Dr. E. J. Butler, late Imperial Mycologist, Pusa is Director. The Bureau will work broadly on the lines of the existing Imperial Bureau of Entomology at South Kensington. It will be a central agency for the accumulation and distribution of information and for the identification of specimens sent in from all parts of the Empire.

Mysore Calendar.

The Mysore Agricultural Calender for 1921 has been published. It contains very useful articles of a practical nature written by specialists who know the subject. The ground covered is wide and almost all subjects in which the ryot is interested have been ably dealt with. The language is simple and the aim is amply fulfilled. The treatment leaves nothing to be desired and the booklet contains matter which can form food for reflection not only for Mysoreans but also gentlemen engaged in farming in other parts of the country. Monthly notes are a special feature of the publication which adds to its usefulness. Each copy is priced one anna and should be found in every rural home.

Comparative study of the Mulberry silk industry in the different parts of the world.

K. ACHYYA, SERICULTURAL EXPERT.

The Mulberry silk Industry which is the queen of the textile industries and which is an important key industry may be divided into six distinct economic organisations each independent of the other and yet forming a peculiar combination of its own. These are (1) cultivation of mulberry (2) rearing of silk worms—an art

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which has been very highly specialised since the worm is domesticated (3) manufacture of silk-worm eggs known as seed where the use of microscope for moth examination has reduced the silk worm diseases to a minimum in highly developed sericultural contries (4) treatment of cocoons i. e., the reeling of raw silk wastes including pierced cocoons (6) manufacturing of silk fabrics out of raw and spun silks after the processes of twisting, bleaching, dyeing, weaving, finishing and designing. These six functions of the silk industry representing as they do six distinct economic organisations are more or less similar in all the silk producing contries of the world, but the degree of success attained by each is dependent upon many other conditions. Chief amongst them are an abundant supply of mulberry, suitable climate, cheap and willing agricultural or semi-agricultural population in the case of 1 and 2. Skill, knowledge and efficiency of labour forces employed in the case of 3 and 4 and highly complicated devices in the form of machinery and the like used in 5 and 6.

The first two parts may be termed an agricultural pursuit in asmuchas the cultivation of mulberry and the seasonal silk-worm crop of cocoons is concerned. Since the worm is domesticated and this branch of the industry is purely carried on in the cottages of agriculturists, it is termed a 'Cottage Industry' and is known as such all the world over. It is this aspect of the industry where machinery plays absolutely no part that has given the eastern nations where agricultural labour is satisfied with little returns, a decided advantage over the western nations and has highly complicated the international trade in raw silk.

The manufacture of seed has become a highly specialised art after the system expounded by that eminent French scientist Pasteur of microscopically examining every mother moth that lays eggs to find out the quality of the seed. This discovery has been the means of eliminating the worst form of silk worm disease known as pebrine or bringing it down to its lowest minimum.

This has demarcated seed industry from the rearing industry in highly developed sericultural countries and being the controlling factor of diseases is in its turn controlled by the respective Governments under a 'guarantee'.

The reeling industry may be termed the 'border line between the cottage industry and the manufacturing industry. In some silk producing countries, this branch of the industry is very highly developed by the system of 'Filatures' where the system of steam heating basins and the application of motor power for the purposes of turning the reel have replaced the old 'primitive method of heating basins by the ordinary fire wood and turning the reels by the human agency which are still in vogue in Bengal, Mysore and Kollegal in India and in parts of China. It is to these primitive appliances employed that the poor quality of the Indian raw silk which finds no sale abroad and few competitors in India is due.

Silk wastes are what may be termed the by—products of the silk industry including long and short fibre wastes secured in the process of brushing and cleaning the cocoons to find out the true filament; pierced cocoons—naturally pierced or otherwise in the act of brushing or rough handling in reeling; double cocoons in India (in other countries they are reeled); and the thin wrapper left over after the cocoons are almost used up. In Kashmir in India and in all other countries silk wastes are graded, cleaned, and sold in an unadulterated state, whereas in India the wastes are sold with all the dirt they contain including chyrasalids. By not observing the proper system of grading and cleaning, India loses annually an enormous sum of money.

All the wastes are cleaned, carded and spun in spinning mills and sold as spun silk. There are two such mills in Bombay. There is sufficient material for one mill in Mysore and Kollegal.

Chrysalids are another byproduct the oil of which when extracted is used in the manufacture of soaps. In India, it is generaly wasted. In China, it is a table delicacy.

Silk weaving: It is this branch of the industry that consumes the total output of raw silk except small quantities used in the manufacture of baloons, parachutes and cartridge bags which found their way to the trenches in the last war. The importance of reserving the silk industry as a great national asset comes in when the high arts of civilization are displayed in the colouring, designing and finishing of silk fabrics. No other fibre presents the same wide scope for this art. The system of state bounties and subsidies given in France for the coccon producing and raw silk industries is to preserve this high national art in silk weaving.

The chief silk producing countries of the world are:—Japan including Corea; China including Indo-China; Italy, France, Asia-Minor and the Levant including Persia and India including Kashmir. Of these countries Japan and Italy have marched forward rapidly both in the production of cocoons and raw silk. China, France and Persia are more or less stationary; figures for Asia-Minor and Levant are wanting and hence cannot be classified. India except Kashmir is on the decline. The reasons for this state of affairs are not far to seek. A critical survey of each country would, I believe, give the silk Industry in India ample object lessons for remodelling her primitive organisations and overcoming the lethargy, indifference and prejudices of the silk worm rearers, reelers and weavers, to adopt more advanced and rational methods.

Japan and Corea:— Japan with its sturdy peasantry ever alive to the advancement of their country in all spheres of life with a climate pre-eminently suited for sericulture, an abundance of cheap and efficient agricultural labour for rearing and reeling and with a paternal government giving every encouragement to those engaged in the industry in various ways with a lavish expenditure of money, it is no wonder Japan is on the forward move supplying a little less than half the total produce of raw silk of the world. Besides individual efforts the activity of the Government may be summarised thus :—

1. Two higher sericultural institutes in Tokyo and Kyoto for advanced course and research besides eight prefectural institutes and five country institutes.

2. Four prefectural schools and thirteen country schools besides many private schools for educating the rural population.

3. Courses of study in agricultural, and forest colleges, besides agricultural stations, include sericulture.

4. Subsidies are given by the Government for enlarging mulberry plantations.

5. Circuit lecturers are employed by Government, prefectures, counties, towns and sericultural associations to direct those in the industry. Some of them are whole-time lecturers, others are recruited from amongst the graduates of the year for the season.

6. As many as fifty competitive exhibitions are held annually with government help to encourage rearers and reelers.

7. Special laws are enacted whereby individual rearers are not allowed to manufacture seed in order to protect them from disease. There are as many as three thousand employees of the central and prefectural governments who visit seed establishments and certify as to their quality. A sum of 20 lakhs is spent on this work alone by the Government.

8. In addition to the above Government support numerous sericultural guilds. Silk worm seed guilds, raw silk guilds, rearers guilds etc. attached to the central silk association with its head quarters at Tokyo and with a prince of the royal house invariably as its president, are in active existence helping the industry in every way possible besides issuing literature in a cheap and popular form for the guidance of its members.

9. Co-operative societies form another important factor in the wholesale purchase and sale. There are as many as one thousand three hundred societies helping the sericulturists in the country.

10. Conditioning house of Yokohama fulfils a function which is most necessary to improve the quality of raw silk and detect fraud by testing the humidity in silk and by degumming also.

11. Above all, the Empress takes a keen interest in the industry in having a small mulberry garden of her own in the palace grounds and rearing worms.

Corea:— All that has been done for Japan is being done for Corea after it became a protectorate and the result has been that in the course of about ten years the acreage under mulberry and the cocoon production has increased almost fourfold.

Italy:— Italy with an intelligent and thrifty agricultural population; a suitable climate and rich soil for the cultivation of mulberry; a highly developed system of rearing worms evolved after years of patient study by Italian sericultural savants, new breed of crosses withstanding disease and enriching the silk fibre in the cocoons and above all the highly efficient and almost perfect state of the silk filatures, which has given Italy *the premier rank in the classic silks in the raw markets of the world*—these and many other causes have added to the prosperity of the Italian silk industry. The Government of Italy has also thrown itself heart and soul into the industry by opening sericultural institutes and schools for research and education work and by liberal industrial subsidies and bounties to private enterprise. The conditioning house at Milan and the great attraction of Milan as the world's central market for raw silk and surplus cocoons has added in no small measure to the rapid growth of the Italian filatures—and the development of the Italian silk market of the world.

China. Conditions in China are very favourable for the rapid growth of a cottage industry like the silk industry with an industrious and teeming agricultural population accustomed to rearing worms from time immemorial, but the want of a stable government

and the vicissitudes of changing politics and civil strife, want of proper transport communications, have been some of the causes for the stationary nature of the industry. If China had unity of action and the Government of China could give all the facilities for her sericulturists as Japan in the opening of a conditioning house, the manufacture of disease-free seed and subsidies for enlarging mulberry plantation &c., the growth of the Chinese silk industry would have been phenomenal.

The establishment of steam filatures at Canton and its neighbourhood which receive cocoons through the splendid high way of the Yang-tse-kiang river has given a good name to China's silk in the world's market and thus improved the cocoon industry to a good extent by getting better values. Country reelers have also improved their silk by the introduction of re-reels.

It is interesting to note that the climate of Southern China is similar to that of Southern India—particularly Mysore plateau—and the breed of cocoons is the polyvoltine worm just as in Bengal, Mysore and Kollegal, whereas in Northern China as in Northern India (Kashmir), the univoltine worm is reared—the difference of course is largely one of climate.

Indo-China. The French Government has not been slow to take advantage of the good climatic condition of the country and an indigenous breed of the worm to develop the silk industry to its utmost capacity. The sericulturists of France tried first of all to rear univoltine French worms which failed, then tried the method of hybridisation and infusion of new blood which also failed and lastly succeeded in improving the indigenous breed by a *careful system of selection.* There is a lot for India to learn out of this system of careful selection and the great revival accomplished thereby since many of the agricultural conditions of Indo-China resemble that of India. The chief help given by the Government is the supply of disease-free seed *free of cost* from small inexpensive rearing centres scattered all over the country.

France. Favourable conditions prevail in Southern France for a progressive industry, but the agricultural labour engaged in rearing is not satisfied with the returns though it is a purely supplementry iudustry undertaken just before the agricultural harvest work. The industry is only kept up through the efforts of the French Government by a system of bounties and subsidies paid on a liberal scale both to the cocoon and raw silk producers. The national importance is attached to the high arts of civilization displayed in the manufacturing industry. The system of bounties alone cost the French Government as much as fancs 200,000. With all the bounty system, I am of opinion that the aggressive policy of the Far Eastern silk market and the improving of quality annually which has already complicated the international trade in raw silk will deal a 'knock-out' blow to the French silk industry unless some other means besides bounties is found for eliminating such silks.

Persia. The periodical political changes have affected Persia's silk industry just as that of China. It is well suited to the growth of univoltine worm. This industry is peculiarly suited to Persia where the Zenana system prevails and women can take an active part in the rearing operations.

India. There is no part of the world where the industry is so scattered as in India, though concentration would have given many advantages, The chief silk producing areas are Kashmir, parts of Bengal, Mysore plateau and Kollegal. Other Provinces and Indian states are yet in an experimental stage and so not worth noting down in a narrative like this.

Kashmir. The industry has been in existence for many years on a small scale and it would have died a natural death if the State had not come to its rescue by bringing the industry under a state monopoly. The remarkable growth of the industry under the state control and the large revenue its brings to the state as well as to the agriculturists has often been discussed in the public press as an example of an industry fostered by the state contributing largely to

the prosperity of the agricultural population of the state. Hence a side light into the working of this department would be of some interest.

The sericultural department of Kashmir and Jammu—each independent of the other—is controlled by the Settlement Commissioner with the Revenue Minister responsible to the Durbar. The department controls the mulberry trees of the state by laws enacted making it penal to cut down even a branch thicker than a man's thumb—the penalty for each offence and for cutting down each tree is as much as Rs. 10. The rules are enforced through the Revenue Department. The tree mulberry has been growing wild abundantly in Kashmir valley and sparsely in Jammu province and efforts are being made by the department to extend the plantation by issuing seedlings from the many state nurseries. Rewards are given to village headmen who take interest in the mulberry cultivation and to individual ryots who plant them largely. The leaves are allowed to be used *only for silk worm rearing* by any rearer, no matter on whose land the tree stands.

Rearing. The univoltine seeds largely imported from Italy and France and hibernated in Srinagar and Balote are distributed free to the rearers according to the season and supervised by the assistants and inspectors of the department. Copper sulphate for disinfection and arsenic for killing rats are also distributed free along with seed. The climate being ideal, the cocoons are as good as those produced in France and Italy. Recently efforts are being made to increase the local production of seed which is proving a great success. As much as 45,000 oz. of seed are distributed annually in both the provinces which, I believe, is the limit for the existing number of mulberry trees. The cocoons are bought by the state paying almost Rs. 50/ per dry maund regardless of quality. Those taluks near about the filatures bring in cocoons in green state which is taken by measurement and others bring in a dry state. Almost 6 lakhs of rupees are received by the rearers for cocoons besides cloth rewards given to individual rearers for extra good quality of cocoons.

The village headmen receive a small commission on cocoon production for providing house accommodation and similar other help to those rearers who are without enough accommodation, since rearing is conducted largely on the ground floor and also for giving help to the Sericulture Department in the oversight of mulberry trees in their respective villages. The Sericulture Department is given a voice in the appointment and dismissal of village headmen to make their work effective. The tahsildars also receive rewards from the department for extra good help given.

Reeling. There are two state filatures in the headquarters of the two provinces viz. Srinagar and Jammu. The Srinagar filature is the biggest individual filature in the world employing as many as 7000 workmen and is complete with every modern equipment. The Jammu filature is a small one with 200 basins. The silk reeled is of a very high quality but the Department had to overcome a lot of prejudices against the Indian silks in the European markets, and has succeeded eventually in classifying the Kashmir silk differently as it ought to be, since the silk is from the superior univoltine cocoons unlike the Bengal and Mysore cocoons and reeled in the most modern style. The chief markets for Kashmir silk are France and Italy.

Silk waste. Is all cleaned, graded and sent to France and Italy.

Weaving. It was tried on a pretty big scale by the engagement of an expert from England but was given up as not paying. It is being started again by a private Indian gentleman on a small scale, the state giving him some help.

Income. The net income to the state during the last four years is nearly 30 lakhs of rupees though the income before the war did not exceed 10 lakhs.

Summarising Kashmir efforts, what one could say as regards the other provinces of India is this:—

All along the Himalayas including the Punjab and northern part of United Provinces, the industry can be successfully started

by first importing disease free univoltine seed from France and Italy. It can even be made a state monopoly in the beginning since *gentle pressure* is necessary to induce the ryots to take it up and then handed over to private enterprise if found necessary.

Experience of Kashmir will considerably help towards its success.

Bengal. The multivoltine breed of worms known as 'Nistari and Chotu polu' is reared, feeding them on bush mulberry. The return from the industry is not much owing to the disease amongst worms and the presence of the parasite fly called "Ujji" and hence there was a great decline until the Government stepped in and started seed—distributing nurseries in several places. The chief object of these nurseries is to rear cocoons very carefully and distribute them as seed cocoons. The existing nurseries are not many and so Government can save the industry by multiplying these useful seed nurseries and supplying all the seed necessary and eliminate the disease altogether.

Reeling is done on primitive methods and with no regard to quality: The silk is sold all over Northern India for the use of the Indian hand looms. There were two or three firms notably Messrs. Lorins Payne & Co., of Lyons, Anderson Wright & Co., of Calcutta who putup modern filatures to find a sale for the Bengal raw silk in the European markets but they have given up the business after many years of work owing, I believe, to the increased cost of cocoons, high wages and the deterioration in the quality of the cocoons and not the over—anxious European markets to buy Bengal silk.

Mysore and Kollegal. The variety known as the Mysore variety of polyvoltine worms is reared all over the Mysore plateau including Kollegal, feeding the worms on the bush variety of leaves which grows well. The life of the bush in Kollegal is about ten years when the plantation is removed and some other crop is grown for a year and the land is again brought under mulberry the following year. The bush is propagated by cuttings. The mulberry land is

not irrigated in Kollegal though in many parts of Mysore the land is irrigated and more than 5 crops, which is the general average in Kollegal, are taken. The system followed in all branches of the iudustry is the same in Mysore and Kollegal.

About 15,000 acres is under mulberry cultivation in Kollegal taluk and about the same number of families engaged in rearing. The mulberry cultivator is not always the rearer and the rearer is not always the silk reeler.

The methods employed both in rearing and reeling may be termed "primitive". The chief defects in rearing are :— overcrowding of worms, ill ventilation, defective system of cleaning the litter, heaping the litter in the cattle sheds which are generally very near the rearing rooms; non-disinfection of rearing implements such as stands, trays and chandrakies. These defects may be remedied by patient work by overcoming many of their prejudices but it would require time. But the great loss to the rearer in this taluk is the use of seed cocoons from Mysore rearers which are not always free from disease. The loss thereby is as much as 20 % of the entire crop annually. It is only the supply of disease—free seed under a guarantee that will not only bring prosperity to the Kollegal rearer, but also increase the acreage under mulberry. The net income from an acre of mulberry (only poor quality land is brought under mulberry) in dry land is Rs. 150 at present and it will be much more if the disease is eliminated and if such land is utilised. If the mulberry cultivator is a rearer, the income is much more.

The reeling industry is also carried on in the villages off and on at the cocoon season-the methods used are most primitive—no regard is paid for the quality of the silk, its lustre, tenacity, elasticity and least of all size and winding properties. The silk finds an easy sale all over South India in the silk—weaving towns such as Conjeeveram, Kumbakonam, Coimbatore, Dharmavaram, Salem. The prices realised are good, considering the quality of the silk. If the silks are well reeled and the sales extended to French and Italian markets, it ought to find a good sale considering the brilliancy of the Mysore quality silks unsurpassed among raw silks.

Silk waste. Being uncleaned waste just as it comes from the reeling basin, the prices realised are almost nothing. If it is graded and cleaned, it would find a good value and good sale abroad.

Weaving. There are about 400 silk looms in Kollegal using local silk but specialised in weaving high grade saries. The workmanship displayed is excellent but the bad quality of silk mars the quality of the cloth to a great extent.

Mysore is trying its best to supply disease-free seed from state seed nurseries, but the attempt for the last 12 years has only brought the supply to almost ten per cent of the total quantity necessary. In Kollegal, the idea is to supply disease—free seeds to all the rearers and maintain it so that the rearers need not bring in seed cocoons from Mysore. Besides this, the improvement of the worm will be effected by a hill farm at Coonoor which has already been started.

Summary of what other countries are doing which can be copied out in India with advantage.

1. Supply of disease-free seed as in Indo-China and free if necessary.

2. System of bounties and industrial subsidies as in France to preserve the higher arts of civilization displayed in the silk handloom industry of India.

3. Opening of a higher Sericultural Institute etc. as in Japan.

4. Improvement of the indigenous breed by a system of careful selection as in Indo-China.

5. Introduction of other varieties and hybridization should not be attempted.

6. Extension of the industry to all suitable centres if necessary by bounties given to mulberry cultivation as in Japan.

7. Improvement of raw silk by encouraging private individuals to put up modern filatures.

7. System of wholesale purchase and sale of raw silk by co-operative societies as in Japan.

8. Improvement of waste silk.

9. Extraction of oil from chrysalides for the manufacture of soap.

News and Notes.

A London despatch to Washington says that a syndicate of capitalists of the Western States has leased 600,000 square miles of Siberian land from the Russian Government.

The All-India Cow Conference for 1920 was held at Nagpur, Central Provinces during the National Week.

Seed-wheat from the famous Plant-breeding Station, Slavof, Sweden, is being introduced into the Scotch market. One or two small parcels sown in 1919 yielded crops of 60 to 65 bushels an acre. Its merits are great hardiness, high yield and resistance to yellow rust. The variety—Iron wheat—is sold at 120 to 135 shillings per 504 lbs.

At the last July Council meeting of the Royal Agricultural Society of England it was resolved to close the Woburn Farm and experiments which entail a loss of £ 1200 a year and yield results in which only 0·3 per cent of the members take any interest.

Returns relative to the financial position for 1919 of the Scottish Small-holders Organization Ltd., are unsatisfactory and according to the Scottish Farmer, November 13th, show that it is an institution kept alive by the subsidies from the Board of Agriculture.

From a White Paper published it is understood that from 150 farms visited the total yield of milk during the period, October 1,