, which for a few years was a problem, is now an established fact ; but the marketable value of the silk of the *palma christi* worm is not quite settled yet.

This insect is quite different in size, figure, and habits from the mulberry tree worm, and its silk likewise differs both in color and quality : the cocoon is so tough, that it can hardly be reeled, and in fact in Assam they do not attempt to reel it, but are contented with carding and spinning it like floss or waste silk (or wool or cotton) which accounts for the inferiority of quality, and the comparatively low price which it fetches in the market. In France and Italy, with the aid of some chemical process, they have succeeded in reeling that cocoon ; but this process does not appear to be in general a practicable one.

At all events the drawback would be largely compensated by the advantage of a quick return, as the *palma christi* grows in a few months and everywhere. Another advantage of the new worm is that several educations might be carried on in the same year : the reproduction of this insect is so rapid, that the only difficulty is to check it.

As for the *Bombyn japonica*, it is one of the valuable acquisitions which are the result of our recent intercourse with Japan. It feeds on the leaves of the tree which yields the so far famed and so much admired Japan varnish: the Japanese silk begins to find favor in the London market.

Before closing this chapter, I beg to call the attention of the reader to a most important fact: it is the constant and progressive increase of silk produced all over the globe; and yet, the demand for this valuable article, and consequently its price is increasing in a still higher proportion: the average prices I gave when I first began to write this Essay, are gradually outstripped by the current prices which reach us by every new mail: the price of French and Italian raw silk in the London and Lyons markets, averaged for the last three months thirty-five shillings per pound.

With these observations I proceed to give the tables alluded to in page 8 observing that for the present they are limited to the mulberry tree worm education, as I have not yet sufficient data concerning the castor oil plant worm, or the Japanese worm: one thing I know: people are very busy and sanguine about them in the countries where they have been newly introduced.

No. 1.—Approximate outlay of a Sericicole Establishment,
on 10 acres (4 hectares) in France.

MULBERRY DEPARTMENT.

10 acres at £30	...	...	...	£300	0	0
Ploughing, harrowing and planting	...	...	...	20	0	0
2500 plants: 500 for full growth on 5 acres, and 2000 mulberry shrubs on the other 5 acres	...	...	...	100	0	0

EDUCATION DEPARTMENT.

Education Hall, a plain brick or stone building 100 feet x 25 feet with sheds or verandahs all round	...	...	...	150	0	0
Education implements	...	...	...	100	0	0

REELING DEPARTMENT.

Reeling Hall, a plain brick or stone building 50 feet x 25	...	...	...	50	0	0
Steam engine 10 horse power, boilers, fittings, &c.	...	...	...	300	0	0

Carried forward £1,020 0 0

Brought forward	£1,020	0	0
20 reeling wheels, &c.	100	0	0
20 copper pans, and other reeling apparatus ...	130	0	0
Total	£1250	0	0

No. 2.—Approximate annual expenditure of a Sericicole Establishment, on 10 acres (4 hectares) in France.

MULBERRY DEPARTMENT.

Keeping the soil and plantation in good order (cross ploughing and harrowing between the trees : forking and spading at the foot of the trees, pruning) &c.	£20	0	0
40 ounces of seed of silkworm at 5s. per ounce	10	0	0
40 men during 20 days picking 80,000 lbs. of leaves at the rate of 100 lbs. per man per day, at a salary of 15 pence per man per day, say 800 workdays at 15 pence per day ...	50	0	0

EDUCATION DEPARTMENT.

40 boys or girls during 40 days in the Educa- tion Hall, at 10 pence each per day, say 1600 workdays at 10 pence per day, round numbers	70	0	0
Fuel	20	0	0
Lighting	6	0	0

REELING DEPARTMENT.

1 engincer during 30 days at 10 shillings per day	15	0	0
In the reeling room, one girl at each reeling wheel is expected to reel 8 lbs. of cocoons, say $\frac{3}{4}$ -lb. raw silk per day, at a salary of 1 shilling per day			
As we have to reel 4,800 lbs. of cocoons or 400 lbs. raw silk, it will require 600 work- days at 1 shilling per day	30	0	0
A few junior assistant girls, and other servants	10	0	0
Fuel	30	0	0
Lighting	9	0	0
Miscellaneous expenses... ..	30	0	0
Total	£300	0	0

No. 3.—Approximate annual return of a Sericicole Establishment, on 10 acres (4 hectares) in France.

One acre of land planted, either with mulberry trees of full growth, or mulberry *shrubs*, is expected to yield annually 8,000 lbs. of leaves.

8,000 lbs. of leaves are expected to feed 4 ounces of seed or 120,000 worms. 1 ounce of seed or 30,000 worms are expected to yield 120 lbs. of cocoons. 12 lbs. of cocoons are required to make up 1 net lb. of reeled or raw silk ready for sale. 480 lbs. of cocoons are accordingly expected to yield 40 lbs. of raw silk ready for sale. 40 lbs. of raw silk at the rate of £1 15s. per lb. last current price in the London and Lyons markets amounts to £75 0 0

This is the return of 1 acre: the total return

for 10 acres is (I) 750 0 0

The expenditure being... .. 300 0 0

The net profit would be for an investment of

£1250 450 0 0

CHAPTER III.

A FEW HINTS FOR THE FORMATION OF A SERICICOLE COMPANY.

The establishment alluded to in the preceeding tables is supposed to be exclusively sericicole; but such is not generally the case; with few exceptions, it is quite the reverse.

The sericicole industry is essentially agricultural, and must be combined and carried on with other farming pursuits.

The worms feed on fresh leaves, and accordingly should be reared on, or close by the spot where the mulberry trees grow.

The cocoon must be reeled in a short time from its formation; if kept a long time, or packed up, or tossed about from place to place, it loses much both in weight and quality, when it is not spoiled altogether. Then again the reeling should take place on, or close by the very spot where the worms have been spinning.

But besides that, it must be remembered that the main labor of a silkworm education does not occupy more than two or three months in the twelve months. During the remainder of the year what will become of the hands, the barrows, the cart, the horse, the engine, the buildings? They will be at a stand still, whereas if the education be carried on in connection with a

(1) The loss and waste or damaged silks have been omitted: their value may be reckoned at about 5 per cent of the amount of the gross return.

common farm, the hands engaged at other times of the year at tilling, sowing, harvesting, &c., might be employed (and at a cheaper rate than fresh hands) in the sericicole occupations, just at a time, when, as we have stated, they would be else unemployed; and the same with the barrows, cart, horse, engine, buildings, &c., so that the sericicole industry, and the other farming pursuits, mutually contribute to, and profit by the advantages of each other, and hence a great saving.

These considerations will have more weight still with the palmachristi worm education; for the palmachristi should be by turns replaced by other crops, and the other crops replaced by palmachristi, which could not take place if the establishment were exclusively sericicole.

The proper size of the farm would be about 100 acres, it might be less, but if in after times extension was required, it would be a pity to have been limited for the sake of saving a few pounds in a country where land is at present so plentiful, and comparatively so cheap.

As the main object would be the sericicole industry, half the land should be devoted to it, and this half divided into four or five equal parts, to be planted in four or five successive years, partly with mulberry trees for full growth, and partly with mulberry shrubs, and eventually with palmachristi and varnish trees.

There are several reasons why the whole area should not be planted at once.

1st. The first, and it is a peremptory one, is, that very likely there would not be plants enough in the colony to cover it.

2nd. But supposing that a sufficient number might be procured, it would not be wise to venture them all at once, for if by some cause, the plantation happened to be a failure, the loss would be immense, and for a long time irreparable.

3rd. It cannot be expected that a sufficient number of efficient educators and reelers could be procured at once; they must be trained by degrees, and attempting to start on such a large scale with unskilful hands, would be running headlong to an unavoidable ruin.

4th. If the whole area were planted at the same time, the consequence would be, the trees would likewise decay all at the same time, so that at a certain period more or less distant, the whole establishment would for years be at a stand still.

The site of the farm should be selected at a certain distance inland, for the silkworm does not like the neighbourhood of the sea. The most suitable spot would be a gentle slope, having a southeast aspect, on a table land of moderate elevation; it is

desirable that the slope be sheltered from hot winds by an opposite slope. There should be a constant and plentiful supply of good water.

Though the mulberry tree thrives everywhere, yet the soil which suits it best, is a deep, rich, but light volcanic soil.

Such is the rough outline of the scheme: I am aware that it is far from being complete. I feel that it requires many elucidations and explanations, but I have to keep within certain limits. As I have stated before, I am prepared to answer any question which might be asked on the subject, and to prove any statement which might be doubted or denied.

I said I would not attempt to calculate what the outlay, annual expenses, and return of such an establishment might be in this colony. With the foregoing data, and those given in the three tables, it will be easy for any one to make his own calculations.

CHAPTER IV.

FORMATION of a Sericicole Establishment either by the Government or by means of a public subscription.

Now let us suppose that a capitalist, or a company could not find inducements to form, *at present*, a Sericicole establishment, would it follow that the Sericicole industry, the principal source of wealth to so many nations, should be given up altogether by the people of Victoria? I have already answered and I answer again most distinctly, No!! If this industry fail to benefit the capitalist, it cannot be denied that it would benefit the farmer and the cottager: the very fact which the capitalist would consider as the main obstacle, that is to say the dearness of labor would be the source of the welfare of the latter. In one word: to object to the dearness of labor is to acknowledge that the cottager, his wife and children would have a handsome remuneration for their industry; and this boon could be obtained by them without a great extra outlay. The whole cost of a cottage apparatus for breeding the worms and reeling the cocoons would not exceed £10 or £12.

Let us suppose a cottager with four or five children; the lads go and pick the leaves, the girls feed the worms; and, when the cocoons are ready for reeling, the younger ones replace the steam, that is to say put the wheel in motion while the elder reel the cocoons.

But we have demonstrated that nothing of this can be done until a model establishment has been formed in this colony.

Mr. Robinet, the proprietor of the largest Sericicole establishment in France, a most able sericulturist, and judicious writer says, that in a *new country* the sericicole industry cannot be expected to take deep root unless it is initiated by a large model establishment, which is a nursery, not only of plants but of worms of the right sort, and at the same time a training school for reelers and breeders. (1)

And this opinion of Mr. Robinet is corroborated by facts: if we follow step by step the history of sericulture, we find that in every country where it is flourishing—where, as in France and Italy, nine-tenths of the silk produced comes from within the walls of the cottage, we find that this industry invariably originated in a model establishment formed and supported by public money.

And even in our days France has establishments of this sort, not only in her young colony of Algeria, but on her own soil: the government has lately founded a vast model and experimental establishment, comprising the three branches of this industry, and farmers' children are admitted and trained there, both theoretically and practically for the sericicole profession. Two eminent professors are attached to the establishment.

If in a nation so self industrious as the French—if in a country where the sericicole industry has been flourishing for three centuries, and gives employment and bread to millions—if among producers whose silk is considered the best in the world—the government found it advisable to take this step—I leave it to the public to decide what the government or the people of Victoria ought to do.

(1) The word *reeling* seems to imply a very simple and easy process; but as regards the cocoons it is rather a complicated one, and calls not only for a previous and somewhat scientific training, but for steadiness, attention and judgment on the part of the reeler.

Any person requiring information about the silkworm industry, may obtain it by writing to Mons. J. Nerevy, Yarraberg, Richmond, and enclosing postage stamp for the answer.