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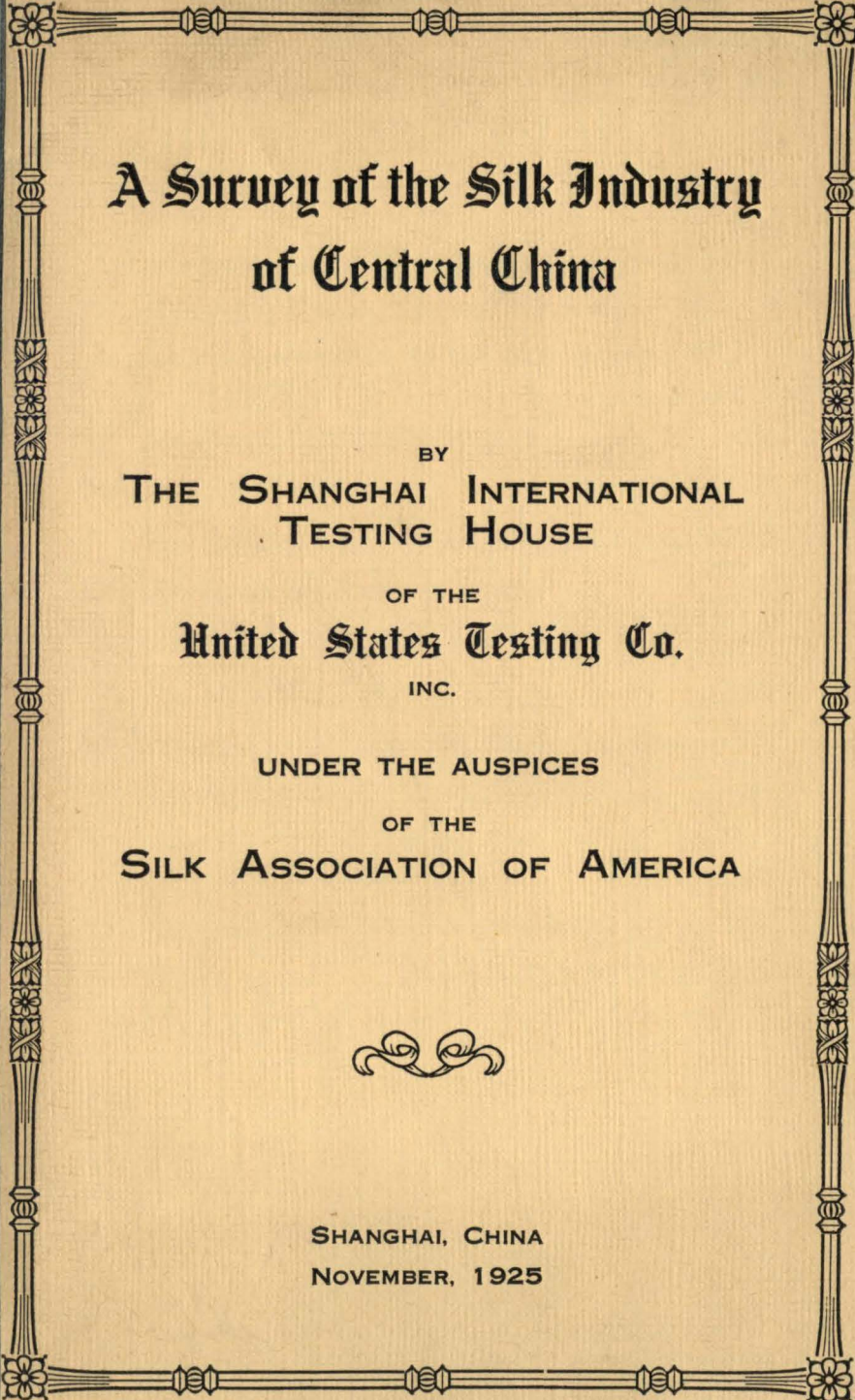
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**A Survey of the Silk Industry
of Central China**

BY
**THE SHANGHAI INTERNATIONAL
TESTING HOUSE**

OF THE
United States Testing Co.
INC.

UNDER THE AUSPICES
OF THE
SILK ASSOCIATION OF AMERICA



SHANGHAI, CHINA
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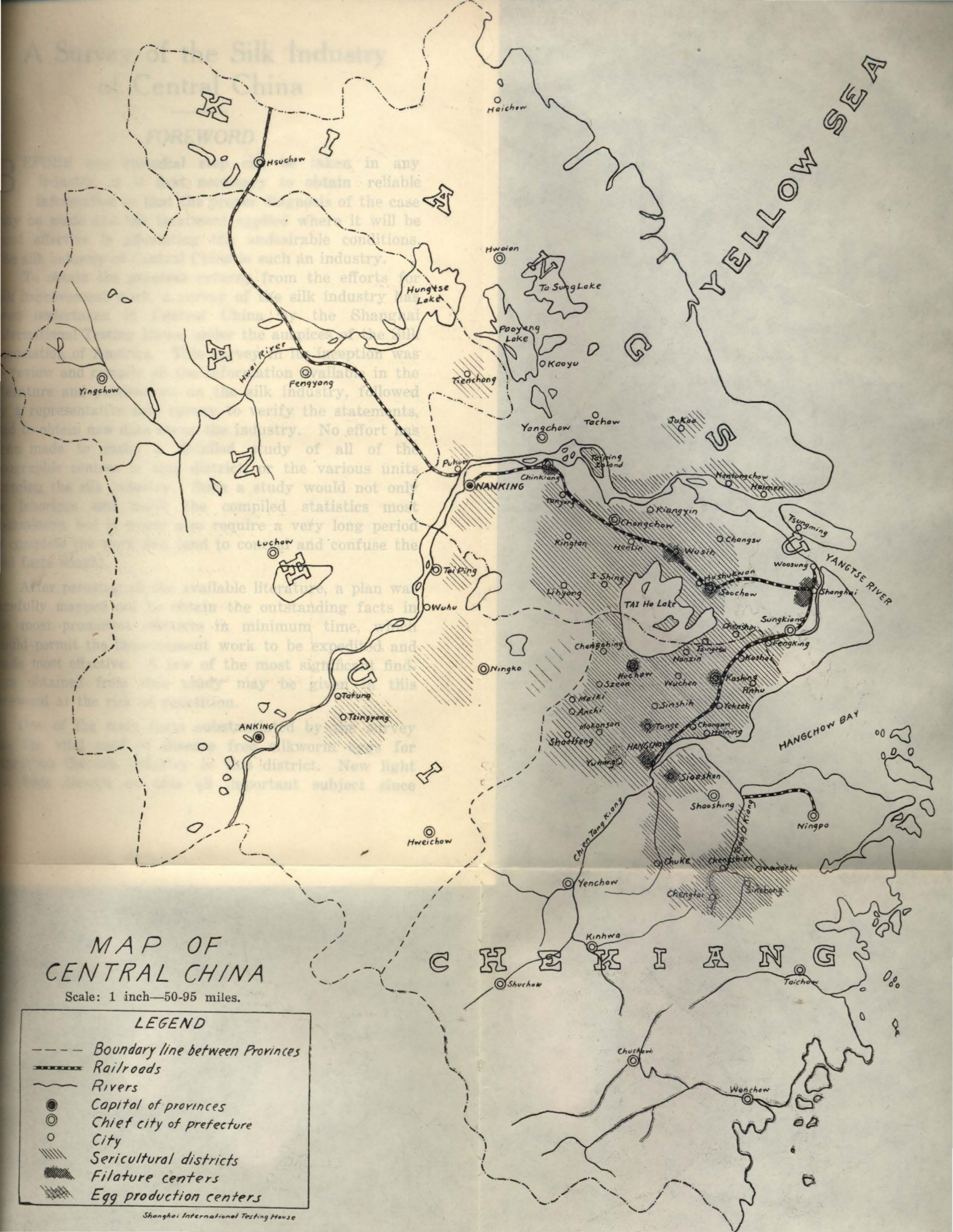
MAP OF CENTRAL CHINA

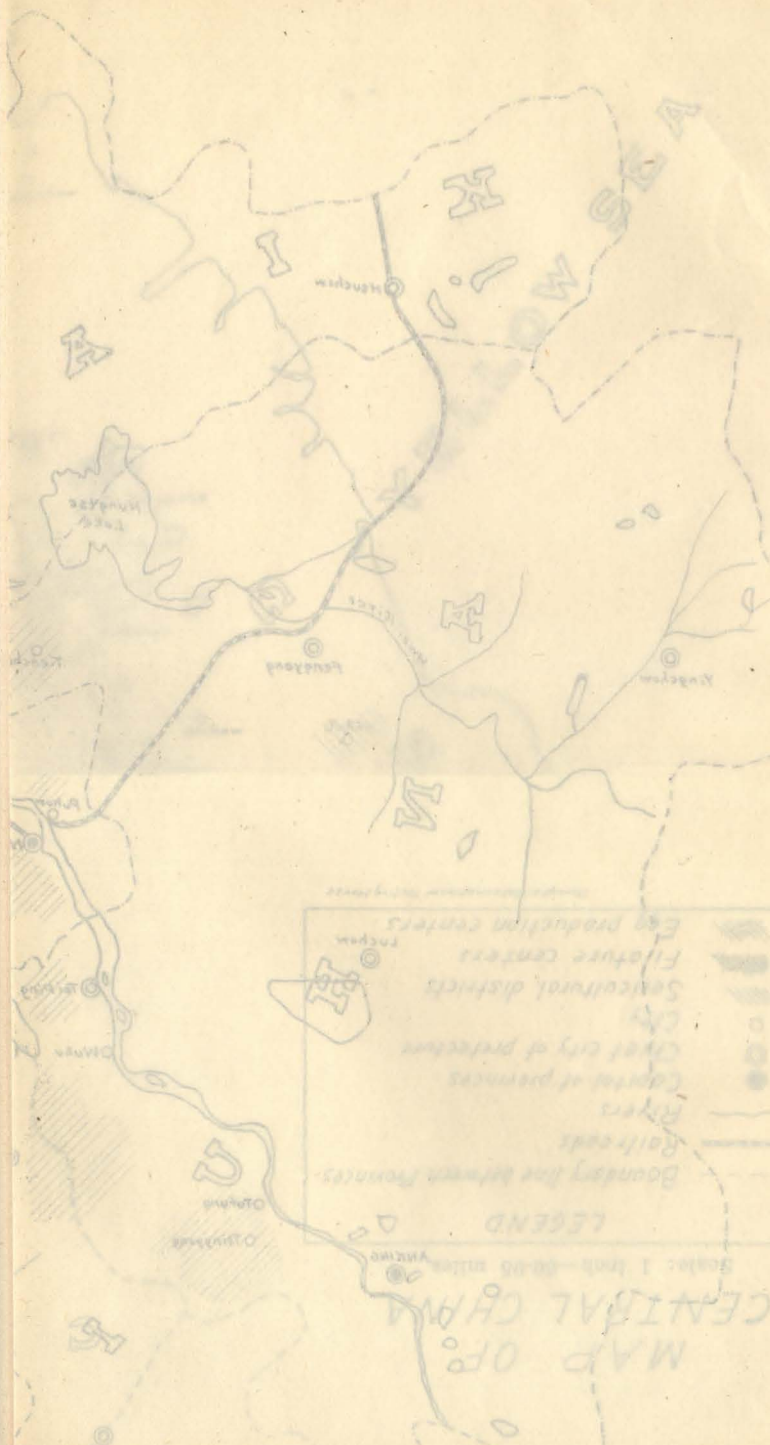
Scale: 1 inch—50-95 miles.

LEGEND

- Boundary line between Provinces
- ==== Railroads
- ~ Rivers
- Capital of provinces
- Chief city of prefecture
- City
- /// Sericultural districts
- Filature centers
- Egg production centers

Shanghai International Testing House





MAP OF
 CENTRAL CHINA
 Scale: 1 inch = 50 miles
 LEGEND
 Boundary line between provinces
 Railroads
 Rivers
 Capital of provinces
 City of prefecture
 Semicultural districts
 Future centers
 Egg production centers

A Survey of the Silk Industry of Central China

FOREWORD

BEFORE any remedial step can be taken in any industry, it is first necessary to obtain reliable information so that the proper diagnosis of the case may be made and the treatment applied where it will be most effective in alleviating the undesirable conditions. The silk industry of Central China is such an industry.

To obtain the greatest returns from the efforts for silk improvement work, a survey of the silk industry has been undertaken in Central China by the Shanghai International Testing House under the auspices of the Silk Association of America. This survey in its inception was to review and compile all the information available in the literature and publications on the silk industry, followed by a representative field survey to verify the statements, and to obtain new data about the industry. No effort has been made to make a detailed study of all of the geographic centres in this district, or the various units forming the silk industry. Such a study would not only be laborious and make the compiled statistics most voluminous, but it would also require a very long period to complete the work and tend to conceal and confuse the real facts sought.

After perusing all the available literature, a plan was carefully mapped out to obtain the outstanding facts in the most prominent districts in minimum time, which would permit the improvement work to be expedited and made most effective. A few of the most significant findings obtained from this study may be given in this foreword at the risk of repetition.

One of the main facts substantiated by the survey was the vital need of disease free silkworm eggs for improving the silk industry in this district. New light has been thrown on this all important subject since

obtaining definite information regarding native egg merchants who were reported to be non-existent at the time of beginning the survey. In the two places of Yuhang in the Hangchow district and Sinchong-Chengshien in the Shaoshing district one hundred and seventy-five million layings of silkworm eggs are produced and sold annually by native merchants to the farmers of Central China. This is over 45 per cent. of the total requirements of these farmers. As the best chops of these sheets contain a very high percentage of diseased layings (seldom less than 75 per cent.) it may easily be understood why the resulting cocoon crop is always poor in comparison to that from disease free eggs, although it is usually better than cocoons produced from individual farmer's eggs. Since obtaining this information from the survey, plans have been made to supply the egg merchants of Yuhang and Shaoshing with disease free layings, to be used by them for their stock from which they will produce commercial egg sheets. If the plans under consideration can be put into effect, the results of the disease free egg production should be made many fold that of the present time.

Another outstanding feature of this study is the cost analysis of the steam filature operations which points conclusively to the fact that good cocoons are most important for reeling silk by the filatures at a profit. By paying a bonus for cocoons produced from disease free eggs, the filature not only obtains the limited supply of these high grade cocoons which are most profitable to the filature, but it stimulates in a practical way the whole egg improvement work. As soon as the farmer realizes he is to be paid more for the cocoons produced from the so-called "School Eggs" he will demand disease free egg sheets and pay the price for them. This in turn will make a profitable enterprise, and place it upon a commercial basis under government supervision. Brief statements of this part of the survey have already been given to both the English and Chinese press, as it was thought to have such a bearing upon the whole improvement programme that to delay its publication would retard the work.

The survey has shown that one of the main contributory causes for the instability of chops produced in the Shanghai filatures is the under-financed condition of many of the filatures. These filatures operate on a very small investment resulting in a "hand to mouth" buying, many times highly speculative with financial disaster bound to follow in the wake. This brings with it the ever-changing management which is interested in the immediate profits rather than in producing uniform chops that will build a reputation and a successful business. The only improvement for the future in this phase of the raw silk industry seems to lie in the improvement of the silk industry as a whole, so as to attract to its ranks the sound business man with ample financial means, rather than the speculator.

In compiling the statistics and in collecting and tabulating the data, every precaution has been taken to verify their accuracy. However, it is beyond the realms of human possibility to expect that no errors will occur. This especially is true when it is taken into consideration that it has required over a year to complete the work and that the many sources of information had to be carefully weighed. In this we ask for your kind indulgence.

Appreciation is extended to the many individuals, institutions and organizations who have assisted so liberally in supplying information. To the many filatures who so generously gave us the privilege of studying their cost of production records we are indeed grateful. Especial thanks are due to the Silk Association of America whose financial support and continual encouragement has made the survey possible.

Silk Industry of Central China

GENERAL

INTRODUCTION

SERICULTURALLY, China can be roughly divided into four sections, South, North, West and Central. On account of the difference in climate and nature of soil, each section produces its distinctive kind of raw silk. South China has its centre at Canton, and produces the soft-natured silk popularly known as Canton silk. The North China section includes the Province of Shantung and Manchuria, with Tussah as its principal silk product. Szechuen is the chief province of Western China, where the silk produced is of yellow colour. Central China consists of the three provinces, Kiangsu, Chekiang and Anhwei of the Lower Yangtse Valley, and its products are known as "China Silks" and Tsatlee Rereels. The importance of Central China can best be seen by the following table of cocoon production in China (excluding Tussah Cocoons) estimated by the expert sericulturalists.

Name of Province	Piculs of Fresh Cocoons	% of Total
Kiangsu	350,000	10.5
Chekiang	1,000,000	30.0
Anhwei	30,000	0.9
Hupei	100,000	3.0
Hunan	20,000	0.6
Szechuen	600,000	18.1
Shantung	60,000	1.8
Honan	100,000	3.0
Kwangtung	1,000,000	30.0
Others	70,000	2.1
	<hr/> 3,330,000	<hr/> 100.0

Of the total annual amount of 3,330,000 piculs of fresh cocoons, 1,380,000 piculs or 41 per cent. is produced in Central China.

The silk industry of Central China under investigation can again be divided into seven primary producing districts, according to geographical distribution; three in Kiangsu

Province, three in Chekiang Province and one in Anhwei Province. Not all the territory in the three provinces is suitable for sericulture. Sericulture in a vast area is centered around the Tai Ho Lake region. In an area of 100 square miles surrounding the lake, mulberry plantations are very prosperous investments. Shanghai is the steam filature and export centre of Central China.

The Wusih-Changchow district lies to the North and West of the Tai Ho Lake and extends northward to the Yangtse River and westward to the border of Anhwei Province. This is the most prosperous sericultural district of Kiangsu Province. The Soochow district which is located East of the Wusih and Tai Ho Lake region extends southward to the borders of Chekiang Province. The area North of the Yangtse River is known as the Northern Kiangsu sericulture district. It also includes the cities of Nanking and Chekiang.

The Tsatlee district of Chekiang Province is situated south of the Tai Ho Lake opposite the city of Wusih. It is bounded on the west by Anhwei Province and on the East and South by the Hangchow district. The Hangchow-Kashing district extends from the southern border of Kiangsu Province southward to Hangchow Bay. The Shaoshing district is located in the Tsao-O-Kiang River valley, south of Hangchow Bay and is the southernmost district which this survey covers. Sericulture in past years has not been very extensive in Anhwei Province. As the silk and cocoon production is rather small, the Province is treated as one district.

The position of the different districts in the silk industry of Central China is brought out in the following table of cocoon and native silk production.

Name of District	Cocoons for Filature, Piculs dry	Native reeled in piculs for home consumption and for export as re-reels and white silks
KIANGSU		
Wusih	55 000	—
Changchow	30,000	—
Soochow	15,000	3,000
Northern Kiangsu	11,000	2,000
	111,000	5,000

Name of District	Cocoons for Filature Piculs dry	Native reeled in piculs for home consumption and for export as re- els and white silks
CHEKIANG		
Hangchow and Kashing	30,000	20,000
Tsatlee	10,000	35,000
Shaoshing	25,000	5,000
	65,000	60,000
ANHWEI	4,000	1,000
	180,000	
Grand Total	244,000	66,000
Cocoons converted into silk		36,000
Grand Total in piculs of silk		102,000

REARING OF SILKWORMS

In Central China there is only one principal crop of cocoons, the Spring crop. The Summer crop is very insignificant due to the weather conditions and the interference of the farmers' main agricultural undertaking—rice planting. The rearing of silkworms in the Spring usually starts the middle of April in Kiangsu and Anhwei Provinces, though the season is usually two weeks earlier in the southern districts of Chekiang.

The silkworms are of univoltine species, moulting four times and producing cocoons of white colour, varying in shade and size. The worms of the Summer crop, however, are of bivoltine type which moult only three times. The different types of worms are generally known after the place of origin, like Yuhang, Tsukwei, Sin Yuen and Wusih. The leaves of the domestic mulberry trees are their only food.

The methods of silkworm rearing practiced by the farmers at present in Central China do not differ much from those of the olden times. Modern scientific influence of sericulture has not yet reached the mass of the sericultural farmers. The rearing is, as a rule, the duty of the wives and daughters of the farmers, who take the opportunity to earn extra money. Each family rears as many worms as their labour and space in the house will permit. Hiring outside labour for this purpose is seldom

done by the average farmer. The only exception is the request for short periods to help from the neighbours during the last few days of the rearing season.

The silkworm rearing season usually lasts for one month and a half from the hatching of the eggs to the subsequent laying of eggs by the moths. The feeding season generally takes 28 days, though it varies somewhat from 25 to 33 days according to the type of worms and the weather conditions. The average life cycle in days of the two types of silkworms, Tsu Kwei and Sin Yuen, reared mostly in Central China is shown in the following table.

Stages	Hatching	I	II	III	IV	V	Total	Spinning	Cocoon	Moth
Feeding		4½	2½	3	3½	8				
Sleeping		1½	1½	2	2½					
Total	8	6	4	5	6	8	29	5	11	3
							Grand Total 56 days			

To feed and take care of the silkworms during the early stages does not require much labour or effort. The worms are small, occupy little space and consume a small amount of leaves. But the worms grow rapidly especially during the last stage. During the 30 days of the life of the average silkworm it increases its weight about 10,000 times. The number of feedings for the worms during the day varies according to the age of the worms. The small worms are fed at frequent intervals usually eight times a day and the older worms five times a day during the fifth stage. The number of times of feeding and the amount of mulberry leaves fed during the different stages are as follows:

Stages	I	II	III	IV	V	Total
Number of Feedings	33	21	20	21	30	130
Catties of leaves consumed by 1|10 ounce of worms.)	.7	4.6	13.6	38.9	284.8	342.8
Per cent. of total leaves con- sumed during each stage.)	.2	1.3	4.0	11.3	83.2	100.0

The space occupied by the silkworms also increases as the worms grow, from 10 square feet for one ounce (Chinese) of small worms to 800 square feet at maturity.

The last stage of silkworm rearing is the key stage of the success of the farmer's enterprise in silkworm rearing. The failure of the crop during the early stages would not cause much loss, while the death of the worms during or at the end of the fifth stage would include the loss of the leaves eaten, and labour spent previously. The silkworm diseases, however, usually appear or cause contamination during the last stage, just about the time of the spinning of the cocoons. The amount of cocoons produced from one ounce of small worms reared, vary from a total loss, in case the crop is taken by disease, to 25 catties, the highest yield securable in China under the most favourable conditions. The successful crops of sericultural organizations are usually about twenty catties, while the farmers obtain fifteen catties or less.

The farmers can dispose of the cocoons by selling them to the cocoon hong in their neighbourhood by reeling the cocoons into silk in their homes, or by letting the moths emerge and then producing egg sheets.

In the question of egg sheets in Central China, conditions vary from district to district. In certain sections, sericultural farmers do not produce any eggs themselves, while in certain localities sericultural farmers do nothing but produce egg sheets. Between these two extremes there are farmers who produce their own egg sheets for the following year's crop, and there are farmers who retain half of their cocoon crop for egg production, and half for cocoon or silk production.

The main cause of the failure of the farmer's cocoon crops is the use of native eggs which are not microscopically examined and which are usually from 75 per cent. to 95 per cent. diseased. These often cause epidemics in the sericultural district. The amount of disease free eggs produced in Central China is still insignificant as compared to the native egg production. Their general use may not be expected in the near future, on account of the reluctancy on the part of the farmers to change from ancient to modern practices. They are accustomed to the native sheets of square or oblong size, completely covered with

eggs. The small sized, disease free egg sheets, with only a few scattered egg circles, look entirely too expensive and modern to the native farmers, to have their complete support and confidence.

It is interesting to note, however, that in pushing the sale of egg sheets, the price element does not play the all important part as in most other commodities. The ordinary farmer will not take even free of charge the egg sheets, of which he is suspicious, or which he has tried before and found to be poor. At the same time he will pay the necessary price for the kind of sheets in which he has confidence, and which he uses year after year with success. The cost of egg sheets amounts to only a very small percentage of the expenses in rearing silkworms, and an additional cost for good egg sheets can be easily offset by the higher yield obtained. Therefore when the farmers know the quality of the egg sheets, there have been occasions when they have paid \$5.00 for 100 layings of disease free eggs, as happened recently in the Tsingza district. The main point is that they want to be sure that the egg sheets are good. This is also the reason why the farmers at Wusih and other places prefer to prepare the egg sheets from their own stock if they have a good crop. When they have a bad crop, they buy egg sheets from outside sources.

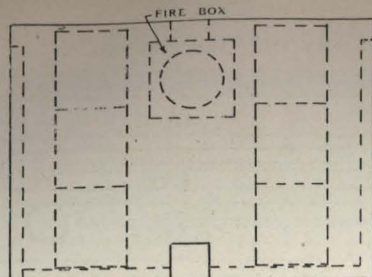
PURCHASING OF COCOONS

The steam filatures purchase cocoons by two different methods; namely, at their cocoon hong in the cocoon producing districts, where they buy fresh cocoons from the farmers and dry them for their own use, or they buy dry cocoons at the filature centres from the cocoons brokers. In general the filatures buy a portion of their cocoon supply during the cocoon season from the farmers direct, varying from 30 per cent. to 80 per cent. according to their financial resources and the amount of risk they are willing to assume in price fluctuations. The change of cocoon prices depends mostly on the fluctuation of prices of raw silk. If the price of raw silk is at a low level

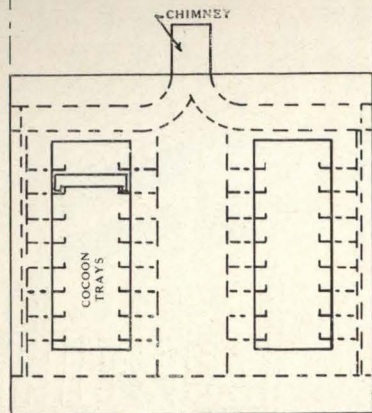
during the cocoon season, the filatures which buy a full supply at that time are reasonably assured of a good profit.

The purchase of fresh cocoons in the producing districts is done at cocoon hong which are the licensed buying stations of the filatures, equipped with ovens to stifle the chrysalides and dry the cocoons. In order to preserve the usefulness of the cocoons, the moths must be killed and the cocoon dried. This is done with the drying ovens whose construction is shown in the illustration. The dry heat radiated from the domed iron furnace top, which is heated to a red heat from underneath with firewood, keeps the enclosed space, where the trays of cocoons are placed, at a temperature of from 170° F. to 180° F. which stifles the chrysalides in from 6 to 10 hours. The drying is usually done by two steps, the first drying from 2 to 4 hours, and the second drying from 4 to 6 hours. When there is a small quantity of cocoons to be dried the two dryings are combined into one. The quantity of cocoons dried is about 120 catties per oven, being 5 catties per tray with 24 trays in one oven. The amount of cocoons, the temperature and time of drying vary from hong to hong and there seems to be no definite rule to follow. The weather and nature of the cocoons guide the hong operatives. The desired result is to obtain cocoons dried uniformly and to the extent that the chrysalis when pressed between the fingers will crush into pieces and give an oily feeling but will not pulverize into a fine powder. Insufficient drying will cause mildew and deterioration when the cocoons are stored in the warehouse. Over drying harms the fiber and causes difficulty in reeling. This type of drying oven is universally used in Central China with the exception of a few steam filatures at Hangchow and Kashing which use the Japanese type of drying machines.

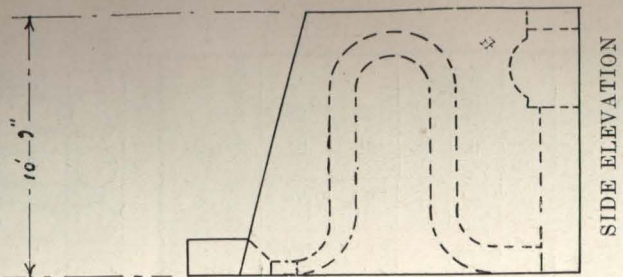
The Japanese type of cocoon drying machine is constructed with travelling belts and a system of steam pipes for heating (see illustration). Its advantages as compared with the tray type of oven in cocoon hong are: (1) no fire risks, (2) uniform drying, (3) high production, (4) labour saving. Because of the high initial cost and



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PLAN



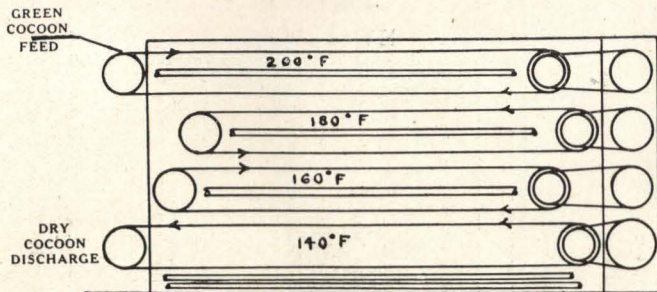
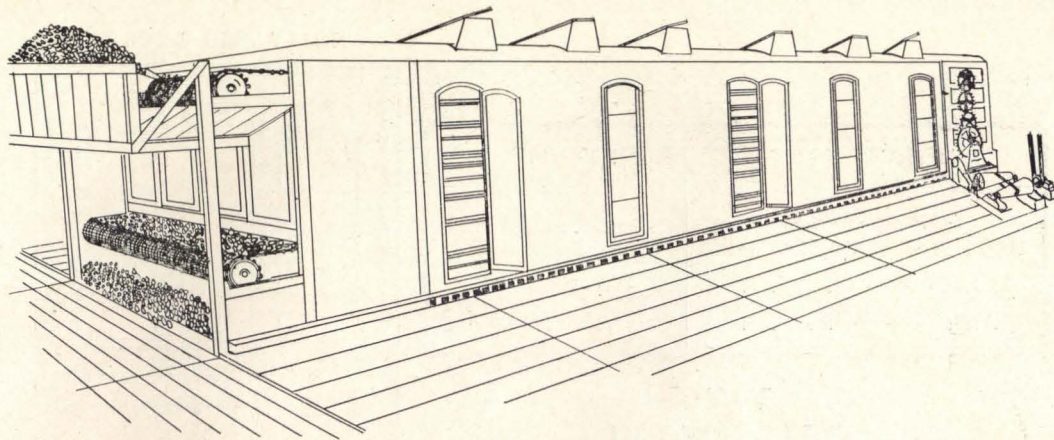
FRONT ELEVATION



SIDE ELEVATION

**CHINESE COCOON DRYING OVEN
DOUBLE TYPE
DATA**

Capacity of double oven for 24 hour day	3 piculs of dry cocoons full dry, 6 piculs of dry cocoons half dry, 48 trays of 5 catties each of fresh cocoons for one drying.
Temperature of drying	107° F. to 180° F.



DIAGRAMMATIC SKETCH

JAPANESE IMAMUR COCOON DRYING MACHINE DATA

Large Type	Drying Capacity in piculs 24 hr. day		Size of Room			Steam used per hour in pounds	H. P. for Drive
	Full Dry	Half Dry	L	W	H		
6 Belt	70	140	72'	12'	14½'	146	3.0
4 Belt	45	90	72'	12'	11½'	115	2.5

the requirement of steam for heating, its general adoption in the cocoon producing districts can only be expected to be very gradual. At Wusih where cocoon buying stations are located in the filatures, this better drying method may be easily introduced.

There are two arrangements of buying cocoons commonly in practice. As most of the cocoon hong are owned by the local gentry of the district, the filature men or cocoon merchants can either rent the cocoon hong during the cocoon season and buy the cocoons, or make the owners of the cocoon hong their buying agents at a fixed commission. Some filatures or cocoon merchants own their cocoon hong.

When renting cocoon hong, the filature men or cocoon merchants pay rent according to the size and locality of the hong, varying from \$50 to \$100 per oven for the privilege of using the property during the cocoon season. The filature sends its own men to supervise the buying and drying of the cocoons and the owner of the cocoon hong does not take any part in its operation. The second arrangement is for owners of the cocoon hong to buy cocoons for the filature man. Then it is only necessary for the filature man to put a few men into the hong to oversee its operations. The commission for such buying is either paid on the purchasing money basis (e. g. \$600 for \$10,000 worth of fresh cocoons) or on per picul basis at \$12.50 per picul of dry cocoons.

The cocoon buying at the cocoon hong is a hurried transaction. The period for the cocoon markets is short, being from 2 to 7 days. During this time the cocoon hong are crowded with farmers who bring baskets of fresh cocoons for sale. The inspector of the cocoon buying in the hong, examines the quality of the lot of cocoons submitted by the farmer and the weigher weighs the lot, after which the price of the lot is fixed. The lots of cocoons for sale are mostly of small amounts, that is from 5 to 20 catties. To buy enough cocoons for a picul therefore requires time. This hurried way of buying cocoons is partly responsible for the poor quality of cocoons used

by the filatures, because there is not enough time for careful selection and examination.

The problem of proper buying methods deserves the close study and attention of those interested in improving the silk industry in Central China.

The amount of cocoons to be bought each day is determined by the finances of the cocoon hong and the supply of the cocoons, but the amount purchased must not exceed the drying capacity of the cocoon hong. The cocoons must be stifled within 10 days from the date of mounting, otherwise the moths will pierce the cocoons and spoil the fiber.

It usually takes three piculs of fresh cocoons to make a picul of dry cocoons. This ratio varies slightly from locality to locality. Therefore the price of dry cocoons per picul is three times the price of fresh cocoons per picul plus the expenses of buying and drying, which varies in proportion to the amount of cocoons bought and the district in which the hong is located. The expenses for drying and buying cocoons per picul dry are roughly as follows:—

Chengshien	\$40	Wusih	\$30
Sinchong	45	Kiangying	35
Siaoshan	40	Changchow	35
Hangchow	35	Kingtan, Liyang I-Shing	40
Kashing	30		

These figures include the following items:

Tax per picul dry	\$11.20
Labour	5.00
Rental of Cocoon Hong	4.80
Fuel for Drying	2.50
General Expenses	4.50
Transportation	2.00
	<hr/>
	\$30.00

The cocoon cost per picul of silk can be easily calculated when the price of the fresh cocoons and the yield are known. The accompanying chart shows the cocoon cost at a glance.

COCOON COST

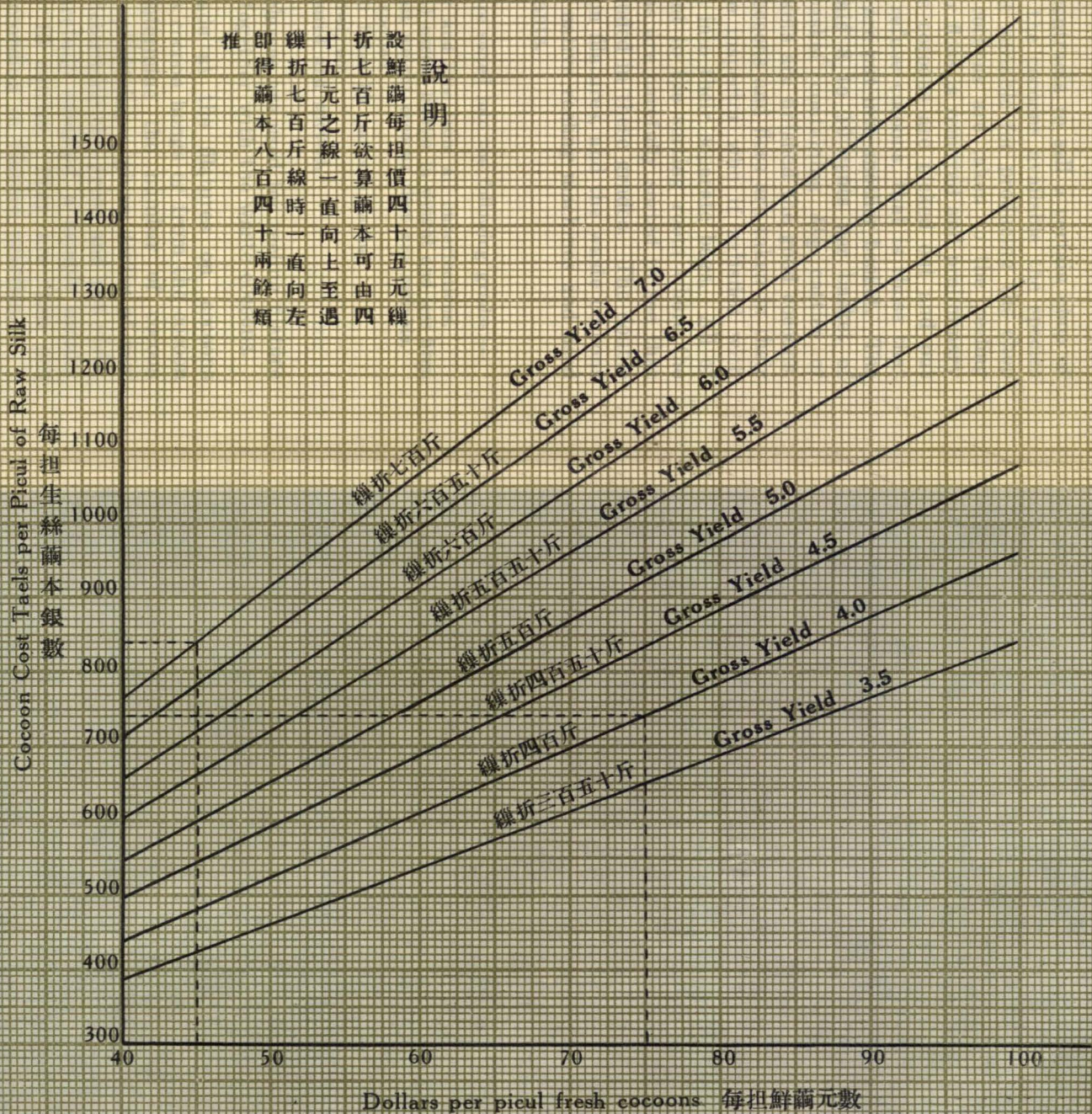
繭行購繭計算繭本法

Constants used

此圖造成乃根據下列諸點

Ratio fresh to dry	烘乾繭一担須鮮繭担數	3.0
Expenses per picul dry	每担乾繭開銷	\$30.
Exchange dollar to tael	洋厘(七錢三分)	.73

說明
 設鮮繭每担價四十五元
 折七百元之線一直向上至遇
 十五元之線一直向左右
 縱折七百斤線時一直向
 左
 推即得繭本八百四十兩餘類



Dollars per picul fresh cocoons 每担鮮繭元數

SHANGHAI INTERNATIONAL TESTING HOUSE.

August, 1925.

STEAM FILATURE OPERATION

When the filature contracts to sell a certain chop of its silk, it selects from the cocoons available the species and grade that are most suitable for producing the chop of silk desired. These cocoons are taken to the peeling room, where the cover or floss is removed and preliminary sorting is done. Double cocoons are picked out and put into a separate basket; refuse cocoons, that is those that are dirty and very thin, are put into another basket. The peelers are generally paid 8 to 10 cents per basket of cocoons peeled, each basket containing $4\frac{1}{2}$ cattiees of cocoons. When the baskets are finished the good cocoons, double cocoons, refuse cocoons and floss are taken in their separate baskets, to the inspector who if satisfied with the work, has them put into their separate bags. All of the cocoons are then sent to the sorting room where the double and waste cocoons are carefully sorted to see that no good cocoons are included in these grades. The double cocoons are sold to dupion filatures, and the waste cocoons are sold to be reeled by native reeling machines and used in the native weaving plants.

The so-called good cocoons are sorted into the following grades:—

- (1) Extra-Firm, heavy and free from all imperfections.
- (2) No. 1—Same as (1) except lighter in weight and less firm.
- (3) Thin ones—Lightest weight cocoons that are reelable.
- (4) Spotted—Slightly spotted.
- (5) Pierced with small holes by parasite worm.
- (6) Coloured—yellow, red, etc.
- (7) Waste—badly coloured and spotted.

Only the first four classes are used for reeling filature silk, the others are sold together with the waste cocoons.

Yield tests are made at the filatures on cocoons purchased at the various cocoon honges or from the cocoon brokers in order to determine the number of cocoon filaments to be used for producing a given denier of raw silk thread and also to determine the gross and net yield. The cocoons are first carefully sampled, a sample usually weighing 20 pounds or 15 cattiees. They are then put through regular tests according to filature practice.

The gross yield is usually expressed as the number of catties of dry cocoons obtained from the farmers or cocoon merchants necessary to make one picul of raw silk. The net yield is the number of catties of reelable cocoons (that is, after peeling off the floss and eliminating the double, waste and other unreelable cocoons) required to make a picul of silk.

On the basis of tests and past experience the superintendent issues orders for the number of cocoon filaments to be used when reeling cocoons from a given district so as to produce a given size of raw silk thread. For instance, in reeling 11|13 denier silk, four raw Wusih cocoons or three raw and two thin cocoons are used. For 13|15 denier raw silk, four raw and two thin, or three raw and four thin, or two raw and five thin, may be used. The reeling girls may change the order slightly in order to secure the size required. The weighing room is the distributing station of cocoons to the reelers. A record is kept of the amount of cocoons distributed to each basin each day. This in turn is compared with the amount of silk produced by the reeler to see if she has obtained the yield which can be expected or as given by the yield test mentioned above. Each reeler is given from 40 to 55 Chinese ounces of cocoons per day, depending upon the quality of the cocoons, and the grade of silk to be reeled. The better the quality, the greater the production, and the lower the filature manufacturing expenses. For instance, in producing size 13|15 denier Extra, 3|3 or 4|2 cocoon filaments are required and the reeling girl can operate six ends and produce 11 Chinese ounces of silk, while in producing 13|15 No. 1 it will require 4|3 or 3|4 cocoons and she can only operate five ends and produce 9 Chinese ounces of silk.

As the equipment is practically all of the Italian type with one boiling pot for two reeling basins the boiling and reeling is all done in the same room. The brushing and boiling of cocoons requires only about five minutes. In practically all the filatures in China this operation is

entrusted into the hands of girls whose age runs from 8 to 12 years and who will eventually learn the reeling work. It is very hard to supervise the work of these tiny tots and the result is that the waste due to boiling is far greater than it would be if a separate boiling department operated by a few older people were used, as is done in Japan, and in some Chinese filatures who have adopted the Japanese method.

In the best type of filatures great care is taken to provide a proper water supply. Most of the filatures have their own sand filtering system, with storage tanks using Whangpoo River water, or water from artesian wells as their source of supply. This water is changed in the basin every hour. In order to assist the inspector to see that the water is kept clean, in many filatures, a porcelain dish is put in the bottom of the basin which reflects the colour of the water. The power plant of an ordinary filature consists of one or two Lancashire boilers to produce steam to heat the basins; one small reciprocating engine to drive the reels and pumps; one feed water pump, and two pumps for the filtration system. The power necessary to drive the reels is about 3 H.P. per 100 basins. The steam consumption is between 2.7 to 3.6 lbs. per basin, per hour, and the water consumption about 3.2 to 4.0 gallons per basin, per hour.

In general, the Grant reel is used for 13|15 and larger sizes of raw silk while for 9|11 the straight reel is used. The reason for this is that most of the fine sizes are sold to France where the straight reel is preferred.

The filatures have a group of inspectors, each of whom usually supervises the work of about 25 girls to see that the proper number of cocoons is used to insure an even size; to see that the basins and water are kept clean and that the proper length of croisure is maintained. Besides inspection, a plan of testing is usually followed and carried out on about 25 per cent. of the basins each day. The numbers for the basins whose silk is to be tested, are

usually drawn at random from a box containing the numbers of all the basins in a section and the silk is immediately tested from the basins whose numbers have been drawn. One sizing skein is made from each skein on the reel. These sizing skeins are weighed individually on a quadrant balance and the total for a basin is checked on an ordinary balance. The workers are usually rewarded or fined according to these tests. As an example, in producing 13|15 denier silk, if it average about 13.80 and the individual sizing skeins fall within 13|15, the reward is 20 cents. If an individual skein is only slightly outside of the above limits the reward is reduced to 10 cents. If the average is 1 denier away from 14 denier, a fine of 10 cents is made and if it is 1½ off, a fine of 20 cents is made. In making the winding test the reeler will be fined if there are 8 breaks, or more, in winding 10 skeins for one hour. Of course the system of tests and fines varies with different filatures and according to the quality of silk produced by the filatures. In producing high quality a slight sacrifice as to quantity must be made, for if the cocoon is reeled too near the inside too many defects of cleanness will occur.

The hours of work are usually from 5.30 in the morning to 5.30 at night with one hour from 11.30 to 12.30 for lunch, making an 11 hour day. The wages for the workers are fixed by the Cocoon and Silk Guild and are as follows:—

	Wages per day
Reeling	43 cents
Assistant Reeling	33 "
Boiler	25 "
Sorting	37 "
Silk Room	45 "
Long Waste	27 "

These wages may be slightly altered by an individual filature which may pay a little higher wages as an inducement to attract the better class of workers for producing high grade silk.

The general cost and other data relating to filatures are shown in the following table:—

The following basic data were obtained from a careful analysis of twenty different filatures:—

	Maximum	Minimum	Average
Capital Investment per basin in Tls. ...	411	195	291
Rental per basin per year in Tls. ...	42.00	26.40	33.10
Picul of Dry Cocoons used per basin per year ...	12.50	5.30	10.10
Picul of Raw Silk produced per basin per year ...	2.35	1.30	1.74
Value of Silk produced per basin per year in Tls. ...	2780	1696	2157
Number of reeling girls per basin ...	1.52	1.00	1.14
Number of boiling girls per basin ...	.66	.50	.54
Number of peeling and sorting girls per basin ...	1.33	.27	.83
Other employees per basin ...	.59	.03	.23
Total number of employees per basin ...	3.87	2.08	2.77
Income from double cocoons per picul of silk in Tls. ...	68.40	18.80	37.70
Income from long waste per picul of silk in Tls. ...	84.00	28.00	45.10
Income from floss per picul of silk in Tls. ...	44.00	5.40	26.30
Income from refuse cocoons and Chrysalis per picul of silk in Taels ...	17.50	2.40	10.60
Total Income from by-products per picul of silk in Tls. ...	204.00	89.00	119.60
Cost of coal per basin per year ...	81.60	60.00	69.70

Note: The totals given above are not the sum of individual items given, as the maximum for a given item in a filature does not mean that the next item will be a maximum in the same filature. This same holds true for the minimum value and the average of averages.

The survey shows that in a filature, 75 per cent. to 80 per cent. of the cost of producing raw silk is the cost of the cocoons used in its manufacture. This indicates that the cocoons are the all important factor in the raw silk industry, and the one which must be closely and carefully scrutinized at all times, to avoid a financial disaster in filature management.

The most important single quality of cocoons is the silk content, which is ultimately shown in the yield and which is expressed as the number of units of cocoons required to produce one unit of raw silk. The higher the grade of cocoons, the better the yield, that is, the number of units of cocoons per unit of raw silk will be low. This means that the good cocoons are of great financial value to the filature.

The second important quality of cocoons is the ease with which the silk can be reeled off. Cocoons that are readily reelable require a minimum time and give very low manufacturing expenses. At the same time they make it possible to produce high grade raw silk. When poor cocoons are used a large amount of waste is produced in "finding ends" of the filaments and these filaments when continually breaking cause not only loss of time and poor production from a quantity standpoint, but also a low grade raw silk thread. Even the most expert and alert reeler cannot make an even and clean thread when there are many breaks in unwinding a cocoon. This can only result in an uneven thread with many defects due to the many "cast ons."

Other qualities of cocoons that require close attention from the filature, are colour and size of the filaments. These have important bearing on the colour and lustre of the raw silk produced and on the size of the raw silk reeled.

In this survey the Shanghai International Testing House made a study of 52 yield tests made on various species and grades of cocoons. These yields have been derived from actual filature operation and are, therefore, entirely practical and not at all theoretical. The average value obtained from compiling the data on the various cocoon districts are given in the following tables:—

YIELD OF COCOONS YEAR 1924 AVERAGES

Province	K I A N G S U							Kiang-su Average
	Wusih	Kiang-yin	Chang-chow	Lih-yang	Soo-chow	Chang-su	Hai-men	
PERCENTAGE OF DIFFERENT GRADES OF COCOONS								
Extra	21.2	27.3	35.8	48.8	29.7	31.1	18.1	33.8
No. 1	37.7	32.4	30.0	26.2	40.5	30.0	41.8	32.8
No. 2	17.8	15.9	11.4	10.9	16.2	16.2	18.0	14.1
Reelable... ..	76.7	75.6	77.3	85.9	86.4	77.3	77.9	80.7
No. 3	4.3	1.7	2.2	1.2	.9	3.8	3.1	2.2
Double	11.7	11.4	11.1	7.6	8.1	8.6	11.8	9.9
Pierced ... ..	.2	1.1	.8	.2	.3	.9	.9	.4
Refuse	1.1	3.5	2.6	2.0	1.2	2.9	2.4	2.1
Coloured ... ..	.2	.6	.4	—	—	.3	.3	.2
Cover/Floss... ..	5.3	6.1	5.6	3.1	3.1	6.2	3.6	4.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

YIELD-CATTIES OF DRY COCOONS FOR ONE PICUL OF RAW SILK

Province	K I A N G S U							Kiang-su
District	Wusih	Kiang-yin	Chang-chow	Lih-yang	Soo-chow	Chang-su	Hai-men	Average
Extra Net	405	411	398	386	397	426	404	398
No. 1 Net	508	538	498	473	461	525	502	492
No. 2 Net	677	785	647	575	599	785	701	651
Avg. Net	498	515	461	419	453	513	507	464
Gross	649	681	598	483	525	663	651	556

(CONTINUED)

Province	C H E K I A N G					Che-kiang	Anh-wei	Grand
District	Hang-chow	Ka-shing	Hu-chow	Shao-shin	Siao-shan	Average	Average	Average

PERCENTAGE OF DIFFERENT GRADES OF COCOONS

Extra	30.7	31.2	36.3	44.5	34.2	34.1	47.9	34.3
No. 1	36.1	32.5	30.9	32.1	30.1	32.6	29.2	32.6
No. 2	11.6	19.1	14.7	6.7	13.7	13.8	12.1	13.9
Releable... ..	78.4	82.8	81.7	83.3	78.0	80.5	89.2	80.8
No. 3 ... ..	.5	1.2	1.6	.6	.7	.8	2.1	1.9
Double	14.5	7.9	10.1	7.0	13.6	11.1	5.4	10.0
Pierced ... ..	.6	.8	.6	.5	.7	.7	—	.5
Refuse	1.4	1.9	1.9	1.9	1.1	1.6	—	2.0
Coloured ... ..	.2	.4	.5	—	.4	.3	—	.3
Cover/Floss... ..	4.4	5.0	3.4	6.7	5.5	5.0	3.3	4.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

YIELD-CATTIES OF DRY COCOONS FOR ONE PICUL OF RAW SILK

Extra Net	414	400	400	410	407	407	360	399
No. 1 Net	461	466	508	513	496	484	402	487
No. 2 Net	719	644	783	661	734	715	509	660
Avg. Net	488	463	481	459	474	474	389	465
Gross	627	558	587	553	609	591	436	574

This study brings out three features of vital importance:—

First—The increased profit made possible to the whole silk industry by using high grade cocoons.

Second—The great value of good disease free eggs in producing high grade cocoons.

Third—The importance of making accurate tests on samples of cocoons purchased.

The average values obtained from these composite yield tests are given in the following table:—

GENERAL AVERAGE OF FILATURES			
Cocoon Quality	Percentage of Cocoons	Yield in Catties	Manufacturing Expenses per picul of raw silk in Tls.
Extra	34.3	399	219.4
No. 1	32.6	487	252.9
No. 2	13.9	660	386.4
Total Reelable	80.8		
Wgt. Average		479	272.8
Gross Yield		574	

The manufacturing expenses per picul of raw silk are calculated according to the daily production of silk per basin and the over all expenses per basin, per day. The higher the grade of cocoons the higher the production; therefore, less expense. In calculating the manufacturing expenses the filatures in Shanghai usually assume a figure of Tls. 1.20 per basin per day for manufacturing expenses, which includes the following items:

Labour, reeling and general	₹.505	42.3%
Light, heat and power .. ..	.240	20.0
Supervision and Management .. ..	.160	13.4
Rent .. ..	.095	8.0
Interest .. ..	.060	0.5
Miscellaneous .. ..	.090	7.5
Incidentals .. ..	.050	4.3
	₹1.200	100.0%

The average income from miscellaneous wastes per picul of raw silk is Tls. 130 made up as follows:—

Double Cocoons @ ₹60 per picul	₹35
Long Waste @ ₹200 per picul	45
Floss @ ₹100 per picul	24
No. 3 Cocoons @ ₹62 per picul	7
Refuse Cocoons	7
Chrysalis and Pellettes @ ₹3 per basin per mo. ..	12
	₹130

These values have been computed from the average of recorded yields obtained by filatures and the average price received. The total is Tls. 10 higher than the average return on by-products as shown on page 19.

To illustrate how high grade cocoons can bring more profit to the filature men, let us take 30 piculs of green cocoons as raw material and reel them into silk, with the averages given in the above table as the basis for calculation. Assuming 30 piculs of green cocoons were bought at the producing districts at \$60 a picul (the average price for 1924) and that it takes 3 piculs of green cocoons to make one picul of dry cocoons, 10 piculs of dry cocoons would be obtained. At the normal rate of exchange the total cocoon cost would be Tls. 128 per picul of dry cocoons. Adding Tls. 32 per picul for the cost of drying, purchasing, expenses, likin tax, transportation, storage and interest the total cost of dry cocoons delivered at the filature would be Tls. 160 per picul. The expenses in working on the different grades of cocoons and the income from silk produced are given in the following table:

GENERAL AVERAGE OF FILATURES

Cocoon Quality	Extra	No. 1	No. 2	Miscellaneous
Piculs of cocoon used	3.43	3.26	1 39	1.92
Cocoon cost in Tls.	548	522	222	307
Manufacturing Expenses	189	170	81	—
Selling expenses	26	20	6	—
	763	712	309	307
Picul of raw silk produced	0.86	0.67	0.21	
Yield in catties... ..	399	487	660	
Production of silk per day in Chinese oz.... ..	9.50	7.50	5.00	
Selling price of silk Tls.	1180	1150	1109	
Value of silk produced Tls.	1015	770	231	
Value of by-products in Tls.	—	—	—	209
Profit or loss in Tls. (+ or -)	+ 269	+ 38	— 82	— 98

The selling prices of raw silk for the different grades as given in the table are the average prices on the Shanghai raw silk market for the year 1924. The miscellaneous column includes the unreelable cocoons which are sold with the long waste produced.

The above table shows that in working on extra cocoons, the profit is Tls. 269, and on the No. 1 cocoons only Tls. 38. The total profit is greatly reduced by the loss incurred in working the No. 2 cocoons and in the sale of

the unreelable ones. So the net profit in converting the ten piculs of dry cocoons into raw silk is Tls. 127. The figures show very clearly the value of the different grades of cocoons to the filatures. Had all the cocoons been in the extra grade, a profit of Tls. 784 per 10 piculs of dry cocoons would have been obtained, which would have increased the earnings of the filature enormously. The report of the Silk Association of Japan shows that the average yield of Japanese cocoons is 350. This would mean that all the cocoons would have to be better than the quality of the extra given. The problem of improving the quality of Chinese cocoons, therefore, is the most vital one to the filature men.

The tests made at the Shanghai International Testing House on cocoons produced from disease free eggs show that the yield is consistently high. Two tables follow, one giving yield tests on cocoons produced from disease free eggs and the other, yield tests on cocoons from native eggs. These tests were all made under exactly the same conditions by a good reeling girl, obtained from a high grade filature, and are, therefore, comparable throughout.

SHANGHAI INTERNATIONAL TESTING HOUSE YIELD OF COCOONS FOR 1925

COCOONS PRODUCED FROM DISEASE FREE EGGS				
Type and Source	Wusih Commercial lot from a Cocoon Hong	Chu Tsing Japan & China Cross Breed Hangchow Sericultural School	Tse Ting Japan & China Cross Breed Hangchow Sericultural School	Average
PERCENTAGE OF DIFFERENT GRADES OF COCOONS				
No. 1	56.6	63.6	59.7	60.0
No. 2	21.3	17.7	19.4	19.4
No. 3	6.7	9.7	10.6	9.0
Reelable	84.6	91.0	89.7	88.4
Double... ..	7.8	1.7	4.7	4.6
Pierced ... ..	.2	4.5	3.0	2.5
Coloured	—	—	—	—
Refuse	2.2	.1	—	1.1
Cover or Floss... ..	5.3	2.7	2.6	3.4
Total	100.0	100.0	100.0	100.0

**YIELD-CATTIES OF DRY COCOONS FOR ONE PICUL
OF RAW SILK**

No. 1	320	314	302	312
No. 2	360	318	325	334
No. 3	403	347	368	373
Average	334	318	312	321
Gross	395	350	348	364

PERCENTAGE OF SILK AND BY-PRODUCTS

Total Raw Silk	25.2	28.6	28.7	27.5
Long Waste	1.5	3.4	2.7	2.5
Chrysalis & Pellette	48.3	50.8	46.9	48.7
Loss in reeling	9.6	8.2	11.4	9.7

**SHANGHAI INTERNATIONAL TESTING HOUSE
YIELD OF COCOONS FOR 1925**

COCOONS PRODUCED FROM NATIVE EGGS

Province	KIANGSU		CHEKIANG				Average
	Wusih	Chang-chow	Hang-chow	Shao-shing	Ka-shing	Siao-shan	

PERCENTAGE OF DIFFERENT GRADES OF COCOONS

No. 1	11.7	27.0	22.7	30.3	33.8	32.4	26.3
No. 2	37.1	35.6	34.4	45.2	47.3	39.5	39.5
No. 3	14.9	7.8	30.5	12.2	8.5	8.7	13.8
No. 4	16.7	11.4	—	—	—	—	4.7
Reelable	80.4	79.8	87.6	87.7	89.6	80.6	84.3
Double	9.8	10.5	5.5	3.1	3.7	11.2	7.3
Pierced	—	—	—	—	—	—	—
Coloured	—	—	—	—	—	—	—
Refuse	3.9	3.1	2.7	1.9	1.2	1.6	2.4
Cover or Floss	5.9	6.6	4.2	7.3	5.5	6.6	6.0
Total	100 0	100 0	100.0	100.0	100.0	100.0	100.0

**YIELD-CATTIES OF DRY COCOONS FOR ONE PICUL
OF RAW SILK**

No. 1	394	415	397	415	381	510	419
No. 2	513	496	429	460	421	592	485
No. 3	600	672	555	553	507	658	591
No. 4	768	653	—	—	—	—	710
Average	540	492	455	454	411	562	486
Gross	673	619	520	520	459	698	582

PERCENTAGE OF SILK AND BY-PRODUCTS

Total Raw Silk	14.8	16.1	19.2	19.3	21.8	14.3	17.6
Long Waste	4.0	4.0	4.6	4.3	3.1	3.9	4.0
Chrysalis and Pellette...	52.3	48.5	51.9	53.7	53.2	51.5	51.9
Loss	9.2	11.2	11.9	10.4	11.5	10.9	10.9

By using good disease free eggs, cocoons having the above high yield can be produced by all the farmers. The production cost of these cocoons may be slightly increased (1 per cent. to 2 per cent.) but the profits to the filature using this grade of cocoons in the foregoing illustrations would be very large. The commercial production of these cocoons would bring great profit to the entire silk industry of China.

The quality of cocoons produced in Kiangsu, Chekiang and Anhwei provinces has greatly deteriorated. Ten years ago the yield of Shaoshing cocoons was 390 while now the yield is 550. The degree of deterioration of Wusih cocoons is greater. In 1923 the average yield of Wusih cocoon was 700 to 800. Unless this deterioration is stopped by the introduction of disease free eggs and better methods of rearing silkworms, the cost of manufacturing raw silk in the filatures will be very high and little profit will come to the filature men.



Wusih-Changchow District

GENERAL

THE Wusih-Changchow District lies north and west of the Tai Ho Lake and extends northward towards the Yangtse River including the cities of Wusih, Changchow, Kiangyin and the three less important cities of I-Shing, Lihyang and Kingtan. It is an area of over a thousand square miles very rich agriculturally, the outcome of its systems of canals used for irrigation as well as transportation. Rice and mulberry, the two principal agricultural products, are cultivated here in abundance. Wusih, the chief city of the district on the Shanghai-Nanking Railway, is the second largest industrial city in Central China, Shanghai being first. There are cotton and flour mills and silk filatures located in various sections of the city.

MULBERRY PLANTATION

The mulberry trees planted in the district are mostly of Shantung origin, called Lu-Sang. They are quite similar to Huchow mulberry trees, except the shape of the leaves is a little longer and more slender. There are acres and acres of mulberry fields in the entire district, plantations of large tracts of land not usually found in other places. In going from Shanghai to Nanking by rail one observes scattered mulberry trees after passing Soochow. Intensity of mulberry plantations increases when approaching nearer and nearer to Wusih. The density gradually decreases after passing Changchow.

The trees are planted closely together, 300 trees to a mow with about 4 feet spacing. They are three to four feet high, which though higher than the Japanese mulberry trees, are the lowest planted in Central China. The plantations are generally well cultivated by the farmers. Fertilizer is applied two or three times a year which consists of pond mud, bean cake and night soil. The annual production of leaves per mow as estimated, is an

average of eight piculs for the spring crop and two piculs for the summer crop.

The farmers plan to have at their disposal from owned or rented land, enough mulberry leaves to rear their worms. This, however, at best is quite a gamble, due to the lack of scientific methods of control used throughout the sericultural industry. First of all, the farmers produce their own egg sheets, without inspection, which are generally 50 per cent. to 75 per cent. diseased. Knowing this fact the farmer makes due allowance by hatching about twice as many worms as he expects to be able to rear to the cocoon stage. If the gods are propitious and the season is good for silk worm rearing, that is, if the climate is dry and mild, the mortality among the worms will be relatively low and the farmer will not have sufficient leaf supply. Following the law of supply and demand, the leaf prices fluctuate greatly, and the prices may soar from the nominal price of \$2 to \$3 per picul, to the unreasonably high limits of \$8 to \$10 per picul. At such prices the farmers must choose between continuing to feed the worms with expensive leaves, or destroying the grown worms by throwing them into the river and calling the previous work a dead loss. When the weather is cold and damp, more than the normal amount of the worms die, which causes a large surplus of leaves when the prices may fall as low as 20 cents a picul.

However, this severe fluctuation of mulberry leaf prices does not mean a corresponding fluctuation in the price of cocoons. To a large extent the price of cocoons is controlled by the price of raw silk, which in turn is practically controlled by the law of supply and demand between Japan and America—the main producer and the main consumer.

Again in Central China where only one important crop of cocoons is produced annually, sericulture is considered a lucrative by-product industry, in which the farmer engages during the off season of his regular agricultural crops, and from which he considers all money made, a

clear profit. The farmer takes what he can get for his cocoons and little consideration is given to the real cost of production.

REARING OF SILKWORMS

It is said that practically all the farmers in the Wusih-Changchow district are engaged in rearing silkworms during the silk worm season. The species of worms are of a distinctive breed not introduced from other districts but are indigenous to this section. The cocoons are quite similar to those of Sin Yuen being small, olive shaped and of excellent white colour. The silk worm season begins the latter part of April. The feeding period is about 28 days and the total silkworm season is about one and a half months. During this period of the year the farmers are free from other agricultural work, as rice planting follows the silkworm season.

The farmers rear silkworms for cocoons only, that is, they do not reel the cocoons into raw silk in their homes as is done in many other districts. The native method of reeling for domestic consumption has long ago disappeared, and modern steam filatures have been introduced.

The farmers are all expert sericulturalists in the native methods, and, because of the keen competition of cocoon buyers for their supply of raw materials, the cocoon farmers receive good prices for their products. Silk worm rearing is a profitable and prosperous enterprise in the district, but this prosperity has brought with it evils which have been followed by a deterioration in the quality of cocoons. Fundamentally, the deterioration is due to the method of producing the native egg sheets, and the unscientific method of rearing the silkworms. But it is said that deterioration is also due to two undesirable practices by the farmers in the district, especially those of Wusih, in silk worm rearing. The first practice is the rearing of the bivoltine type of worm, with the univoltine type during the Spring crop. The cocoon of the bivoltine

type is of inferior quality and its presence in a lot of Spring cocoons gives a poor yield. The rearing of bivoltine worms has the advantage from the farmer's point of view, of a shorter rearing period since the worms moult only three times, instead of four. They eat much less leaf, and produce heavy green cocoons for the small amount of silk they contain. The second bad practice is the insufficiency of the amount of leaves fed during the last few days and the vicious habit of shaking the cocoon mounts while the worms are spinning their cocoons. This immediately causes the worm to stop spinning and stops the changing of a silkworm into a chrysalis, thus decreasing the amount of silk content and increasing the weight of the individual cocoons. This unwise practice is doing a great deal of harm to the cocoon crops.

COCOON PRODUCTION

The city of Wusih is without question the most important cocoon centre of Central China. Its own production which amounts to 60 per cent. of the total cocoon production of Kiangsu Province, besides a large part of the cocoons from the whole district of Wusih-Changchow are shipped to the city direct for reshipment. During the cocoon season it is a busy city. Along the banks of the Grand Canal near the railway station native houseboats and motor launches are anchored in large numbers serving as temporary offices for the filature managers from Shanghai. The hotels are filled with a long list of patrons.

Meetings are held before the opening of the cocoon season at the Wusih Silk and Cocoon Guild which are attended by the local and Shanghai filature managers and cocoon merchants who decide the date of the opening of the market and the average price of cocoons to be paid during the season. Meetings of the same nature are held in all the cocoon districts where there are guilds. The decisions of these meetings are only suggestive and not compulsory.

The cocoons bought and dried at the different cocoon hongs in the villages surrounding Wusih, Changchow, Kiangyin and other cities are either shipped by rail or canal directly to Shanghai or reshipped from Wusih. If the cocoons are to be shipped outside of the producing district, a likin tax has to be paid. The regular likin tax per picul of dry cocoons is \$8.00. In addition to this there are different kinds of surtaxes, the amount and kind varying according to the locality. In Wusih during the year 1924 the following additional taxes were levied:—

Surtax for police force	\$0.10
Surtax for Cocoon and Silk Guild .. ..	.30
Surtax for Community Charity Work .. ..	.45
	\$0.85

Therefore the total tax amounted to \$8.85 per picul of dry cocoons. Because of its fine filament the cocoon produced in the Wusih-Changchow district is greatly demanded by the filatures, especially in producing silk of 9|11 and 11|13 denier, where these cocoons give the best results. The filaments of cocoons from other districts are too coarse to reel such fine sizes. It requires a larger number of cocoons to reel a 13|15 silk by using Wusih cocoons than cocoons from Chekiang province, and therefore it is easier to produce even silk from Wusih cocoons, as the breaking of one filament will affect the evenness of silk by a much smaller per cent.

The following brief table gives a comparison of the qualities of Wusih-Changchow and Shaoshing cocoons:—

Kind of eggs used	Wusih		Changchow	Shaoshing
	Native Eggs	Disease Free Eggs	Native Eggs	Native Eggs
Average denier size of single filament of silk	1.8	2.2	1.9	2.3
Average length of single filament in meters	356	505	375	553
Average weight of single cocoon in grams	0.272	0.373	0.299	0.544
Net Yield... ..	5.400	3.340	4.920	4.540
Gross Yield	6.730	3.950	6.190	5.200

The one characteristic wherein the Wusih and Changchow cocoons produced from native egg sheets is most inferior is in the silk content or yield. It takes in ordinary years over six piculs of dry cocoons to make a picul of raw silk or the Wusih-Changchow cocoon has a gross yield of over 6.0 as against 3.5 of the Japanese cocoons. In 1923 it took even as high as 8 piculs of dry cocoons. This deterioration is due to the lack of recognition of the value of high grade cocoons by the buyers. They have up to the 1925 season paid the same price for all grades of cocoons without careful examination. This in turn has caused the farmers to introduce the vicious practices in rearing which have already been described.

STEAM FILATURE SILK PRODUCTION

In Wusih there are 18 steam filatures with a total of 5,536 basins. The annual production of raw silk is from 7,000 to 8,000 piculs which is for export. The filatures are quite prosperous. Being newly established, they are better equipped and of better appearance than most of the filatures in Shanghai. The Tsun Nee filature which contains 752 basins is said to be the largest filature in China. Its annual production of "Double Eagle" chop silk is about 1,500 piculs. The Jay Sung is the second largest filature in Wusih with 520 basins and an annual production of more than 1,000 bales of "Three Dancers" chop silk.

The cocoon supply for the filatures comes mostly from the Wusih-Changchow district itself. The figures from the Provincial Tax Bureau for the year from May 21st, 1923 to May 20th, 1924 show that 30,918 piculs of dry cocoons were shipped into the city of Wusih from Kiangyin, Changchow, I-Shing, Kiangtan and Lihyang, while the city of Wusih shipped to Shanghai 8,099 piculs of filature silk and 23,643 piculs of dry cocoons produced around Wusih. Assuming a yield of 5.5, the Wusih filatures consumed about 44,500 piculs of dry cocoons, one-third of which were produced around the city of Wusih and two-thirds from the other cities of the district. The Wusih silk filature

industry is over-expanded, and is dependent on other cities for its cocoon supply. With the water communication which has just been established between Wusih and Huchow across the Tai Ho Lake, there is a prospect of drawing a large supply of cocoons from the Tsatlee district.

The Wusih filatures have a number of distinct advantages over those of Shanghai. One of these is the lower wage of the operatives. The comparison of the daily wage as given by the Guilds is as follows:—

	Wusih	Shanghai
Reeling Girl	\$.40	.43
Apprentice Reeling Girl ..	.32	.33
Boiling .. .. .	.24	.25
Sorting .. .. .	.40	.37
Silk Room .. .. .	.44	.45
Long Waste .. .. .	.24	.27

Besides the lower wage scale, the workmanship of the Wusih reeling girls is considered superior and the working day is of 12¼ hours instead of the 11 hours per day as in Shanghai. This reduces Wusih manufacturing expenses about 15 per cent.

The following table gives the average expenses for producing raw silk per basin per day:—

	Wusih	Shanghai
Labour, reeling and general ..	¥ .40	.51
Light, heat and power .. .. .	.26	.24
Supervision and Management ..	.17	.16
Rent .. .. .	.09	.09
Interest .. .. .	.05	.06
Miscellaneous .. .. .	.02	.09
	<hr/> ¥1.00	<hr/> ¥1.15

Another advantage is the lower likin tax that is paid. The Wusih filatures can either pay the tax on dry cocoons or on raw silk. A fee of \$8.00 per picul is levied on dry cocoons. In computing the tax for raw silk the authorities use 460 catties of dry cocoons as equivalent to one picul of silk as a basis. This gives a tax of \$36.80 per picul of silk. However, the yield of the Wusih cocoons is usually 600

catties or more per picul of silk which makes the tax paid on the cocoon basis at least \$48.00. Thus a saving of over eleven dollars per picul of silk can be made by the Wusih filatures over those of Shanghai in paying the tax on the silk instead of on the cocoons.

Probably the greatest advantage that the Wusih filatures have is the ample financial backing by local capitalists which makes them sound and successful enterprises. Continual changing of management and organization is thus avoided. The business is made permanent, the physical conditions of the filatures is kept up and the reliability of the chops is established. It is little wonder that chops such as Double Gold Deer, Double Eagle, Three Dancers, etc., are found uniform and are graded very high on the market, year after year.

Wusih is, however, over-crowded with filatures. The competition for the cocoon and labour supply is exceptionally keen. As mentioned before the local filatures consume more cocoons than the Wusih area can produce. Further expansion of the filature industry therefore depends on the increase of its cocoon supply, which in turn can be brought about by the opening of new cocoon districts, by supplying better egg sheets to the farmers, and by teaching them scientific methods of silkworm rearing.

EGG PRODUCTION

In the Wusih-Changchow district, like other districts of Kiangsu Province, the sericultural farmers produce egg sheets themselves. Each family selects one or two catties of the best cocoons of their crop, and prepares the egg sheets for the next year. The number of egg sheets or layings used annually in this district is not known, but from the annual cocoon production the most conservative estimates are nearly sixty million layings. Practically all are produced in the native way, that is, the moths are not microscopically examined.

Modern egg producing stations are being established in the Wusih-Changchow district and disease free egg

sheets are being distributed to the farmers, but the amount is as yet too small to be significant. There are two egg producing stations at Wusih, namely, the Provincial Sericultural Experimental Station outside of West gate, and the city Silkworm Egg Producing Station, in the Silk and Cocoon Guild building near the Wei Hills. The former was established in 1918 by the Provincial authorities of Kiangsu with a nominal annual appropriation of \$12,720 and produces 40,000 layings of disease free eggs, with the assistance of branch stations at I-Shing and Kiangyin. The latter station was established in 1923 by the city authorities of Wusih with an annual appropriation of \$1,800 and produces the same amount of eggs. The International Committee for the Improvement of Sericulture in China has a station at Heng'in near Changchow for egg production. Besides the disease free egg sheets made locally 20,000 sheets of half a million layings are purchased annually by the filatures, the Silk and Cocoon Guilds and other organizations. These eggs are purchased from the International Committee, the Girls' Sericultural School at Hushukwan and other disease free egg producers, for distribution among the farmers.

IMPROVEMENT WORK

Besides the production and distribution of disease free egg sheets in the Wusih district, which is the most urgent need in the silk improvement work in China, a station demonstrating modern methods of silkworm rearing was established in 1925 at Yen Chao, a village ten miles North of the city of Wusih, by the Hushukwan Girls' Sericultural School under the auspices of the International Committee. It was felt that a demonstration station at this place, where so many disease free egg sheets were distributed, would be of great value in teaching the farmers better methods of rearing silkworms.

This station hatched 2,000 egg sheets and sold the small worms to the farmers after the first and second sleep. Only a very small amount of worms was raised at the station for the purpose of demonstration. The girls

spent most of the time in teaching the farmers better rearing methods in daily visits to the one hundred or more farmers to whom the small worms were distributed.

During the 1925 season much propaganda work was done among the filature men, by members of the International Committee, on the value of high grade cocoons produced from disease free eggs, as determined by the Shanghai International Testing House. As a result the cocoon markets paid a premium for cocoons raised from the so-called "school eggs." When the excellent gross yield of about 4.2 became known, this premium reached from 20 to 25 per cent. the price of the ordinary cocoons, with several unique types of bonuses added to attract and encourage the producer of the high grade cocoons. About 900 piculs of fresh cocoons produced from disease free eggs were purchased in this district at a price ranging from \$70 to \$80 while those produced from native eggs sold for \$55 to \$65. Even at the price paid, the net profit to the filature was over ₣100 more per picul of silk for the high grade cocoons than for the usual kind, which after all is the best demonstration for the hard-headed business man. This has given a big impetus to the movement of introducing certified eggs, as every one sees their economical advantage.

Soochow District

GENERAL

THE Soochow district sericulturally is of far less importance than the Wusih district. It is located East of the Tai Ho Lake and covers a strip of land bounded by the Yangtse River on the North and Chekiang Province on the South, including the city of Soochow, the Lake Island and Changsu. Its northeastern section extends to the cotton growing district of Tai Chong, and its southern section adjoins the Tsatlee district. Sericulture is prosperous in the villages near Kiangyin and Wusih, the immediate territory surrounding the lake, and the islands of the Tai Ho Lake.

The city of Soochow is a filature centre as well as a silk weaving centre. There is another silk weaving centre in the district called Chenshai which is located near Kashing in Chekiang Province.

MULBERRY PLANTATIONS AND SILKWORM REARING

The mulberry trees planted and the species of silkworms reared in the northern section of the district are similar to those of the Wusih district, while in the southern section, they are more like those of the Tsatlee district. The type of mulberry trees planted in the southern section is of Huchow origin, popularly known as Husang, which is the type cultivated in Chekiang Province. The trees grow about 6 feet tall and are planted 6 feet apart, or about 140 to 160 trees to a mow.

The following detailed cost of production of leaves in the Soochow district was given by the Hushukwan Girls' Sericultural School. The value of mulberry land with trees in full production is about \$80 per mow. Assuming an interest rate of 10 per cent. which is the average interest charge in China, the interest on the initial investment is \$8.00. The average farm labourer can cultivate

eight mows of mulberry land, and the wage paid is about 30 cents a day without food (that is, the worker has to furnish his own food) or \$9.00 a month or \$108 per year. The labour cost per mow per year is \$13.50. The amount of fertilizer to be applied on a mow of land including pond mud in winter, and night soil in spring, costs \$6. The land tax is 70 cents per mow. In tabulated form, the cost per mow per yard, is as follows:—

Interest on investment in land	\$8.00
Labour	13.50
Fertilizer	6.00
Land Tax .. .. .	.70
Total	<u>\$28.20</u>

There is an income of about \$2.00 per mow from by-products in the form of branches to be sold as firewood. The annual production of mulberry leaves per mow is about 8 piculs for spring crop, and two piculs for summer. Therefore the cost of producing mulberry leaves is approximately \$2.60 per picul.

The above figures apply only to those producers of leaves like sericultural schools, sericultural organizations and wealthy land owners, who employ labour to cultivate the fields. The ordinary sericultural farmer works his own mulberry orchard, and therefore will have no labour item on his cost sheet. He may be an owner of land or may be just a tenant. In the latter case he has to pay annually \$7.00 per mow to the landowner. Part of the fertilizer used will be bought, and part secured by himself. The cost of producing mulberry leaves per mow in this case, therefore, is as follows:—

Rent on Land	\$7.00
Fertilizer	3.00
Total	<u>\$10.00</u>

He will use the branches as his fuel supply and feed the leaves to his silkworm crop. If he does not rear silkworms, or produces more leaves than he needs for his requirements, he may sell them in one of three ways. First, he may sell the right to pick leaves on his tract of land, in which case it is usually stipulated in the contract that the buyer shall

have the right to pick half grown leaves, for feeding small worms. The second way is to sell by forward contract the leaf production of the land at a fixed price, per picul. Here it is stipulated that the leaves are to be picked when full grown. The sale by forward contract usually means that the farmer is hard pressed financially so the price paid for the leaves is below par, (usually about \$2.00 a picul) one-half of which is paid at the time of signing the contract, and the remainder at the time of delivery. The third way is to sell leaves on the open market where ordinarily the farmers can get \$3.00 per picul for their leaves. However, the price is subject to severe fluctuations, as the market for leaves is of short duration, (about 10 days) during the period between the last moulting of the worms, and the spinning of cocoons, and this introduces a large element of speculation.

COCOON AND FILATURE SILK PRODUCTION

The most important cocoon centre in the district is the Lake Islands with an annual production of 3,000 piculs of dry cocoons. The villages like Modor and Kwangfu, southwest of the city of Soochow are also cocoon producing localities. The products are known as Lake Islands cocoons, and form the main source of raw material supply of the Soochow filatures. More than half of the cocoon honges in the above places are owned and operated by the filatures, giving them a partial monopoly of the cocoon production there. In the northwestern part of Changsu, cocoon production is also prosperous. There are 20 cocoon honges, with 368 ovens, and an annual production of 4,000 piculs of dry cocoons. The quality of cocoons is similar to that of the Kiangyin cocoons. The extreme southern section of the district is a cocoon producing as well as a Tsatlee silk producing place.

The city of Soochow itself and its immediate surroundings, is a filature and weaving centre. It has three filatures with 788 reeling basins. These filatures like those of Wusih are well equipped and managed, and likewise enjoy the advantages of cheaper production costs in comparison to Shanghai filatures. The silk chops of Soochow filatures

also have a high grading. The establishment of another flature in the near future at Soochow is being planned.

SILK WEAVING CENTRES

Soochow was a leading silk weaving centre in China in the Tsing dynasty, producing beautiful brocades, figured satins, ribbons and embroideries as tributes to the Imperial throne. According to Mr. James H. Hart, Commissioner of Customs, in his report on silk, the raw silk consumed locally during each of the years 1878 and 1879 for manufacturing purposes amounted to 159,000 kilograms or 2,640 piculs. Its importance has gradually declined since the introduction of the modern silk weaving industry into Hangchow and Huchow of Chekiang Province in 1910. At present its hand looms are still busy, although their output is of far less quantity; yet it is estimated to be valued at millions of dollars annually.

Chenshai is the second centre of silk weaving in this district. The silk piece goods produced here are of light weight, like the Habutae of Japan. There are about 8,000 looms consuming about 8,000 bales of raw silk annually. This silk is supplied by Tsintsa, Nanzin, Pinwong and a very large portion by the Kashing district.

EGG PRODUCTION

The farmers in the northern section of the Soochow district like those of the Wusih district prepare egg sheets themselves. In the southern section, the eggs are either produced by the farmers individually or are bought from the egg merchants in the Tsatlee or Shaoshing district. Modern disease free eggs are produced in this district by the Hushukwan Girls' Sericultural School, and the Soochow Station of the International Committee.

The Hushukwan Girls' Sericultural School is located in the small town of Hushukwan ten miles west of Soochow. It was established in 1913, and is not only the largest school of its kind of China, but, from the very beginning, it has had a most enviable reputation. The school is supported by an annual grant of \$35,000 from the provin-

cial government of Kiangsu Province, and gives free tuition and board to students of the province while a small fee is charged for outside students. The annual enrollment is usually about 140, although in 1925 it dropped to 80 due to the political disturbances within the province.

The work of the school is divided into four departments:—silkworm rearing, mulberry production, silk reeling and extension. The last named department is not a part of the instruction work but has for its purpose the introduction of modern sericultural methods to the farmers, in the different parts of the province.

The silkworm rearing department gives courses of instruction in silkworm rearing, and practical demonstration during the rearing season. It also supervises the egg production work, producing annually 6,000 sheets of 168,000 disease free layings which are distributed to the farmers. Besides the egg production of the school, 10,000 sheets of 280,000 layings were made by the graduates of the school, and distributed through the school. Of the 16,000 sheets, 4,000 were bought by the farmers at Tsingzah in the Tsatlee district, as a result of the extension work carried on at that place for a year. The Wusih filatures also took a large quantity of their sheets. Owing to the good demand, the school in 1925 is planning to make 10,000 sheets instead of 6,000 and the graduates are planning to increase their production.

The sheets produced are sold on the market at three prices, 40 cents each for Sin Yuen and Ta Yuen species of worms; 50 cents each for Tsu Kwei and 60 cents each for Japanese-Chinese cross breed. The cross breed egg sheets are the most in demand among the sericultural schools in China at present. It is claimed that they are superior to other kinds of egg sheets, giving worms which are easy to rear and producing high grade cocoons with a gross yield as low as 3.2. The cross breed egg sheets are expensive to produce, the actual cost being \$0.80 to \$1.00 per sheet. In order to be able to produce cross breed egg sheets on a large scale, it is necessary to have machines for separating male and female cocoons, and also refri-

gerating facilities for egg storage. There may be, however, a serious consequence from the introduction of cross breed worms. The farmers who have always been accustomed to make their own egg sheets, when seeing the fine cocoons resulting from the cross breed may decide to produce their own egg sheets from these cocoons. In as much as the second and third generations of worms begin to revert to the original species, the cocoons produced would soon be a poor mixture of Japanese and Chinese cocoons.

The microscopic examination of egg sheets is done during the summer by the instructors of the school. The percentage of disease is claimed to be very low, varying from .2 to .5 per cent. but always less than one per cent. The egg sheets produced by the graduates of the school, who have six companies located in the vicinity of the Shanghai-Nanking railroad, are all examined by the school at a very low charge. The percentage of disease in the egg sheets produced by the graduates last year averaged below 1 per cent., the worst case being 3 per cent. The cost of producing egg sheets in the school is approximately \$1.20 per 100 layings.

The mulberry production department cultivates the 170 mows of mulberry land owned by the school, and supervises the work of 230 mows of adjoining mulberry land owned by the graduates.

The courses in silk reeling are given after the rearing season. There is a small laboratory in the school consisting of a number of small hand reeling machines, and miscellaneous apparatus. Madame Ou, widow of the late manager of the Sincere Company of Shanghai, has recently donated to the school, a 30 basin Japanese filature with boiling tanks, power plant, etc. Due to the unsettled political situation of the province, the school has not yet been able to obtain funds to house and install the machinery.

The Extension Department is a distinctive feature of the work of the school. The department has a staff of

three who spend most of their time outside of the school, in introducing disease free eggs, and modern methods of sericulture to the farmers. The farmers need to be shown real facts before they will follow and adopt the new methods. The work done by the department at Tsinzah, of the Tsatlee district, in the 1924 silkworm season brought wonderful results and a good reputation. A fund of \$1,200, half from the treasury of the school and half from the city of Tsinzah, financed the work. Two hundred and twenty egg sheets were taken to the rearing house in the suburb of Tsingzah, and the new methods of rearing were demonstrated to the farmers. The healthy growth of the worms during the first and second sleeps attracted much attention. The small worms were then offered for sale at a low price to the farmers who were promised the supervision of the staff from the school. They were rapidly bought and the staff kept a small quantity for itself. The bad weather during the third and fourth stages caused much disease to develop among the worms from native eggs being reared according to native methods. However, the worms distributed by the school staff grew healthy in spite of weather conditions and gave an excellent crop. The name of the school was thus made famous. Before the close of the rearing season the farmers came in to place orders for their egg sheets, and 3,600 sheets were sold in advance. If they had had more disease free sheets available, they could have been distributed there at high prices.

Besides the work done at Tsingzah the school also took care of the Soochow station of the International Committee in 1924. The work done by the staff of the school there showed such good results that the Committee arranged with the school, to secure for the Committee, the permanent service of the staff.

In 1925 the Extension Department of the school besides continuing its work at Tsinzah, also secured the co-operation of the International Committee in establishing another demonstration station at Yen Chao, the results of which have been described elsewhere in this book.

Nanking and Northern Kiangsu Province

THE two main sericultural districts of Kiangsu Province have been treated in the previous chapters. There remains the outskirts of the main area to be dealt with, which includes Nanking, Chinkiang and the section of Kiangsu Province north of the Yangtse River. Sericulture is not at all extensive in these regions but they may be areas for future expansion.

Nanking is a silk weaving centre. However, it has become prominent in the silk industry of China in recent years by the educational and egg production work done by the University of Nanking, the Government Southeastern University and the international Committee for the Improvement of Sericulture in China. Chinkiang is a filature centre. North of the Yangtse River, Yangchow is the seat of the Provincial Sericultural Station. Haimen, and the Taiping Island in the river, are cocoon producing cities.

NANKING

Nanking rivalled Soochow and Hangchow in the production of exquisite silk fabrics for the imperial family during the Tsing Dynasty, but like Soochow its leading position has been overshadowed by the rapid development of the modern silk weaving industry of Hangchow and Huchow. The production of figured and plain satins therefore is decreasing. At present there are about 3,000 looms, with products valued at half a million dollars a year. The market for their goods is in Manchuria and the Northern Provinces of Chili, Shantung, etc. The raw materials used are the native silk skeins as produced around Nanking, and collected by the numerous silk honges in the city of Nanking before being sold to the weavers.

Nanking is rapidly becoming the centre of modern disease free egg production, in Central China. With the increase in the producing capacity of the University of

Nanking, through the completion of its sericultural building given by the Silk Association of America, and the expansion of the Nanking Station of the International Committee for the Improvement of Sericulture in China, Nanking surpasses Hangchow in the amount of disease free egg sheets produced. Nanking produces 1,500,000 layings annually as against 600,000 in Hangchow. Nanking, like Yuhang and Sinchong-Chengshien, the two principal producing centres of native eggs in Central China, has the advantage of being isolated from the main sericultural districts, and is, therefore, more or less free from contamination, in seasons of silkworm epidemics.

UNIVERSITY OF NANKING

The sericulture department of the University of Nanking is now concentrating its work in the production of disease free egg sheets, and is the largest single station in Central China. It has at its disposal the equipment, facilities and personnel to carry on the work. The building which is built of reinforced concrete is a princely residence for the silkworms. It meets all the requirements of a rearing house, being dry, well ventilated and well lighted. The University has its own mulberry plantations for the feeding of the silkworms, and the materials and supplies used in connection with the work. In 1924, 348,000 healthy layings of eggs were produced, which amount was doubled in 1925.

The cost of producing disease free egg sheets is always higher than that for the native egg sheets due to the investment, high cost of supervision, and additional labour for microscopic examination. This is particularly true in government and educational institutions, where the overhead absorbs a large part of the appropriation. The University of Nanking, however, has shown through its excellent work, how the cost of disease free egg production can be brought down to reasonable limits. The figures for the 1925 season are shown in the following table:—

	Cost of 100 layings
Value of leaves @ \$2.85 per picul	M.\$0.69
Labour .. .. .	.43
Salaries of staff .. .. .	.36
General expenses .. .. .	.13
Materials and supplies .. .. .	.20
	<hr/>
Less receipts on pierced cocoons @ Tls. 130 per picul	1.81 .31
	<hr/>
Net Cost	\$1.50

SOUTHEASTERN UNIVERSITY

The Southeastern University of Nanking is the only educational institution of collegiate standing in Central China that gives a sericultural course. The department is closely connected with the Nanking Station of the International Committee. In fact the University is in charge of the station and the students receive practical experience at the station. The work of the Nanking Station of the International Committee is described in connection with the Shanghai report.

CHINKIANG

In Chinkiang there are two filatures with a total of 456 basins. These filatures are not so well equipped as those in Wusih and Soochow and they have not been very successful. One was closed in the Spring of 1925. While they have the advantage of cheaper labour, longer working hours and less taxation on cocoons, they are handicapped by the difficulties in securing raw material and skilled labour. The cocoons come mostly from Taiping Island, Tanyang, Nanking and North of the Yangtse River, for which reason the supply is limited and unless they have the first choice of these resources, they experience difficulties in replenishing cocoon supplies from other cocoon producing districts which are not so accessible. The type of labour in Chinkiang is not so skilful as in Wusih and Soochow due to inherited characteristics of the people and the environments. The prospects of its further development as a filature centre is rather doubtful.

Taiping Island, the nearest source of raw material supply for Chinkiang filatures is a very large Island in the Yangtse River, 20 miles downward from Chinkiang. Twenty-one cocoon honggs with 236 drying ovens are located here, producing 600 piculs of dry cocoons.

NORTHERN KIANGSU

In the cities north of the Yangtse River in Kiangsu province, sericulture is not prosperous, and the quantity of cocoons produced is only a small amount. It is a wheat and cotton territory, where the farmers are engaged in the production of wheat during the spring and cotton during the summer. They raise two crops annually, with which they are occupied during the entire year. The expansion of the sericultural industry, therefore, is rather handicapped.

YANGCHOW SERICULTURAL EXPERIMENT STATION

The Provincial Sericultural Experiment Stations at Yangchow has as an objective the introduction of sericulture into Northern Kiangsu Province. The main station is located at Yangchow, with three branch stations at Hsuechow, Haichow and Taishien. It distributes 250,000 mulberry seedlings and 4,000 egg sheets every year to the farmers.

The Yangchow station has two hundred mows of mulberry land half of which is for the production of leaves, and the other half for the production of seedlings. This is almost the only place in Kiangsu Province where mulberry seedlings are produced. Most of the seedlings are secured from Changan in Chekiang Province. The station is maintained by an allowance of \$2,400 monthly from the provincial authorities.

The mulberry seedlings are sold at 1.6, 1.2 and .8 cents each graded according to size. They are produced in the summer by sowing berries from the wild mulberry trees, and transplanted in Autumn when they are about 5 feet high. In the following spring they are grafted with

domestic mulberry branches, which the station buys from Chinkiang. One year after grafting the seedlings are sold to the farmers, and they will produce leaves in two years. The cost of working one mow of mulberry seedling land, which produces 6,000 to 7,000 seedlings, is as follows:—

	One year	Total
Fertilizer	\$ 6	\$12
Labour	10	20
Berries for seeds	2	2
Branches for grafting	5	5

The cost per tree is therefore, 65|100 of a cent.

During the silkworm rearing season the station also gives courses of instruction to students from the surrounding cities. This part of the work conducted by the station is not so important as distributing seedlings to the farmers so as to produce a larger supply of leaves for raising silk worms.

NANTUNGCHOW AND HAIMEN

The Chamber of Commerce gave the figures as \$500,000 worth of cocoons or 3,000 piculs of dried cocoons produced in the two cities of Nantungchow and Haimen annually of which one-third is produced by the farmer and two-thirds by the latter. The Chamber of Commerce bought annually \$700 worth of mulberry seedlings from Chekiang to give to the farmers, to encourage the production of cocoons. The cocoon hong in this district, 23 at Nantungchow with 354 ovens and 24 at Haimen with 356 ovens, are owned by the local cocoon merchants, who sell the cocoons at Shanghai in small lots to the filatures.

There is a small silk weaving mill at Tangkaza, the industrial suburb of Nantungchow. Forty wooden hand looms have been installed for the weaving of narrow silk piece goods from native reeled raw silk.

Jukao and Taishien are also cocoon producing districts. They have 19 hong with 280 drying ovens and 10 hong with 91 drying ovens respectively. The total production of these two places is between one to two thousand piculs of dry cocoons annually.

Hangchow-Kashing District

GENERAL

THE Hangchow-Kashing district presents a most complete picture of the sericultural and silk industry of Central China. Here one can observe each and every diversified phase of the whole industry, from the production of the silkworm eggs, to the silk fabrics woven in unique and elaborate patterns, and dyed in many brilliant shades and hues to meet the demand of the Chinese people in all walks of life. A few of the most interesting units of the silk industry in this district are, the native egg producing centre of Yuhang, the vast mulberry seedling plantations of Changan, the endless belt type of cocoon drying machines of some of the cocoon hong, and the Japanese methods of steam filature operation.

This district covers the Northeastern section of Chekiang Province, and is traversed by the Shanghai-Hangchow Railway running through Kashing, Yehzah, Changan to Hangchow. The other cities of importance are Pinhu, Haining, Zamen and Yuhang. This whole district is a vast area of mulberry land and during the rearing season all the farmers' homes are turned into silkworm rearing houses, producing an enormous amount of silk. It is stated that one-fifth is sold as cocoons to be reeled in the steam filatures for export purposes and four-fifths is reeled into silk at the farmers' homes to supply the local silk weaving industry. The annual production is estimated to be 30,000 piculs of dry cocoons and 20,000 piculs of raw silk.

MULBERRY PLANTATIONS

The mulberry trees are of Huchow type, produced on the mulberry seedling farms in Changan. They are of medium height, planted 7 feet apart and from 140-150 trees per mow. The production of leaves annually is about

10 piculs of spring crop and 2 piculs of summer crop for each mow. The plantations are fertilized 3 times a year, once with pond mud, once with refuse of silk worm rearing and another time with night soil.

MULBERRY SEEDLINGS OF CHANGAN

In the vicinity of Changan and Zamen the farmers specialize in the production of mulberry seedlings. It is the only district in Central China where a large amount of mulberry seedlings is produced and distributed not only all over Central China but in many other provinces. Seedlings are produced by the sericultural institutions, or by private firms in various places in small amounts, but these sources are insignificant when compared with Changan.

Between Changan and Hsiachiao, running parallel with the railroad, the seedling plantations are mostly in evidence. There is an area of about 50 square miles where the rice fields are cultivated for the production of seedlings. The annual production is estimated to be one-half billion trees valued at \$600,000 to \$700,000. The two centres of production and distribution are Chowwangmiao and Tienhuadong. Chowwangmiao and Changan produce seedlings of the Huchow or large type tree, catering both to the Hangchow-Kashing trade and to the buyers in the Tsatlee and Shaoshing districts. Occasionally buyers come from the far distant provinces of Shantung, Honan and Anhwei to purchase the seedlings. Tienhuadong produces seedlings of Lusang or Shantung type which is a small mulberry tree. These trees are also used at Wusih, Changchow and other Kiangsu cities.

There are two types of the large or Huchow seedlings which are generally known as Red Skin and White Skin according to the colour. The Red Skin is reputed to yield better leaves but lives only 20 years, while the White Skin is not such a good leaf producer, but lives 30 years. The price of the single stem Red Skin seedlings, three and one-half feet high, is about 2 cents per tree; of four feet high single stem is between 2.5 cents to 3 cents; of five to six

feet high double stem, is between 5 and 6 cents. The price of the White Skin seedling is usually 10 per cent. less. The mulberry seedlings planted at Tienhuadong to be sold to Wusih, are only one to two feet high, and are sold for 0.4 to 0.5 cents a tree.

The individual farmers plant from one to ten mows of seedlings a year. It takes two years to harvest the seedlings, and on each mow there are usually about 2,000 trees. The seedlings are planted by sewing berries from the wild mulberry trees or Ching-sang in the spring and allowing them to grow for a year. In the following spring, before the seedlings bud, they are grafted with twigs from the Huchow or Husang mulberry tree. The purpose of grafting is to produce a tree with a strong trunk and luxuriant foliage. The leaves of the wild mulberry trees are thin and small possessing little nutriment, but the tree itself is very hardy and can thrive both in a cold climate, and in poor soil. It is planted, therefore, because of its trunk. The leaves of the Huchow mulberry trees are large and round, juicy, and tender. When grafted on to a wild mulberry tree, the combination possesses the good quality of both types.

The farmers by rotation of crops keep the land in suitable condition for the growing of mulberry seedlings. One year rice is planted, and the next year, the rice fields are laid out in ridges; wild mulberry seeds are sown, and the soil is fertilized with manure. Cotton is also planted during this year in the same field, and the mulberry seedlings are grown under the cotton plants, which grow to a height of 2 or 3 feet during the year. In the spring of the third year the seedlings are grafted and the field is entirely devoted to the purpose of mulberry seedling production. The ground is carefully worked and fertilizer is constantly applied. By autumn the seedlings have grown 3 to 4 feet high and are ready to be sold in the winter.

The seedling markets at Wusih, Wuchun and other localities usually open about the latter part of February or early in March. The seedling merchants from these places come to the Changan and Zamen seedling markets

to secure their supply, a few days prior to the opening of their markets, and ship them by boat. Many merchants of Changan and Zamen also ship seedlings to these localities. A usual method of selling seedlings by the farmers, is to have the buyer come to look over the field and set a price per 100 trees, and pay according to the number of trees gathered from the field. Usually a farmer receives \$50 income from a mow of land and his cost of production is about twenty-five dollars.

As mentioned above, the total production of mulberry seedlings for Changan and Zamen is valued at \$600,000 to \$700,000 a year. To produce seedlings equivalent to this value, it takes approximately 4 square miles of solid rice fields. Assuming that 20 per cent. of the seedlings distributed to the different sections of Central China do not live to full growth, the amount of seedlings produced annually is sufficient to replace 27 square miles, or 100,000 mows of solid mulberry fields in Central China, every year. The average life of mulberry trees is about 25 years. Hence the total mulberry land in the different parts of China where Changan seedlings are planted amounts to 675 square miles or 2,500,000 mows. This indicates the magnitude of the Changan and Zamen mulberry seedling industry.

DISEASE FREE EGG PRODUCTION

The first sericultural school of China was established in 1897 at Hangchow, and is now the Provincial Sericultural School of Chekiang Province. It is located near West Lake and is supported by an annual appropriation from the provincial government of \$200,000. The school has an enrollment of 150 students, and gives courses of middle school curriculum. Efforts have been made towards collegiate standing, but the political situation during recent years has not given the opportunity for such an expansion.

The long history of the school with its many graduates has resulted in the establishment of a modern egg producing industry in Hangchow. All the egg sheets produced are of the modern type; that is, layings are separate and microscopically examined for disease.

The list of provincial and private egg producing stations with the number of sheets (28 layings) produced is as follows:—

	Sheets
Provincial Egg Production Station	3000-4000
Provincial Sericultural School	2000-3000
Tu Yih Ying Egg Station	3000-4000
Yih Chow Egg Station	2000-3000
Tien Pao Egg Station	2000-3000
Wai Tzun Filature	2000-3000
Pu Li Egg Station	1000-1000
Sericultural Lecture School	500-500
Girls' Sericultural School	500-500
Wu Pan Girls' Sericultural School	500-500
Provincial Agricultural School	300-300
Provincial Agricultural Experimental Station	500-500
Yu San Egg Station	500-500
Grand Total	Sheets 17800-23800

The total number of layings produced, is between 460,000 and 670,000. The important market for these sheets is not in Chekiang and Kiangsu Provinces, but in those provinces where commercial egg sheets are not produced and where sericulture is less developed or newly developing—such as Shantung, Honan, Hupeh and Anhwei Provinces. This is probably due to the fact that many students come from these provinces to the sericultural school at Hangchow and after completing their studies return home to start sericultural work. Sericultural schools are opening in large numbers in these provinces, especially in Shantung and Honan, where these egg sheets are in demand.

That the commercial production of disease free egg sheets is a profitable undertaking, can be shown by actual results of a Hangchow egg producer. In producing 3,000 sheets of 84,000 layings annually and after deducting all fixed and operating charges, a handsome net profit of over 20 per cent. was his reward. The commercial production of disease free egg sheets is significant. Disease free egg sheets must be produced on a commercial scale if production is to meet the immense demand for egg sheets in Central China. Government institutions are but transitional organizations for the purpose of demonstrating and encouraging such production.

NATIVE EGG PRODUCTION OF YUHANG

Yuhang is a city of 174,000 population, located 20 miles west of Hangchow, and reached by bus line from Hangchow in one hour's time. Politically and historically the city is insignificant. The production of silkworm egg sheets was perhaps the only thing commonly spoken of in connection with the name of the city, until the recent road construction movement brought Yuhang to the front as the centre of three inter city motor routes.

The egg producing industry of Yuhang is quite unique. There are no records as to the antiquity of the industry, but for centuries the city has been in the business of supplying egg sheets to the farmers in the important sericultural regions of Haineen, Kashing, and Huchow, which the egg producers of Yuhang call the "Lower Lands." Whether it is really due to the good quality of the egg sheets or to tradition and superstition, no definite statement can be made; nevertheless, Yuhang is distributing a tremendous number of sheets in these districts. The reputation of the Yuhang egg sheets is an established fact.

ANNUAL PRODUCTION OF EGG SHEETS

It is estimated that seven-tenths or 3,000 to 4,000 of the families in Yuhang are engaged in the production and distribution of egg sheets, during the silkworm season. There are no statistics of any reliability to tell the amount of production each year. The estimates given by different authorities, vary from 300,000 to 500,000 sheets annually. An egg sheet is 19 by 20 inches and is completely covered with eggs, which is equivalent to 10 International Committee egg sheets or 240 layings. Assuming 3,500 as the number of families (the number of producers registered in the Yuhang Egg Producers' Organization at present is 1,813), and that each family produces on an average 100 sheets a year, the total production would be 350,000 egg sheets, or 84,000,000 layings.

Another method of estimating the production of egg sheets in Yuhang is by measuring the amount of paper used. The sheets are made of standardized heavy red

coloured paper, 19 by 20 inches. This paper is manufactured at Sintan, a city southwest of Yuhang, and is distributed only by the Wong Yung Li paper store. The proprietor of this store claims to import 600 piculs of 1,000 sheets each, every year. About 20 per cent. of this paper is sold for other purposes, the balance being bought by the Yuhang egg producers. So from this source of information, the annual production is estimated to be about 480,000 sheets or 115,200,000 layings. It is said that the consumption of this kind of paper has doubled in the last ten years.

The annual income to the farmers from the sale of egg sheets is from \$700,000 to \$1,000,000; from cocoons and raw silk about \$200,000; and from pierced cocoons about \$200,000.

EGG PRODUCTS

In villages outside of the West and North gates of Yuhang almost every farmer is an egg producer. There are about 3,000 families scattered over an area of ten square miles with generally one or two families grouped together. The list of the larger producers is as follows:—

Name	Location	Chop	No. of Sheets distributed
Pao, Long	Le San Hu Village	Map	1,000
Wang, Ching-Pa	Ta Ping Loong ..	Chu Chung Tong	1,000
Woo, Foo-Tsing .	Shan Hu See Village	Foreign House ..	3,000
Hung, King-Sung	Shan Hung Village	Hung Ziang-Fong	2,000
Dih, Yung-Nee .	Sia Za Lee Village	Dih Fong Wei ..	2,000
Chen, Yu Liang	Put Tu Wei	Pih Sih Tong ..	3,000
Loong, Pao San .	Mow Chu San ..		1,500
Voong, Pao San .	Mow Chu San ..	Tien Pao Tang ..	2,000
King, Cheng Fu .	Ting Bridge	King Sun Mei ..	2,000
Woo, Ying Hung	City	Woo Ziang Fong	1,000
Woo, Ching Ling	Tien Chu Ling ..	Woo Ying Lung	3,000
Chen, Ming Woo	Ta Ping Lung ..		1,500
Wong, Chu Ying	Ta Ping Lung ..	Chu Chung Tang	1,000
Tsai, Nien Mei ..	Tien Chu Ling ..	Double Lion ..	2,000

There are a thousand families distributing more than 300 sheets each, and others distributing less than this amount. It is to be noted that the producers listed above do not produce all the sheets themselves. To its full

capacity one family can not produce more than 700 sheets. The average number of sheets produced by one family is 300 or 400. It is, therefore, necessary for the larger producers to buy sheets from families which are sold under their private chops. These sheets thus bought and resold are known as "back door goods" to differentiate between the "front door goods" produced by the seller. The "back door goods" are sold at the same price, and farmers buy them with the same confidence as the "front door goods."

Among the egg producers in Yuhang, Mr. Woo Foo-Tsing enjoys the highest reputation, and his egg sheets are considered the best in the province. Being one of the old egg producers, with a long family history, and also the largest producer at present, he holds a peculiarly important position in the Yuhang egg producing industry. His egg sheets are sold at the highest prices. At the beginning of each season before the egg sheet market opens, the price for his egg sheets is posted on the market bridge of the city, and is the controlling guide for the other producers in fixing their prices which are usually 20, 40 or 50 cents less per sheet.

The farmers and egg merchants almost worship his egg sheets. They come to his home to make a cash deposit before the producing season, and he later distributes his egg sheets to them according to the amount of deposit, usually not in full but 70 to 80 per cent. For instance, in 1924 a farmer made a deposit of \$100 and the sheets were sold at \$2.50. When the sheets were ready for distribution a few weeks later, the farmer received \$80 worth of sheets and \$20 was returned in cash. This shows the popularity of Mr. Woo's egg sheets. The farmers even have the superstition that if they do not get good results by using Mr. Woo's egg sheets, the gods must be against them, and it is therefore better to quit silkworm rearing.

Mr. Woo's reputation gives him a distinct advantage, financially, over his competitors. It is the custom among the farmers to make settlement for the egg sheets at the rice harvest, which comes about six months later. In having cash deposits made in advance, Mr. Woo has the

use of his money six months longer than the other egg producers, besides avoiding the collecting expenses.

Next in importance to Woo Foo Tsing follows Chen Yu Liang, better known as Pih Sih Tong, and a number of others. The majority of them produce a few hundred sheets of their own, and secure the balance from their neighbours and friends, so as to meet the demand for their chop of egg sheets. Several of them do not produce a single sheet but distribute only "back door goods." Other producers neither rear worms, nor buy egg sheets, but buy cocoons and produce sheets from them. This last class is very small.

MARKETS FOR YUHANG EGG SHEETS

There are two principal markets where the Yuhang egg sheets are distributed; one in the Hangchow-Kashing district, and the other in Nanking and Northern Kiangsu Province. Large quantities of egg sheets are also distributed to the Tsatlee district, and in the southern section of the Soochow district. The two principal markets are both silk districts but not cocoon selling districts, (that is, the farmers in these districts reel silk for sale instead of selling cocoons.) Over half a million dollars worth of egg sheets are distributed to the farmers in the Hangchow-Kashing district every year. Unlike those of Wusih and Huchow, the farmers there do not produce egg sheets themselves, but buy them from Yuhang. This market is steady, good and continuous, and perhaps the best one to be found anywhere in China. To those farmers who produce sheets when their crops are good, and who buy sheets only when their crops fail, the Yuhang egg merchants cannot look for a continuous sale of their products. The other market (Nanking and cities North of the Yangtze River) is also a silk district where silk is reeled by the farmers to be sold to the weavers. As a market, Nanking is of far less importance than the Kashing-Haining territory. However, more than 100,000 sheets are sold there which consist mostly of unsold sheets from the Kashing-Haining market and sheets made from the double cocoons.

Producers of different chops of egg sheets have patrons in different localities. For example, the Chu Chung Tang egg sheets are preferred by the farmers of Chow-wangmiao and are sold at 10 cents more per sheet than Woo Foo Tsing's sheets. The "Double Lion" egg sheets find their patrons at Suntown, a city near Yehsah. Good-will plays an important part in marketing the egg sheets. The successful sale of the sheets depends on the special sphere of influence, created in previous years.

METHODS OF DISTRIBUTION

On account of its long history, the marketing of Yuhang egg sheets has developed into complicated systems, interesting traditions and practices. The nature of the egg industry is such, that, if the sheets are not sold before the next rearing season, they are not worth any money, and in consequence the producer has to suffer a great loss. Modern methods of refrigeration for egg preservation being unknown, the systems tend towards the complete and early sale of the sheets. The different steps in marketing the egg sheets are as follows:—

(1) When the silkworms are ready to go on the mountings, to make cocoons, the egg producers take trips to call on their patrons, inquiring as to the success they had with the egg sheets distributed to them the year before. This is called a "friendly visit" but is really to survey the market to see how many egg sheets can probably be sold during the coming season. They then return to prepare the estimated number of sheets required. The egg merchants in the territory, on learning that the egg sheets will be produced soon, follows the "friendly visitor" back to Yuhang to wait for the production of sheets.

(2) A few days before the moths lay the eggs, Yuhang is filled with egg merchants from the different localities. The hotels and the tea houses of the city are kept especially busy during the period. It is estimated that about 1,000 merchants come every year. Each buys 500 to 2,000 sheets for resale. The moths usually lay their eggs in the morning and the egg producers prepare the

sheets in the afternoon and evening. The egg merchants take the sheets immediately, and depart from the city by 12 o'clock at night travelling by waterway or bus to Hangchow, to catch the morning train for Yehzah. This is called "distributing the sheets." The egg merchants try every means possible to get the sheets early so as to have the first chance to sell them to the farmers and get a higher price. The egg sheets sold on the first day command a better price than those sold on the second day, because most of the egg merchants would have left Yuhang after the first day. During these two days of distributing sheets, the city is a busy scene of buying and selling. The producers bring the egg sheets to the city and many stores are temporarily converted into egg sheets sales rooms, where sheets covered with eggs still bright yellow in colour, are piled one upon the other.

May 21st, 1925, two o'clock in the morning was the hour set, by the city magistrate's notice on the main bridge of the city, for "distributing the sheets," after which the egg merchants could leave the city with their purchases. It is a custom, however, that Woo Foo Ching's egg sheets are to be distributed during the second evening.

At the Hangchow station on the morning of May 21st, the platforms and baggage room were heavily loaded with basketfuls of egg sheets, each basket containing 200 sheets. It was estimated that about 10,000,000 layings of egg sheets were carried away from Hangchow by the 9 a.m. train May 21st. The transportation of egg sheets continued for about a week.

(3) Two days after the date of distributing the sheets, the egg producers and the egg merchants of Yuhang start on their trips to Yehzah with the unsold sheets in order to sell to the egg merchants at Yehzah and to those merchants who may not yet have started their trips to their places of destination. This is called "sending off the sheets." The egg sheets thus sold at Yehzah by Yuhang producers are usually 20 cents or under in price. After the "sending off" to Yehzah, the producers carry the remaining sheets to the different cities for sale to the farmers direct.

(4) All the sheets left over from the Kashing-Haining Territory are sold at Nanking, Northern Kiangsu and to Anhwei egg merchants who come to Yuhang every year during the winter and following spring. There are altogether 4 egg sheet stores in Yuhang during the winter and spring which care for this business. The sheets sold at that time are at a very reduced price. Most of the sheets produced from double cocoons are also sold during that period.

COST OF PRODUCTION

The cost of producing native egg sheets per 100 layings according to the average of four Yuhang egg producers is as follows:—

Value of leaves	\$0.271
Labour .. .. .	.348
Materials and Supplies .. .. .	.090
Selling Expense .. .. .	.087
Total Cost	\$0.796
Deduct income from Pierced Cocoons .. ..	.289
Net Cost	\$0.507

The best selling price for the years 1924 and 1925 was \$2.50 per sheet of between 220 and 270 layings. The average selling price was \$1.75 and assuming 240 layings per sheet the income to the producer per 100 layings is \$0.73 and the profit is \$0.223 or 44 per cent. The annual profit to an average producer who is fortunate enough to sell all the 100 sheets produced would be \$53.50. The larger producers who combine production and distribution by buying "back door goods" to sell under their private chop name, make a far greater profit. In fact, it is said that a few of the largest producers earn from \$2,000 to \$4,000 a year.

The cost of production is low, as compared with native producers of other districts, on account of the short rearing period which requires less leaves to be fed and less labour. In comparison with the disease free egg producers, the cost is about one quarter of the average cost of certified egg sheets.

THE PRACTICE OF HIGH TEMPERATURE REARING

As mentioned above, the earlier the egg sheets can be put on the market the easier they can be sold and the higher the price. The small producers who sell sheets to the larger producers as "back door goods" also get more if they can be ready earlier. For instance one of the larger producers bought from the small producers on the first day at \$2.00 a sheet and sold to egg merchants at \$2.50, a net profit of 50 cents per sheet, but on the second day he bought at \$1.80 and if sold at \$2.50, the net profit would be 70 cents per sheet. So the small egg producers endeavour to market their egg sheets as early as possible. This results in the common practice at Yuhang of high temperature rearing to hasten the growth of worms. It takes 18 days at Yuhang to rear the worms as against 28 in other places and 30 when using disease free egg sheets. The distribution of time in silkworm rearing at Yuhang is as follows:—

Stages	Hatching	I	II	III	IV	V	Total	Spinning	Cocoon	Moth	
Feeding		2½	2	1	2	6½	14				
Sleeping		1	1	1	1		4				
Total	7	3½	3	2	3	6½	18	5	10	2	
							Grand Total	42 days			

A special type of mulberry tree known as the fire mulberry tree which produces leaves earlier than other types, is used in feeding the small worms. Artificial heating is used until the fourth sleep. During the time of spinning cocoons and pairing of the moths, artificial heat is also used.

The Yuhang egg producers claim that they have better practices in silk worm rearing than farmers at other localities. In the first place they give the worms more space, three times as much as the Kashing farmers. Secondly, they feed the worms diligently and never wait for the worms to consume all the leaves before adding on more. Only dry leaves are used. A bad crop in the Yuhang district is rather uncommon. This is perhaps due to the fact that the country is not densely settled in the sense that the farmers' houses are located quite a distance apart and all are two story brick houses, which fact tends to lessen the spread of disease.

THE EGG PRODUCERS' ORGANIZATION

The Egg Producers' Organization was organized two years ago for three purposes; namely (1) to encourage better egg production; (2) to reform the practice of hastening the growth of worms, and (3) to give due punishment to those who produce cross breeds between univoltine and bivoltine types of worms. The total number of producers registered is 1,813 who pay an annual fee of one dollar. A house has been erected in the city where the members meet and discuss business.

It is evident that the rearing methods practiced at Yuhang are ancient and unscientific. The egg sheets are not examined. No modern or scientific influence has worked there, except when, a few years ago, the Girls' School of the city tried to obtain two sericultural school graduates to teach the girls the rearing of silkworms. This plan was later discontinued on account of the lack of financial support.

To the ordinary business man who is not acquainted with all the ramifications of the Yuhang silkworm egg industry, the whole system seems absurd and unreasonable. It is hard to justify, even with extreme competition the reduction in the time of production, not by days but by hours and even minutes, of a commodity which must be stored for almost a whole year before it can be used. No doubt these practices given above in detail for accelerating the production of eggs is harmful to the silk industry, and should be eliminated in the not too distant future.

There is no question that Yuhang is one of the most important, if not the most important egg production centre of China, and it deserves the attention of those who are interested in improving China's silk production. It is a most fertile field to make the work of disease free egg production more effective, by inducing these native egg producers to use disease free eggs, as the stock from which they in turn produce their egg sheets.

REARING OF SILKWORMS

The silkworms reared in the Hangchow-Kashing district are mostly of the Yuhang type which spin cocoons of a greenish hue and in turn give the greenish cast to the white raw silk produced.

The methods of rearing silkworms as used by the sericultural farmers differ from the Wusih farmers in one significant point. They use artificial heating from the early period of the silkworm rearing season, through the second moulting. This is done to produce strong and healthy worms during the cold and wet season, and is consistent with the modern method of constant temperature rearing, though it may not be scientifically controlled.

Practically 100 per cent. of the farmers in the district are sericultural farmers, so they are free from other kinds of agricultural work during the silkworm rearing season. The care of the worms is mostly the work of women with the help of children. Men labour in the mulberry fields, in the reeling of silk and in selling cocoons and silk. The rearing of worms is naturally a woman's job as the worms demand delicate care and constant attention which only women can give.

COCOON PRODUCTION

Cocoon production for sale is not an important phase of the sericultural industry in the Hangchow-Kashing district. Most of the cocoons are not sold to cocoon hong, but reeled by the farmers in their homes. That the cocoon industry is a growing one there, is not questioned. We shall see the time, not very far off, when the district shall compete with Wusih in cocoons and filature silk production. The cocoon centres are Hangchow, Konzenchio, Yuhang, Changan, Kashing, Kashai, Fenking, Haiyien, Tonghong and Pinhu. The total dry cocoon production of Chekiang Province in 1924 according to tax figures was 64,655 piculs of which between 25,000 to 30,000 piculs was produced in the Hangchow and Kashing district.

The problem in purchasing cocoons in these localities is different from Wusih, in that the farmers choose between

reeling their cocoons and selling them. When the price paid for the cocoons is low, the farmers prefer to reel them into silk. When they sell cocoons, it is a common practice to include an extra amount of double and refuse cocoons in the lot.

The district as a whole is more progressive than any other district of Central China in the introduction of modern developments from Japan, through its group of industrial men trained in that country. The endless belt type of cocoon drying machine described elsewhere, was installed in one of the filatures in 1919, and now there are 5 machines, in the four filatures, of the district, while not a single one has yet been installed in any other district in Central China.

FILATURE SILK PRODUCTION

There are five filatures with 1,172 reeling basins in this district, three in the city of Hangchow, one at Tange, a city 15 miles north of Hangchow, and one at Kashing. Of the five there are two built according to Japanese fashion, with separate boiling departments and rereeling frames. The operations are carried out entirely according to Japanese methods and a very fine rereeled China silk is produced.

With the exception of the filature at Tange all the filatures are owned and operated by silk weaving companies. These weaving companies, realizing the importance of having high quality raw materials, built filatures, and purchased cocoons, to reel silk for their own use. Gradually they found that it was more profitable to sell the high grade raw silks produced, to the foreign buyers, and buy low grade steam filature silk from the Shanghai filatures, for their own use. Years of business experience taught them to concentrate their efforts in producing high quality steam filature silk for export and now these weaving mills place their filatures equal to their weaving mills in importance as an integral part of their business.

The filatures are mostly prosperous. They have the advantage of cheaper production costs similar to other

filatures outside of the Shanghai area. The daily wage for the operatives is much cheaper, and the working hours longer, as shown in the following table. However, three cents per employee for food supplied by the filature must be added to the daily wage listed for Hangchow to make the labour item comparable to that of Shanghai filatures.

	Hangchow	Shanghai
Reeler	\$.35	\$.43
Boiling . . . . .	.15	.25
Sorting . . . . .	.30	.37
Silk Room . . . . .	.40	.45
Long Waste . . . . .	.25	.27

These filatures are bound to develop as the supply of cocoons in Chekiang province increases. Three new filatures are already being planned and organized for Hangchow, Konzenchao and other cities of the district. In 1926 or 1927 a few more filatures will undoubtedly be added to the present number. The one difficulty the Hangchow filatures faced previously was that the cocoons produced in Kiangsu Province could not be shipped to Chekiang, without being taxed again. This regulation, however, has been changed recently to give the Chekiang filatures the same advantage in buying Kiangsu cocoons, as Kiangsu filatures enjoy when buying cocoons from other provinces.

NATIVE SILK PRODUCTION

This district supplies the raw materials to the silk weaving industry of Hangchow, the most important centre of Central China. It also supplies the looms of Chengshai and Paoyuen, two small weaving centres. The tax reports of Chekiang province show that in 1924 the number of piculs of raw silk taxed for home consumption was 16,280. This amount is less than half of the average domestic consumption of the previous years, due to the political disturbances in the latter part of 1924. The total production of silk for home consumption in Chekiang Province can be safely estimated as 40,000 piculs, half of which probably is produced in the Hangchow and Kashing district.

Practically all of the raw silk used by these looms is reeled into big heavy skeins, by the farmers, in their homes. In using these skeins, the weaving concerns sort them and put them through a cleaning process. To be sure, this raw silk is not even and clean, but it can be very well used to produce heavy weight satins and brocades. In producing light fabrics some of the weaving mills are using steam filature silk, particularly those of a low grade. The steam filature silk, however, is much more expensive than native reeled silk, which means an increase in the cost of production.

The native reeled silk is also exported to Europe and America where it is known as Haineen and Kashing Re-reels. It formerly was exported in very large quantities but it has gradually decreased and now amounts to a very insignificant figure.

MODERN SILK WEAVING INDUSTRY OF HANGCHOW

Hangchow for many centuries has been famous for its beautiful silks, but it became the leading silk weaving centre of China in 1912 only after the introduction of modern equipments and methods of weaving. Hangchow has had a rapid advancement and there are now 6,000 modern Jacquard looms, mostly power driven, and 1,000 native Jacquard looms with an annual production of 7,000,000 yards of silk fabrics, valued at Tls. 30,000,000 a year. The raw silk consumption of the looms in Hangchow is estimated to be 20,000 piculs annually.

The larger sized silk mills range from 200 to 400 looms with the necessary preparatory and finishing equipment. They are well organized and produce different kinds of fabrics varying from very light weight silks to very heavy satins and brocades. The goods produced enjoy a very good market, and are sold at such important cities of China as Peking, Tientsin, Shanghai and Hankow.

The Tsatlee Silk Industry

GENERAL

THE nature of the work of the Tsatlee Silk merchants differs from that of the steam filature silk merchants, in that it is distributive instead of manufacturing. They are commercial organizations dealing in buying and selling only, while the manufacturing is entirely carried on by the farmers. The farmers reel the cocoons into silk according to their crude native methods. The silk "hongs" buy the silk, sort it into grades and redistribute it to the farmers for rereeling, before packing into bale lots. In equipment, the silk hongs possess only the weighing and packing apparatus.

The Tsatlee Silk as reeled by the farmers and bought by the Tsatlee "silk hongs for export" is produced in the "Tsatlee district" as it is generally known. Roughly speaking, this district includes the entire territory of the prefecture of Huchowfu, in Chekiang Province, in which the important cities of Nanzing, Tsingtsa, Huchow, Woochun, Sonlin and Linhu are located. However, the area and territory of the Tsatlee district is rather obscure and no sharp line of demarcation can be drawn between this district, and the cocoon districts surrounding it. In general it lies south of the Tai Ho Lake, and for centuries has been one of the most important sericultural districts of China, where land is suitable for mulberry production, and where men and women have learned the art of rearing silkworms and reeling silk from childhood. About 15 per cent. of the land is devoted to mulberry production. The Huchow type of mulberry tree is famous, and is to be found in all parts of Central and Northern China. The fine water available for reeling is said to give the silk its exquisite nature.

The Tsatlee silk forms the main source of raw material for the looms in the weaving centres such as Huchow, Soochow and Chenshai. Hangchow weavers also draw a

part of their silk from this region. As there are no statistics available except the export figures, the definite amount of raw silk produced in this district cannot be ascertained. Estimates vary from 30,000 to 50,000 piculs a year of which about 30 per cent. is exported.

PROCESSES OF PRODUCTION

The farmers in the Tsatlee district pay special attention to the rearing of silkworms. The carelessness and bad practices carried on by the cocoon farmers in Wushih and other places are not found here. The cocoons are reeled as soon as the worm finishes spinning, the double and refuse cocoons are sorted out and the rest are reeled immediately into silk by the farmers without drying. As the products are sold as silk instead of as cocoons, cocoon drying is not practiced in this district. The yield of cocoons is excellent. The average catty of cocoons, which includes the double and refuse cocoons, produces 1.2 Chinese ounces of raw silk or gives a gross yield of 4.43 which is much better than that of the average cocoons produced in Central China.

Tsatlee Cocoons	Oz. of Silk from 1 catty of cocoon.	Gross Yield fresh Cocoons	Gross Yield Dry Cocoons
Best Yield	1.5	10.7	3.55
Avg. Yield... ..	1.2	15.3	4.43
Low Yield	1.0	16.0	5.33

The reeling is done by men reelers, on a crude, foot power reeling machine of four bar construction, with a circumference of about 6 feet which is built by the farmers themselves. The boiling and reeling is done in the same basin, which is heated by firewood. One reeler operates three ends on the reeling machine, producing three skeins (having a total weight of 35 to 40 Chinese ounces) in about four days.

These farmer reelers do not realize the importance of producing even silk as it is not demanded of them. The reeling is done at the farmers' homes, without supervision. They do not try to keep the same number of cocoons in

order to produce a uniform size of thread, and every reeler is left to himself to decide the number of cocoons to use, to reel the silk. This is the main reason for the unevenness of the Tsatlee silk, which tests show that the size varies from 15 to 40 denier on individual bales, in the better grades collected for export. Furthermore, as the reeling has to be completed in about a week before the moths pierce the cocoons, the work naturally has to be done rapidly, during long hours, extending into the night, which makes careful reeling impossible.

The skeins thus produced are sold to "local" silk hongers in the different cities of the district. These local silk hongers are either the commission agents of the weaving concerns, or the agents of the "silk hongers for export." Only the silk hongers for export have "Chops" and they place orders at the local silk hongers to collect for them so many ounces of raw silk for their best, medium, or low grade chops. The local silk hongers know their requirements, and purchase from the farmers accordingly. The commission for such purchases is 1.6 per cent. The local silk hongers have close contact with the farmers as well as with the silk hongers for export and are the mainstay of the industry.

REEREELING

The "silk hongers for export" inspect the raw silk as collected by the local silk hongers and sort it carefully into grades. As the skeins are of large size and flat reel, they are rereeled into Grant reel, and the silk thus made is known as Tsatlee Rereels New Style, of which Blue Dragon and Flying Horse are the best known chops. Sometimes they are rereeled into flat reels of narrow skeins, which are known as Tsatlee Rereels Ordinary, like K. K. Mars Chop.

The rereeling process is done by two steps. First the silk is put on to a cone by a coning process, and then rereeled from cones on to the reels of regular size, and with the diamond crossing. Most of the farmers know the process and have one or two rereeling machines in their homes to do the rereeling for the silk hongers. The silk hongers do not supervise the rereeling work. They distribute silk to

the farmers, for rereeling, at a wage of \$35.00 per picul of rereeled silk, allowing on an average, a waste of 8 per. cent.

The packing is done by the "silk hong for export" who put their regular chops into bales, and ship them by water route through Soochow, to their selling agents in Shanghai

COST OF TSATLEE SILK

The cost of producing one picul of rereeled Tsatlee silk of Blue Dragon and Flying Horse grade, assuming an initial cost of \$60.00 per 100 Chinese ounces of native reeled silk, which was the average market price during July, August and September 1924, is as follows:—

Native reeled silk 100 catties	M.\$960.00
Plus 8 per cent. of reeled silk as rereeling waste ..	76.80
Commission to local silk hong 1.6 per cent.	16.90
Labour for rereeling	35.00
Packing and hong expenses	10.00
Normal Tax and other taxes paid at Nanzing	50.00
Export tax and surtaxes paid at Shanghai	25.30
Storage charges at Shanghai	1.40
Broker's commission (Tls. 2.50)	3.47
Shanghai selling agent (Tls. 2.50)	3.47
Total	\$1,182.34
or Taels	852.90

The cost figures may be summarized as follows:—

	\$	Taels	Per Cent.
Raw material cost	960	692	81.1
Rereeling Waste	77	56	6.6
Expenses	145	105	12.3
	<u>1,182</u>	<u>852</u>	<u>100.0</u>

In the expense accounts, interest on investment is not included. If silk is to be stored for a long period, say one half to one year, the interest usually amounts to quite a large sum. The average selling price of Blue Dragon and Flying Horse Chop at Shanghai during the same months was between Tls. 900 and Tls. 950.

THE TWO CENTRES—NANZING AND TSINGTSA

Only at the two centres, Nanzing and Tsingtsta, are there "silk hong for export." The silk produced in the Tsatlee district to be exported flows to these two centres first,

where it is collected, sorted and shipped to Shanghai. At Nanzing there are at present eight silk hong's exporting Rereeled Tsatlee Silk under their own chops. These silk hong's are of substantial means, each shipping from 100 to 1,000, or more bales annually.

The leading hong's are May Hun Yue and Wei Tzun, producing such chops as Blue Dragon and Flying Horse, Cloud and Unicorn, Woolworth, etc. The rereeled silk shipped from Nanzing is of the New Style, and in general of high grade. Its distribution as to grades is as follows:—

	Per Cent.
Extra like Gold and Silver Swan Chops	15
No. 1 like Blue Dragon and Flying Horse Chops	60
No. 2 like Black Lion Chop	20
Inferiors	5
	100

The annual shipment varies as to the demand. The season of 1923-24 recorded 6,500 piculs, while in the 1924-25 season it dropped to 4,500 piculs.

The exporting silk hong's buy very little from the farmers themselves. More than 90 per cent. of the purchases are made through the local silk hong's. There are about 25 local silk hong's at Nanzing, each buying from the farmers from 500 to 1,000 piculs of reeled silk. About half of the silk consists of low grades, coming from Songlin, Huchow, and Linghu, where there are also local silk hong's. So the collection of reeled silk at Nanzing, excluding the 20 per cent. sold to Tsingtsa and 10 per cent. to weaving mills, can only meet half of the shipments from the city. Besides the local silk hong's, there are 5 other silk hong's which buy 400 piculs of coarse size silk, for the weaving and thread mills.

As a silk city Tsingtsa presents many more interesting features than Nanzing. The annual shipment is larger, the products are more varied and the number of hong's greater. There are now more than 20 "silk hong's for export," each doing one to six hundred piculs of business for export. Their business standing as a whole is not as good as that of Nanzing. The annual shipments for the last two years were 4,500 to 6,300 piculs respectively. Tsingtsa besides

producing New Style Rereels also produces Tsatlee Rereels Ordinary, which are not reeled by the Grant method. The production of different grades is as follows:—

	Per Cent.
Extra like Gold and Silver Swan	5
No. 1 like Blue Dragon and Flying Horse Chops	40
No. 2 like Black Lion	25
Tsatlee Rereels Ordinary	30
	100

Tsingtsa produces only a small portion of the silk it ships out. More than 80 per cent. of its products come from Linghu, Songlin, Wochun, Nanzing and Huchow. There are more than 100 local silk hong in the city, which do only a small volume of business.

Tsingtsa also produces thrown silk, for Soochow and Canton weaving mills. 1,000 to 1,400 bales were produced in the seasons 1924-25 and 1923-24 respectively. The thrown silk is of two ply soft twist and is reputed to be very even in size.

THE PRESENT BUSINESS SITUATION

The Tsatlee silk industry, or rather the business of the "silk hong for export" suffered severely from the upheaval in the silk business world following the Japanese earthquake. Immediately after the earthquake the silk hong bought heavily from the farmers, expecting a rise in price during the remainder of the silk year. The expectation did not materialize and many merchants lost heavily from this speculation. The price has rapidly declined since the early part of 1924 until the Spring of 1925 when it reached the lowest level in many years, causing business to come to a standstill. A number of the silk hong failed at the close of the Chinese calendar year, and practically all, with few exceptions, suffered losses.

Customs statistics show that the export of Tsatlee Rereels has been decreasing gradually. The business in 1924 was particularly bad, only 9,000 piculs being exported as compared with 14,000 piculs, the average of the ten year period 1914-1924. As was pointed out to the Tsatlee merchants, by the American manufacturers; unless the

quality of Tsaltee Rereels is radically improved, its future demand would be very limited. The chief defect of the Tsaltee silk is its unevenness, the improvement of which can only come through the discarding of the present method of production, and the introduction of steam filatures into the district.

INTRODUCTION OF STEAM FILATURE

The introduction of steam filatures has been slow in the Tsaltee district. Though the profit to the community, by such an undertaking, will be great (as the value of products will be increased by the high price of steam filature silk) there are many obstacles that make the establishment of steam filatures difficult. Prominent among these, is the hesitation on the part of the Tsaltee merchants to go into the production of steam filature silk themselves. As mentioned before, the nature of the Tsaltee silk business is entirely different from that of the steam filatures. The one involves buying and selling only, while the other is primarily manufacturing. The plunge into a new business of a different nature and the forsaking of well established organizations and long experience seems not entirely attractive to the Tsaltee silk merchants. In spite of the low selling prices, profit can still be made by purchasing reeled silk from the farmers at a level low enough to meet the selling price. The risk of the Tsaltee silk business is not so great as that of the filature industry, and most of them, if not all, wish to continue the business as it is.

Another hindrance is the fact that it is still an open question whether starting a filature in the Tsaltee district is a paying proposition at present. The farmers are accustomed to selling silk instead of cocoons. Incentives in the form of high cocoon prices must be used for the first few years; labour has to be trained, and new organizations must be formed. So, a filature starting in the district has to pass through an experimental stage before it can succeed, and unless the business is sufficiently well financed to tide over these lean years, the experiment may prove exceedingly expensive. The initial resistance is great and the

Tsatlee people are hesitating in entering this new field, especially during a period of business depression and unstable political situation.

But there are a few bright spots on the horizon in the improvement work in the Tsatlee district. The constant persuasion by the American silk manufacturers, and the Shanghai International Testing House for improving the silk by filature reeling, has created a strong public opinion in the district for such a movement. At Tsingtsa a model steam filature of 300 basins is being promoted to start operations in 1926 or 1927. At Nanzing the Liu family is planning to build a steam filature on a mill site that has been bought, and which is being prepared for the enterprise.

But it must be noted that both of these are promoted by men who are not in the silk business at present but who are influential financially and socially in this district. They believe that the establishment of filatures will bring prosperity to the community as a whole, and they are ready to invest their money in the experiment, if the silk merchants will give them the little co-operation they need.

In connection with the work of introducing steam filatures, one fact stands out prominently. The Tsatlee silk district is surrounded on all sides by cocoon or filature silk districts. On the outskirts of the district there are three filatures, one at Kashing, one at Tange and one at Huchow, and many cocoon hong. Both Kashing and Huchow are important cocoon centres and the cocoon merchants who try to get more cocoon supply for the filatures are pushing their hong into the Tsatlee district. There are cocoon hong now three miles south of Tsingtsa, five miles north of Nanzing and four miles south of Linghu. Practically all the important Tsatlee cities are surrounded by cocoon hong. If the penetration of cocoon hong into the Tsatlee district continues, the natural result will be the elimination of the Tsatlee silk industry, and its replacement by the filature silk industry. This may be the ultimate solution to the question of producing high grade silk from the cocoons now used in the Tsatlee industry.

Shaoshing District

GENERAL

THE Shaoshing district is the southernmost sericultural district of Central China. It is located in the southern section of the Shaoshing Prefecture of Chekiang province consisting of the two counties of Sinchong and Chengshien, and can be reached both from Ningpo and Hangchow, by way of Parkwan, and up the Tsao-O River. The region is a fertile valley surrounded on all sides by mountains. The climate is suitable for sericulture and the soil is particularly fertile for growing all kinds of vegetables.

It is estimated that the products shipped out of the two counties of Sinchong and Chengshien, annually, are valued at \$10,000,000 consisting of the following:—

Tobacco leaves	\$ 3,500,000
Cocoons (including \$500,000 egg sheets)	2,500,000
Tea	2,000,000
Pei Chi, a kind of medicine	1,000,000
Peanuts and others	1,000,000
Total	\$10,000,000

Rice and wheat is also produced to feed the population, though the amount of production is not ample, as 30 per cent. of the rice consumed has to be imported.

Sericulturally, the district is unique in two ways. First, it is the only cocoon district in Chekiang Province where cocoons are produced, and from which native reeled silk is not produced. Second, it is one of the only two important silkworm egg producing centres in Central China, rivalling Yuhang, in supplying egg sheets to the sericultural farmers.

MULBERRY PLANTATION

The mulberry trees grown in the district are of the Huchow type. They grow larger, and much higher, than those planted in Huchow and Hangchow. Evidently the soil is very fertile, and extremely suitable for mulberry plantation. However, judging from observation, mulberry land

only amounts to 2 to 3 per cent. of the total land in the district. The need of land for the production of rice, and the high profit in tobacco plantations, prevents the extension of mulberry land. With the exception of the western section of Chengshien, very few good sized mulberry fields can be found. Mulberry trees are scattered here and there along the country roads, in the wheat fields, and on the slopes of the hills. The cultivation is not so carefully done as in other places.

The prospect of increasing cocoon production in this district is handicapped by the limitation of land. The land here is practically all cultivated for some purpose. The plains of the valley, the slopes of the hills and even the hill tops have all been turned into plantations. It seems that the possibilities of increasing cocoon production depends mostly on the development of transportation facilities in the future. The district can only be reached now by native boats pulled up stream against a strong current, requiring a day and a night to reach destination. Rice imported from outside districts becomes quite expensive, and the cultivation of rice within the district is highly necessary. If rice can be bought from other places when better means of transportation have been developed, then the cultivation of mulberry trees which grow so well in the soil of the district, can replace the rice crops.

COCOON PRODUCTION

The farmers in the district are mostly sericultural farmers. Due to the rotation of crops about 70 per cent. devote themselves to the production of cocoons and silkworm eggs. The types of worms reared in the district are popularly known as Sin Yuen but known in the district as "large round head" "small round head" and "olive." The "small round head" is preferred by the cocoon merchants on account of its high silk content. The "olive" is similar in shape to the Tai Ho breed of worms, whose origin may be traced to the shores of Tai Ho Lake, as many of the egg producers in this district carry on a thriving business with the Tsatlee farmers.

The cocoons produced in the Shaoshing district average 10,000 piculs of dry cocoons annually, of which 8,000 piculs are from Chengshien, and 2,000 piculs from Sinchong. The production of cocoons from Chengshien during the past five years was as follows:

Year	Piculs of Dry Cocoons		
	Spring	Summer	Total
1919	7,743	553	8,276
1920	8,868	524	9,372
1921	6,530	135	6,666
1922	8,302	586	8,883
1923	8,294	309	8,603
Total	39,739	2,090	41,829
Average	7,948	422	8,370

The cocoons from the district are popularly known as Shaoshing cocoons. They are pure white in colour, good quality, easy to reel and the yield is high. Those of Wangchi are famous in the market. However, in recent years the cocoons produced in the country east of Wangchi enjoy a better reputation. The important cocoon hong centres are Chengshien city, Wangchi, Sinchong city, San Kai and Chung Zen. The cocoon markets during the year start from the western section of Chengshien, move eastward to Chengshien city and then on to Wangchi and Sinchong, lasting three or four days at each place, and totalling not more than 10 days. The season is usually two weeks earlier than Wusih, and is the earliest cocoon market in Central China.

The cocoon season is quite a big occasion in the district. The buyers come from Shanghai, with boxes of silver dollars, carried on bamboo rafts up stream, and protected by soldiers against banditry. Traffic is heavy on the Tsao Wu River, during the cocoon market period.

EGG PRODUCTION

Shaoshing is another district, besides Yuhang, in which farmers devote themselves to the production of commercial egg sheets, for the sericultural farmers in the Lower

Yangtse Valley. The production is on a tremendous scale. It is estimated that from 400,000 to 500,000 sheets are distributed by the egg producers, to the other districts every year. The sheets are 14 inches by 14 inches, containing about 150 layings each. Therefore, the production of silkworm eggs every year is from 60 to 75 millions of layings which is 25 to 40 per cent. less than the amount estimated for the production at Yuhang.

EGG PRODUCTION CENTRES

Egg farmers are grouped in one special section of the Shaoshing district. In this section most of the sericultural farmers produce egg sheets instead of cocoons, differing from the farmers in other sections.

This section is about 20 miles long and 2 miles wide, located in a valley extending from a village 3 miles west of the Chengshien city, along the west branch of the Tsao Hu River for 20 miles. The following villages are included:—

Mooko, Wu Yey, Tien Chien of Chengshien.

Meitsu, Chengtai and Huangpootai of Sinchong.

Of all the villages Chengtai is the largest and most important centre; Mooko and Meitsu come next.

Chengtai is the centre of distribution of egg sheets in the district. It is a good sized village with a main street lined with shops. One special feature peculiar to this egg producing centre is the existence of a fifteen day egg sheet market, during the latter part of May every year. In 1925 the market started on May 15th and lasted to the end of the month. The business hours for the egg sheet market are from 12 o'clock midnight, to six o'clock in the morning. The moths lay eggs during the day, and finish laying by evening time. Then the farmers take the egg sheets to the market for sale. On the first day of the season the sheets were sold at 95 cents each. The price was reduced gradually, day after day, until May 26th, when the price was about 60 cents. The shops on the streets are used for business transactions in selling the egg sheets. Those who use these shops pay a commission of 2 cents per sheet to the shop owners.

The number of sheets sold on the market every night averages 10,000 and the total amounts to 150,000 sheets. Not all the sheets produced in the neighbouring villages are sold in this market, which is only for those farmers who do not go to the other districts to sell their egg sheets themselves, or who do not have the assistance of their relatives and friends. The buyers at this market are farmers who are leaving for the other districts with their own egg sheets, and who wish to have a larger egg supply, or who act simply as egg merchants. No egg merchants from other districts come to Chengshien and Sinchong to buy egg sheets as they do at Yuhang. The sheets sold on the Chengtai market are estimated to be only 30 per cent. of the total amount distributed.

The egg producers and egg merchants form smaller units than those of Yuhang. Only a few sell more than a 1,000 sheets. The list is as follows:—

Name	Location	No. of sheets
Ma Ying Hsing (six families)	Mooko	5000-7000
Gee Tsiang	Tien Chien	2000
Chiu Kwe Chen	Tsao Chien	2000
Lee Tseu Chien	Chengtai	1000
Chang Ling Chien	Chengtai	1000

But the number of distributors are numerous, as the business is carried on by individuals, without any central organization of control.

MARKET OF EGG SHEETS

The markets of egg sheets can also be divided into two separate markets, as at Yuhang. The one market is South of the Chien Tan River, around Siaoshan. The other is North of the Tien Tang River, particularly the Tsatlee district. Owing to the difference in the colour of cocoons produced from the Yuhang and the Shaoshing egg sheets, the two producing districts seem to cater to different markets. At certain places, however, they become competitors.

Siaoshan is the important market for the egg producers. As the egg sheets produce pure white coloured cocoons, they are preferred by the sericultural farmers here. In fact, the Yuhang egg sheets are not sold south of the Chien Tan River. Kai Shan, a city seven miles northeast of Siaoshan, is the centre of distribution. Great numbers

of egg merchants from Sinchong and Chengshien, flock to that city after the egg sheets are produced. The place can be reached by foot or boat from Chengtai in three days. The egg merchants sell the egg sheets at the various shops, at a price of \$1.20 to \$1.40 per sheet, allowing a 10 per cent. commission on the value of egg sheets sold to the shop owners, for the use of their premises.

The other market is in the Tsatlee district and the surrounding territory of Wuchan, a city 15 miles south of Nanzing, which is an important distributing centre. It is interesting to learn that most of the egg merchants here know Wuchan. The one big egg producer of Mooko city, known as Ma Ying Tsiang, is doing an \$8,000 business every year. The Ma family has six brothers and all of them are making egg sheets for Wuchan to the amount of 6,000 sheets every year. The oldest brother maintains a house at Wuchan from which the sheets are distributed. Besides Wuchan, the cities of Nieumou, Singchang, Soulin, Linhu, Huchow and Kashing are also using egg sheets produced in Sinchong and Chengshien. At these localities, with the exception of Kashing, white silk is preferred by the silk hong; therefore, the farmers like Sinchong-Chengshien egg sheets, instead of those from Yuhang, which produce cocoons of greenish colour.

CONCLUSIONS

Shaoshing is another egg producing district, which deserves the attention of people interested in introducing disease free eggs to farmers. However, this district is not so accessible as Yuhang. The egg producers here seem to have a suspicion of outsiders when they begin investigating their conditions. Seven years ago the city magistrate of Sinchong, with the assistance of some of the city gentry, tried to put a tax on the egg sheets with a pretense of inspecting them. This caused so much trouble to the egg producers, especially in the saleability of their sheets, that the egg merchants resisted with force and stopped the unwise taxation. With the minds of the people already prejudiced, any movement in improving egg production in the district requires tactful handling.

Shanghai as a Filature and Silk Market Centre

SHANGHAI AS A FILATURE CENTRE

SHANGHAI has the largest number of filatures of any centre in China. Sixty-eight filatures with 18,576 basins are located in the greater Shanghai area, which includes the foreign settlement and the territories of Chapei and Nantao. Chapei claims 36 filatures out of the total 68. These filatures purchase their cocoons in the Central districts; that is, in the province of Kiangsu, Chekiang and Anhwei, but they also at times purchase cocoons as far west as Hupeh and as far north as Shantung.

Practically all the filatures in Shanghai are two storey brick buildings, with the peeling and sorting departments on the first floor, and the reeling department on the second. They are equipped with the Italian type of reeling basins; that is, there is a cocoon boiler for each two basins, and the boiling and reeling of cocoons is done in the same room. Straight, or Grant reel skeins are made, direct for exportation without re-reeling. It has been stated that the silk produced in this section is so "springy" that it is impossible to produce satisfactory re-reeled silk. However, this is not the case as there are several filatures near Shanghai which operate on the Japanese method of reeling, and no trouble is experienced by these filatures in producing high grade re-reeled silk.

In general, cocoons are purchased for the use of Shanghai filatures from the different sections of the Central China District, by the filatures in the cocoon hong which they own or rent in the various sections. The operation of these cocoon hong has already been described under the cocoon markets in the various geographical cocoon centres.

The filatures purchase cocoons to meet their requirements from three to eight months. The cocoons required for the remainder of the year are usually purchased from cocoon brokers who do not only speculate on the cocoons

purchased, but also charge exorbitant interest on the money, which has been tied up in the cocoons, and on storage, insurance, and all other costs that may accrue.

Cocoons are mainly shipped by canal boats in 40 catty bags, from the source of supply, to Shanghai, and are carefully stored to keep the various lots from the different districts separate, and to keep the cocoons dry and away from vermin. As the cocoons are often purchased with money borrowed from the banks, these cocoons are stored in the banks' warehouse called "godowns" and are withdrawn in small amounts, usually enough to produce 10 to 50 bales of raw silk. The sale of this silk gives the necessary funds for making payment to the bank to obtain another supply of cocoons.

This operation of the filature on such a small capital, buying from hand to mouth, makes the business very unstable. If the price of raw silk falls very materially, no reserve fund is available to tide over the crisis, and the result is, that the filature changes management. Due to this constant changing of management in many of the filatures in this area, the chops produced by these filatures cannot be called reliable. This is one great source of dissatisfaction in the raw silk industry, and no relief is seen for this difficulty until men having greater financial resources at their disposal, can be induced to invest their money in filatures. This probably can be done as part of the regular improvement work on China silk, when disease free eggs, and the scientific methods of cocoon production are used throughout the Central China district, and the element of speculation is largely removed from the silk industry.

THE COCOON AND SILK GUILDS

The filature men and cocoon merchants in Shanghai formed the Cocoon Merchants' and Steam Filature Guild of Kiangsu, Chekiang and Anhwei Provinces, for the purpose of promoting their interests in dealing with other organizations, such as The Government Tax Bureau, The Foreign Silk Association of Shanghai, etc. The Guild has branch organizations in all the important cocoon districts where meetings are held at the beginning of the cocoon season,

to decide the date of opening the market and the price to be paid for cocoons. Perhaps the most important work of the Guild is the negotiations with the provincial authorities, in fixing taxes on cocoons and in changing the regulations in cocoon buying.

In co-operation with the Foreign Silk Association of Shanghai they have established standard methods for the buying and selling of China silks. Besides its regular activities, the Guild has assisted in organizing the International Committee for the Improvement of Sericulture in China, jointly with the Foreign Silk Association of Shanghai, and French, British, American and Japanese Chambers of Commerce. It also helped in establishing the Shanghai International Testing House, in conjunction with the Silk Association of America and the United States Testing Company, Incorporated, of New York.

The Tsatlee silk merchants in Shanghai have a separate guild known as the White Silk Guild to promote their interests. It has branch organizations at Nanzing and Tsing-sa, the two centres of Tsatlee silk production.

SILK BROKERS

The raw silk, as produced by the filatures, or the Tsatlee silk establishments is sold to the foreign raw silk exporters in Shanghai, through the Chinese silk brokers. These men go from one exporter to another to give the trend of the market, the transactions reported in the trade and to bargain for the best price for the sale of the raw silk at their disposition. They exert a strong influence over the raw silk market of Shanghai.

EXPORTATION OF SILK FROM SHANGHAI

Shanghai is the focal point of the entire export silk industry of Central China. Practically all the silk shipped from Central China is exported through the port of Shanghai. From 70,000 to 100,000 piculs of raw silk are shipped annually. The amount for the silk season of 1924-1925 was 79,000 piculs, of which amount 42 per cent. was White Steam Filature Silk produced in the filatures of Shanghai, Wusih, Hangchow, and Soochow; 11 per cent. was Yellow Steam Filature silk largely produced in Szechuen Province;

31 per cent. of the total export was white and yellow native silk, and 15 per cent. Tussah.

Looking at the silk exportation from another standpoint, the customers for China silk and the percentages purchased by each during the past year are as follows:—

America	39 Per Cent.
Europe	45 " "
All Others	16 " "

Practically all the silk shipped from Shanghai is shipped by foreign exporters, who act as agents for their various customers in America, Europe, Asia and Africa. In 1908 these exporters formed an association called the Foreign Silk Association of Shanghai which has become a very active organization with 37 members and 16 subscribers at the present time. It has also established in conjunction with the Chinese Silk Guild, standard methods for buying and selling China silk.

Besides systematizing raw silk transactions, this association arbitrates upon matters concerning the trade in Shanghai, at the request of the parties interested; keeps in close contact with similar organizations throughout the world and issues weekly a market report giving the exportation of the various classes of raw silk, the shippers and the current rates of exchange. It initiated and takes a most active part in the work of the International Committee for the Improvement of Sericulture in China, which is fully described elsewhere in this survey.

EFFECT OF THE RATE OF EXCHANGE

The rate of exchange between China and the country of the purchaser is a most deciding factor in the silk market. During the early part of the 1924-1925 silk year, silver was at a premium and due to the depreciation of the gold monetary standard of America in relation to silver, America purchased very little silk in Shanghai. This was especially exaggerated in as much as the Japanese Yen was very low, and the rate of exchange was most favourable for America to place her orders with Japan. The fluctuation of the exchange rate makes it very hard for the exporter to make quotations and carry on his business due to the time required to obtain acceptance on cable quotations. At

best a large element of speculation necessarily enters all transactions in as much as from day to day the exchange may fluctuate through a wide range and cause a heavy loss or a handsome profit depending on which way it fluctuates.

THE INTERNATIONAL COMMITTEE FOR THE IMPROVEMENT OF SERICULTURE IN CHINA

The International Committee for the Improvement of Sericulture in China was organized in 1918 by the Foreign Silk Association of Shanghai, The Steam Silk Filatures and Cocoon Merchants' Guild of Kiangsu, Chekiang and Anhwei Provinces, and the French Chamber of Commerce. In 1919 the British, Japanese and American Chambers of Commerce also joined in the work. The work was started with Tls. 5,000 from each of the above organizations. In recognition of the importance of the work the Chinese Government soon gave a monthly grant of H.K. Tls. 4,000 to the Committee and in 1922 the grants were doubled, viz., H.K. Tls. 8,000 per month or Tls. 96,000 per year.

Up to the present the main work of the Committee has been the distribution of disease free layings to the farmers and in educating the farmers as to their value in producing high grade cocoons. It is recognized by all the sericultural experts that the most urgent need in the raw silk industry of Central China is disease free silk worm seed.

The following table shows the total number of disease free layings distributed in 1924 by the Committee, the number of these layings that were purchased as well as those produced by the Committees' stations.

Purchased	Disease Free Layings
From France & Italy	3,658,600
In China	125,200
Produced at the Committees' Stations	
Shanghai	12,000
Hengling	62,430
Nanking	214,800
Kashing	80,000
Chuke	—
Soochow	184,690
Tsinyang	154,140
Total	4,491,860

The International Committee realizes that at best its work on disease free egg production can only demonstrate that the work is just as feasible in China as in Japan, Italy or France. It cannot hope to supply with its limited financial support, the requirements of all of Central China's silk industry when the masses become educated to the use of healthy eggs. The Committee further realizes that this all important problem must be solved in China using the indigenous specie of silkworms that has made China's silk historically famous. To this end, every endeavour is made to stimulate the disease free egg production in China so as to make it a profitable commercial undertaking without requiring a government subsidy and to eventually eliminate entirely the purchase of silk worm seed abroad.

ANHWEI PROVINCE

Sericulturally Anhwei Province is very young. While no doubt silk worms have been reared, and silk reeled for home use in a very limited way, for centuries, still its importance to the outside world has been nil. It was only about 15 years ago that the Shanghai cocoon and silk merchants began to investigate the potentialities of cocoon production in Anhwei Province, as a means of enlarging the cocoon supply of Central China. The movement was led by Mr. Shen Lien Fong, Chairman of the Cocoon Merchants' and Silk Filature Guild, who has continued his activity in pushing this work. Mulberry seedings and silkworm egg sheets are purchased in large quantities annually for the free distribution among the Anhwei farmers. Cocoon honges have been established at convenient localities, to create markets for their products and arrangements have been made for the transportation of the cocoons to filature centres.

The eastern section of the province, along the Yangtze River, is close to the main silk producing area of Central China, and enjoys the same climate and nature of soil; it is therefore the cocoon production area of the province. The total production is estimated to be 4,000 piculs of dry cocoons and 1,000 piculs of native white silk.

The colour of the cocoons is generally white although about 20 per cent. are pink and 10 per cent. yellow. They are of a large type having a coarse filament adapted only for reeling the coarser sizes of raw silk.

The future of Anhwei province's sericultural work is bright and no doubt would expand very rapidly if the chaotic political condition of China were eliminated. The abolition of the Likin taxes would permit the payment of a price for Anhwei cocoons sufficient to greatly stimulate their production and still they could be transported to the Shanghai filatures and compete with cocoons from other markets.

APPENDIX "A"
TABULATED DATA ON THE SILK INDUSTRY OF
CENTRAL CHINA

EGG PRODUCTION

General Condition

- Kiangsu. Farmers produce their own eggs and a small part supplied by Chekiang.
 Chekiang. Two main egg-producing centres, Yuhang, Sinchong-Chengshien.
 Anhwei. Supplied by Kiangsu and Chekiang.

SIZE OF EGG SHEETS

Kind of Sheets	Colour of Sheets	Size	Layings
Yuhang... ..	Red	19-ins. by 19-ins.	250
Sinchong-Chengshien .	White	14-ins. by 15-ins.	150
Tai Ho	Red	17-ins. by 15-ins.	180
Wusih	White (on cloth)	no definite size .	
Inspected Egg Circles	White	14-ins. by 8½-ins.	20-23

DISTRIBUTION

Kind of Sheets	Districts Served	Time of Distribution
Yuhang sheets	Hangchow, Kashing, Nan-king and Northern Kiangsu }	May 20-30
Chengshien-Sinchong	Siaoshan	May
	Tsatlee	June
Disease Free Eggs	Everywhere	{ March-April of the following year.

MULBERRY PRODUCTION

Type-Huchow Mulberry Tree

	Height	Feet Apart	Trees per Mow
Wusih	4	4	250
Huchow	6	5	200
Shaoshing	7	6	150

LEAF PRODUCTION

	Spring Crop	Summer Crop
Per mow in piculs	10	3
Price per picul of leaves	\$2.00-3.00	\$0.50-1.50

Life of mulberry trees in years.

Before Picking	Full Grown	Total Life
4	7	30-40

MULBERRY SEEDLINGS

Centre of Production—Changan and Zamen near Hangchow.
 Area of land used for mulberry seedling plantations—100,000 mows.
 Products valued at \$600,000 to \$700,000 a year.

SILKWORM

Type in general use, Yuhang, Sin Yuen, Wusih, Tsukwei.
 Time in days of the life cycle of the average silk worm of the different types :

YUHANG EGG PRODUCERS

Stages	Hatching	I	II	III	IV	V	Total	Spinning	Cocoon	Moth
Feeding		2½	2	1	2	6½	14			
Sleeping		1	1	1	1		4			
Total	7	3½	3	2	3	6½	18	5	10	2
Grand Total 42 days										

TSUKWEI TYPE

Stages	Hatching	I	II	III	IV	V	Total	Spinning	Cocoon	Moth
Feeding		4	3	3	3	5	18			
Sleeping		2	1	2	2		7			
Total	10	6	4	5	5	5	25	5	11	3
Grand Total 54 days										

SIN YUEN TYPE

Stages	Hatching	I	II	III	IV	V	Total	Spinning	Cocoon	Moth
Feeding		4	3	3	4	6	20			
Sleeping		1	2	2	1		6			
Total	9	5	5	5	5	6	26	6	10	3
Grand Total 55 days										

Number of Feedings and Amount of Mulberry Leaves Consumed

TSUKWEI TYPE

Stages	I	II	III	IV	V	Total
Number of feeding	36	21	20	21	30	130
Consumption of leaves in catties per 1/10 Chinese oz. of worms	.7	4.6	13.6	38.9	284.8	342.6
% of total leaves	.2	1.3	4.0	11.3	83.2	100.0

SIN YUEN TYPE

Stages	I	II	III	IV	V	Total
Number of feedings	34	19	17	21	35	126
Consumption of leaves in catties per 1/10 Chinese oz. of worms	1.4	2.7	9.9	31.8	306.0	351.8
% of total leaves ... ..	.4	.8	2.8	9.0	9.0	100.0

COCOON PRODUCTION

	Catties of green cocoons for one ounce of worms.	Piculs of leaves per picul of green cocoons.
Sin Yuen	209	16.8
Tsukwei	231	14.8

PHYSICAL PROPERTIES OF COCOONS

Tests made by the Shanghai International Testing House

	Weight of cocoons in grams	Length of fibre in meters	Size of filament in deniers
Wusih ... ..	.272	356	1.81
Changchow ... ..	.299	375	1.90
Hangchow ... ..	.518	514	2.43
Kashing ... ..	.431	443	2.45
Tastlee ... ..	.357	432	2.06
Shaoshing ... ..	.544	553	2.31
Wusih (disease free) ... ..	.373	505	2.17
Tsukwei (disease free) ... ..	.408	477	2.38
Cross breed (disease free) ... ..	.514	622	2.71

COCOON HONGS

General Information on Cocoon Drying

Capacity for drying in cattles of green cocoons per oven	Temperature of drying	Time for Drying in Hours		
		1st drying	2nd drying	Total
120	80°- 90° C. or 176°-194° F.	2-4	4-6	6-10

REELING IN FILATURES

Method of reeling—Travette system. Average size of filature 275 basins.

Production per basin per day.

Grade of Cocoons	No. of ends reeled	Production Chinese Ounces	Grams
1st	5-6	11	416
2nd	4	9	340
3rd	3	6	227

	Reeling	Cocoon Boiling
Water temperature	170° F.	210° F.

Picul of dry cocoons used per basin per year average 10

Piculs of raw silk produced per basin per year average 1.8

Number of employees per basin average 2.8

COST OF PRODUCTION

MULBERRY LEAVES PER MOW

Expenses

	\$	%
Rent or interest on investment, 10% on \$80 per mow . .	8.00	34.8
Labour at \$84 a year for 12 mows	7.20	31.3
Fertilizer	7.00	30.4
Taxes . . . . .	.80	3.5

Total Cost \$23.00

Deduct income from by-products 1.00

Cost per mow \$22.00

Cost per picul of leaf, Spring \$2.00

Cost per picul of leaf, Summer67

RECEIPTS

10 piculs of leaves, Spring at \$2.80	\$28.00
3 piculs of leaves, Summer at \$.75	2.25
Total income from leaves	30.25
Less Expense	22.00
Profit per mow	8.25
Profit %	37%

EGG PRODUCTION

Cost per 100 layings

	Disease Free Egg Producers		Native Egg Producers	
Value of leaves	\$.90	33.3%	\$.24	40.0
Labour . . . . .	.30	11.1	.26	43.3
Inspection and Supervision	1.30	48.2	—	—
Materials and Supplies . . . . .	.20	7.4	.10	16.7
Total	2.70	100.0	.60	100.0%
Income from pierced cocoons . . . . .	.40		.20	
Cost	2.30		.40	
Selling price per 100 layings	-1.10		.62	
Profit (+), Loss (-)	-\$1.20	- 52%	+ .22	+ 55%

COCOON PRODUCTION

Cost of a picul of fresh cocoons		
Cost of eggs @ 100 layings	\$ 2.20	6%
Cost of leaves	33.30	94%
Cost of own labour is not included		
Selling price of cocoons, dollars per picul, fresh	\$60.00	
Deduct cost	35.50	
Profit and return on labour	\$24.50	or 41%

COST PER PICUL OF DRY COCOONS

Taxes per picul dry	\$11.20
Labour for drying	5.00
Rental of cocoon hong	4.80
Fuel for drying	2.50
General expenses	4.50
Transportation	2.00
Total	\$30.00
Initial cost to build a double oven	\$140.00
License of a cocoon hong for 20 years	150.00

RAW SILK PRODUCTION

COST PER PICUL OF FILATURE SILK

Fresh cocoons at \$60 per picul, yield—6.0

Fresh cocoon cost	₹ 780	62.9%
Cocoon buying and drying expenses	180	14.5
Manufacturing expenses	250	20.2
Selling Expenses	30	2.4
	₹1,240	

INCOME

Silk selling at	₹1,150
From by-products, Long waste	₹55
Double cocoons	42
Floss	32
Chrysalis	11
	140
	₹1,290
Net Profit	₹ 50

If cocoons are purchased to a better advantage, the net profit will be greater.

MANUFACTURING EXPENSES PER BASIN PER DAY

Rent or interest on initial investment ..	₤ .095	9.0 %
Labour, Reeling and general .. .. .	.515	50.0
Supervision and Management .. .. .	.125	12.0
Coal .. .. .	.250	24.0
Interest and Insurance on cocoons .. ..	.015	1.0
Packing and tax .. .. .	.020	2.0
Miscellaneous .. .. .	.030	2.0
	<u>₤1.050</u>	<u>100.0%</u>
Initial cost per basin	₤300	
Rental per basin per year	₤ 36	

COST OF ONE PICUL OF TSATLEE REREELS

Native reeled silk 100 catties	₤692	78.5 %
Rereeling waste 10 per cent.	69	7.8
Expenses	120	13.7
	<u>₤881</u>	

BASIC UNITS OF PRODUCTION FIGURES

Number of layings of eggs per picul of raw silk ..	3,600
Picul of mulberry leaf per mow	10
Piculs of mulberry leaf required to produce one picul dry cocoons	70
Picul of dry cocoons required to produce one picul raw silk	6

STATISTICS

EGG PRODUCTION

NATIVE PRODUCERS

	Layings
Wusih-Changchow district—estimated production by individual farmers	60,000,000
Other districts in Kiangsu—estimated production by individual farmers	40,000,000
Yuhang—produced and distributed	100,000,000
Shaoshing—produced and distributed	75,000,000
Other egg producers in Chekiang	100,000,000
Total	<u>375,000,000</u>

MODERN EGG PRODUCERS

Hangchow—school and private	750,000
Soochow, Wusih—school and private	1,000,000
Nanking University	800,000
International Committee's production in China ..	1,000,000
International Committee's purchases from France and Italy	4,000,000
Total	<u>7,550,000</u>

COCOON PRODUCTION IN CHINA

In piculs fresh (estimated)

Name of Province	Piculs of fresh cocoons	% of Total
Kiangsu	350,000	10.5
Chekiang	1,000,000	30.0
Anhwei	30,000	.9
Hupei	100,000	3.0
Hunan	20,000	.6
Szechuen	600,000	18.1
Shantung	60,000	1.8
Honan	100,000	3.0
Kwangtung	1,000,000	30.0
Others	70,000	2.1
Total	3,330,000	100.0

COCOON AND NATIVE SILK PRODUCTION IN CENTRAL CHINA

(Estimated)

Name of District	Cocoons for filatures piculs dry	Native reeled silk in piculs for home con- sumption and for export as rereels and white silks
KIANGSU		
Wusih-Changchow	85,000	—
Soochow	15,000	3,000
Northern Kiangsu	11,000	2,000
	<hr/> 111,000	<hr/> 5,000
CHEKIANG		
Hangchow-Kashing	30,000	20,000
Tsatlee	10,000	35,000
Shaoshing	25,000	5,000
	<hr/> 65,000	<hr/> 60,000
ANHWEI		
	4,000	1,000
Grand Total	180,000	66,000
Cocoons converted into raw silk		36,000
Grand Total in piculs of raw silk		102,000

COCOON HONGS AND OVENS IN CENTRAL CHINA

KIANGSU	No. of Hong's	No. of Ovens
Wusih-Changchow	504	10,008
Soochow	125	1,888
Northern Kiangsu	157	2,243
	<hr/> 786	<hr/> 14,139
CHEKIANG		
Hangchow-Kashing	103	1,932
Tsatlee	49	883
Shaoshing	177	2,419
	<hr/> 329	<hr/> 5,234
ANHWEI		
	116	1,415
Grand Total	1,231	20,788

FILATURES IN CENTRAL CHINA

Name of City	No. of filatures	No. of basins
Shanghai	68	18,576
Wusih	18	5,536
Soochow	3	736
Chinkiang	2	456
Hangchow	4	972
Siaoshan	1	340
Huchow	1	200
Kashing	1	200
	98	27,016

STATISTICS

Customs Statistics of Shanghai Exports

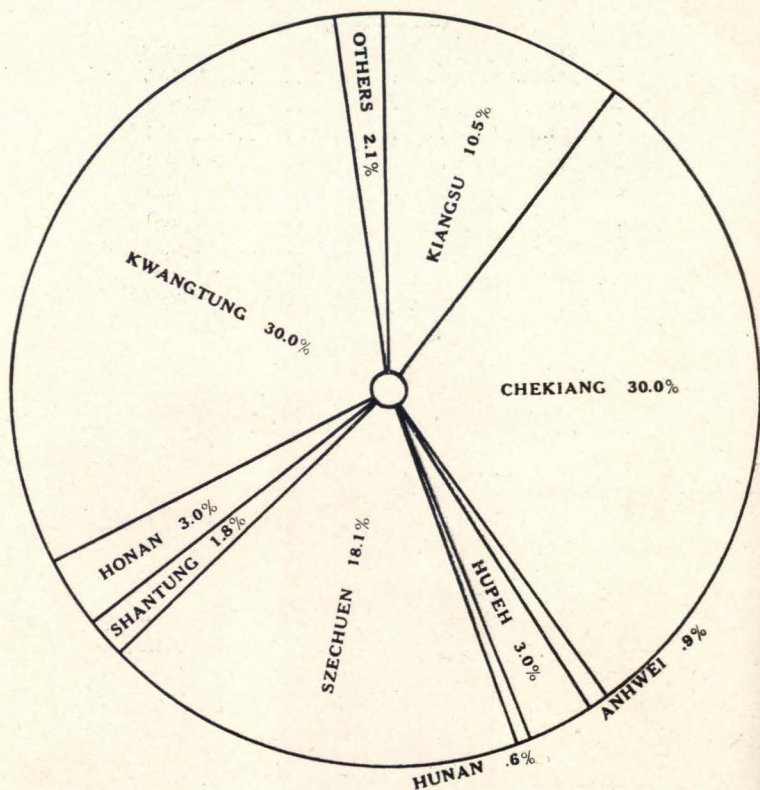
		Piculs	
		1923-24	1924-25
White Steam Filatures			
Europe		16,703	17,509
America		14,348	15,273
Others		76	30
		31,127	32,812
Yellow Steam Filatures			
Europe		6,843	7,139
America		932	1,408
Others		131	339
		7,906	8,886
White Silks			
Europe		4,553	6,348
America		6,721	5,408
Others		3,554	3,140
		14,828	14,896
Yellow Silks			
Europe		1,224	1,225
America		120	—
Others		10,021	8,308
		11,365	9,533
Tussahs			
Europe		1,962	2,979
America		4,626	8,641
Others		744	1,065
		7,332	12,685
Grand Total		72,558	78,812

CONSUMPTION OF RAW SILK BY THE DIFFERENT WEAVING CENTRES

(Estimated)

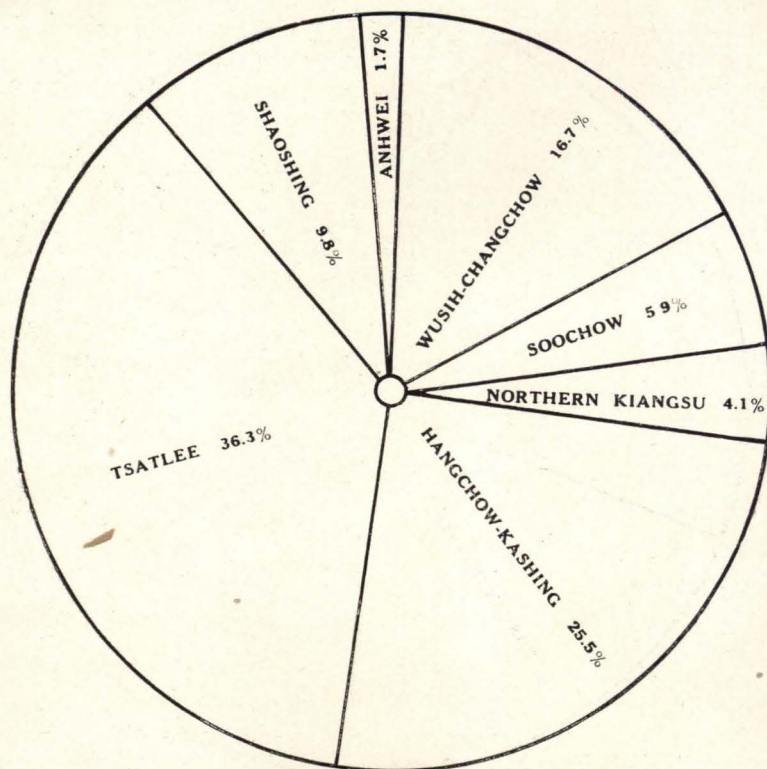
	Piculs
Hangchow	20,000
Huchow	15,000
Chenshai	8,000
Paoyuen	4,000
Soochow	3,000
Nanking	2,000
Shaoshing	5,000
	<hr/>
	57,000

COCOON PRODUCTION IN CHINA



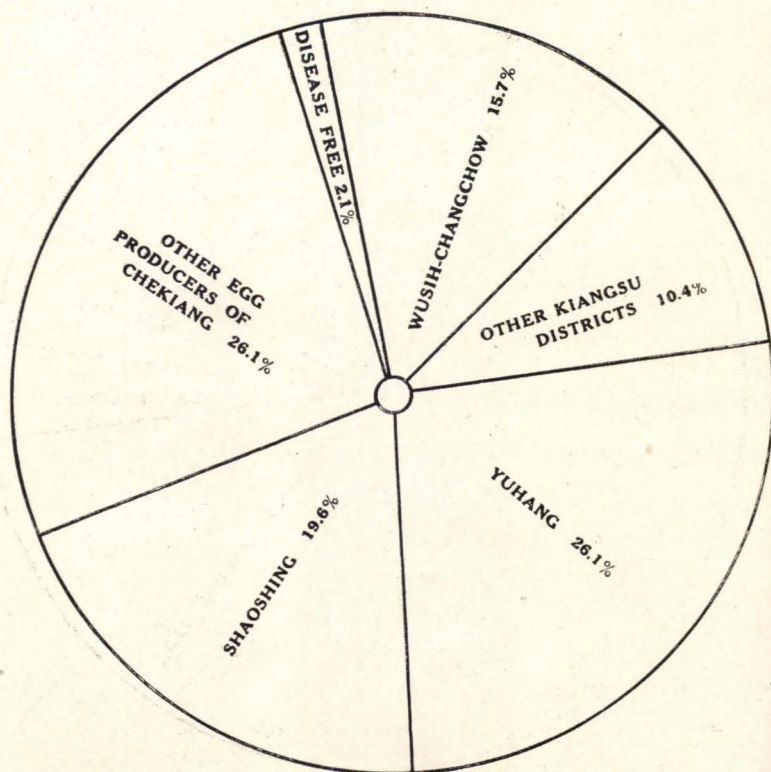
	Piculs of Fresh Cocoons	Per cent.
Kiangsu	350,000	10.5
Chekiang	1,000,000	30.0
Anhwei	30,000	.9
Hupeh	100,000	3.0
Hunan	20,000	.6
Szechuen	600,000	18.1
Shantung	60,000	1.8
Honan	100,000	3.0
Kwangtung	1,000,000	30.0
Others	70,000	2.1
TOTAL	3,330,000	100.0

COCOON PRODUCTION IN CENTRAL CHINA IN TERMS OF RAW SILK



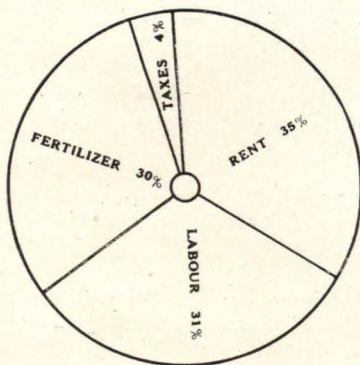
District	Piculs	Percent.
Wusih-Changchow	17,000	16.7
Soochow	6,000	5.9
Northern Kiangsu	4,200	4.1
Hangchow-Kashing	26,000	25.5
Tsatlee	37,000	36.3
Shaoshing	10,000	9.8
Anhwei	1,800	1.7
TOTAL	102,000	100.0

EGG PRODUCTION IN CENTRAL CHINA

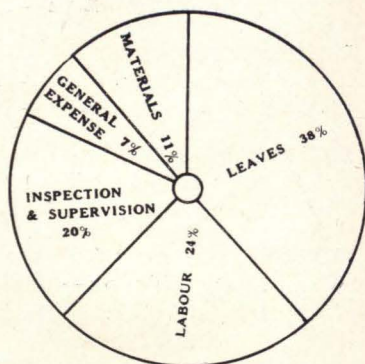


District	Millions of Layings	Percent.
Wusih	60	15.7
Other Kiangsu	40	10.4
Yuhang	100	26.1
Shaoshing	75	19.6
Other Chekiang	100	26.1
Disease Free	8	2.1
	383	100.0

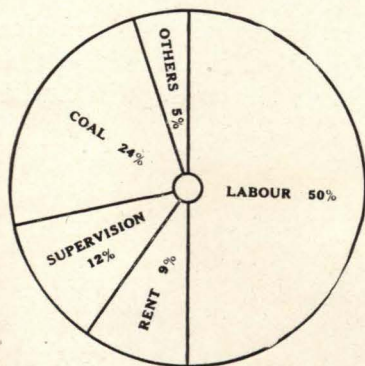
COMPARATIVE CHARTS ON COSTS OF PRODUCTION



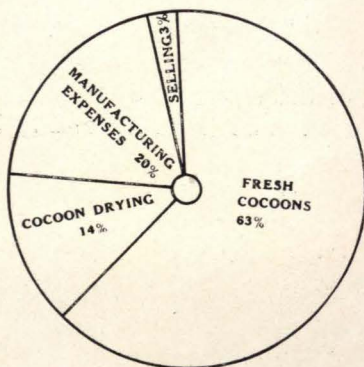
MULBERRY LEAF
PRODUCTION



DISEASE FREE EGG
PRODUCTION



FILATURE MANUFACTURING
EXPENSES



FILATURE SILK
PRODUCTION

APPENDIX "B"

Table of Units

Weights

Chinese	—	English	—	Metric
1 ounce (Chinese)	—	1.3333 oz. (av.)	—	37.7986 grams
1 catty — 16 ounces	—	1.3333 lbs. (av.)	—	.60478 kilos
1 picul — 100 catties	—	133.3333 lbs. (av.)	—	60.478 kilos

LINEAR MEASURE

1 foot (Chinese)	—	14.1 inches	—	35.81 cms.
1 Li — 1,800 feet	—	.40057 miles	—	.64464 kilometers

SQUARE MEASURE

1 square foot (Chinese)	—	1.38 sq. ft.	—	.1282 sq. meters
1 mow—600 sq. ft. (Chinese)	—	1/6 acre		

MONEY

1 cent (Chinese)	—	0.473 gold cents (U. S. currency)		
1 dollar (Silver or Mexican)	—	100 cents — 0.473 gold dollars (U. S. Currency)		
1 Tael (Shanghai)	—	1.39 dollars (silver) — .653 gold dollars (U. S. Currency)		
1 Haikwan Tael (Customs)	—	1.55 dollars (silver) — .726 gold dollars (U. S. Currency)		

The exchange rate between silver or Mexican dollars and gold fluctuates greatly from time to time. Those given are the nominal values.

The exchange rate between Shanghai taels and silver or Mexican dollars fluctuates only slightly. At normal times one silver or Mexican dollar equals .72 taels. The fluctuation is between .71 and .73.



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