Vol. III No. 5

BULLETIN

OF THE

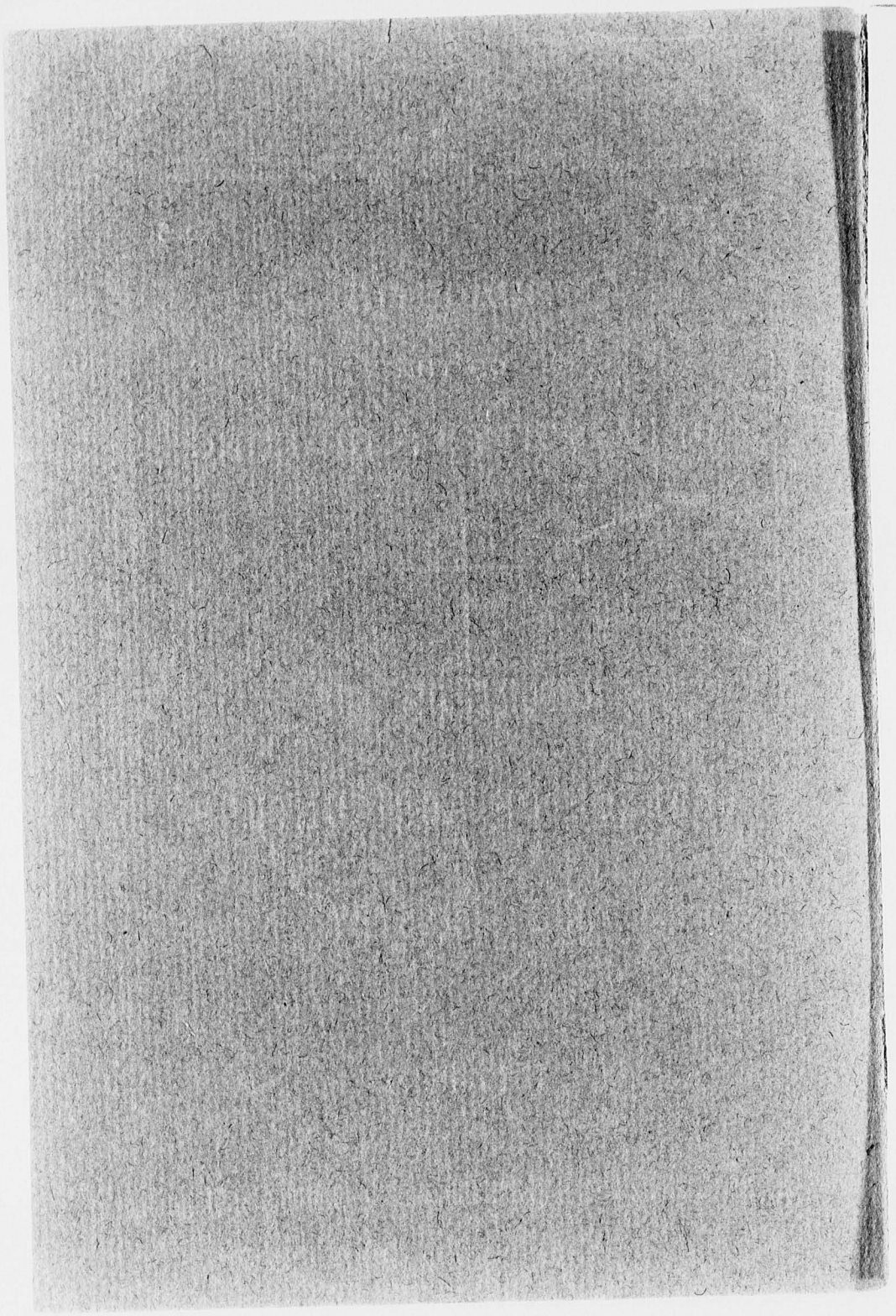
UNIVERSITY OF NANKING

REPORT OF THE

COLLEGE OF AGRICULTURE

AND FORESTRY

1917-1918



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1917-1918

SHANGHAI
Printed at the Methodist Publishing House
1918

Reprinted from the annual report of the
President of the University.

THE COLLEGE OF AGRICULTURE AND FORESTRY.

THE FACULTY.

BOWEN, ARTHUR JOHN, LL. D., President.
*WILLIAMS, JOHN ELIAS, D.D., Vice-President.
†BAILIE, JOSEPH, B.A., Dean.
REISNER, JOHN HENRY, M.S.A., Acting Dean; Soils and Farm Crops.
‡BRAASTAD, MISS FLORENCE A., English.
‡CH'EN CHEN, B.S., Agriculture.
CLEMONS, HARRY, M.A., English.
§FRANCKE, MRS. HELEN, B.A., English.
ING ZAUNG-TEH, M.A., Biology, Botany.
||LI PING-YUNG, B.S., Botany.
LI TSIH-HSING, B.S., Interpreter, Summer School 1918.
LI YING (ALEXANDER Y. LEE), M.S., Chemistry.
LIN DAO-YANG (D.Y. LIN), M.F., Forestry.
LIU CHING-PAN, B.A., Chinese Translator.
LIU KING-SHU, Ph.D., Chinese Literature.
||LIU YUEN-EN, B.S. (Japanese), Japanese, Horticulture.
¶ROYS, HARVEY CURTIS, B.S., Physics and Surveying.
SAMPLE, JOHN LA VANT, B.S., Forestry.
§SHÏH PING-CHÏ, Forestry.
‡SIE CHIA-SHEN, B.A., Agriculture.
‡THOMSON, JAMES CLAUDE, M.A., M.S., Chemistry.
**TS'IEN T'IEN-HO, M.S.A., Sericulture.
WEIGEL, WILLIAM HAROLD, Jr., B.S., Animal Husbandry and Pomology.
‡WHITE, MISS ANNE CATHERINE, English.
††WOODWORTH, CHARLES WILLIAM, M.S., Special Investigator and Lecturer on Entomology.
§YANG KWEI-CHEN, Chinese Writer.

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* On furlough 1918-1919 and spring semester 1917-1918. † Absent on colonization service. ‡ 1918-1919. § 1917-1918. || 1917-1918, autumn semester. ¶ On furlough 1917-1918. ** Beginning spring semester 1917-1918. †† 1917-1918 spring semester and 1918-1919 autumn semester.

REPORT FOR 1917-1918

Faculty and Teaching.

The loss of Messrs. Y. H. Tsou and P. W. Tsou from our last year's faculty created considerable difficulty at the beginning of the year. It was not until after the middle of November that our faculty began to assume an appearance of stability and not until after December first that our class work became fully organized and normal. Mr. D. Y. Lin's arrival from the Conservation Division of the Chinese National Y. M. C. A. Lecture Department, shortly after the opening of school, saved the forestry situation for us; and with Mr. John L. Sample's arrival in October, the problem of the forestry teaching was solved. Mr. Lin is a graduate of the Massachusetts State College of Agriculture and of the Yale Forestry School. Mr. Sample is a graduate in Forestry of Purdue University. Mr. W. H. Weigel of the New York State College of Agriculture arrived in late October and took classes in Pomology and Animal Husbandry. Mr. B. Y. Li, B. S., Iowa State College of Agriculture, was secured for part time. Mr. Y. E. Liu, a Chinese student returned from Japan, started in the term teaching Japanese and Horticulture, but was relieved of his responsibilites in December. The English work for forestry students was very well taken care of by Mrs. Francke and Mr. Hummel during the first term, and Mrs. Francke continued it alone, with marked results, the second. Mr. Shih Ping-chi, a graduate of the School of Forestry, Philippine Islands, who came as Assistant in Forestry on February first, has resigned in order to go into another line of work. Mr. Weigel will devote his full time to religious work this coming year, and will have no teaching work.

Professor Woodworth, Head of the Division of Entomology at the University of California, came to us, on sabbatical leave, in February. He has been a tremendous help and inspiration to us. Entire credit must be given him for the successful short course in sericulture, and without him the summer school would hardly have been undertaken. Besides his sericultural work he gave three classes in entomology to our regular students, and managed (almost single handed) a campaign to exterminate the mosquito from Nanking.

Mr. Ts'ien T'ien-ho, M. S. A., 1917, from the New York State College of Agriculture, was secured temporarily to work along with Professor Woodworth as interpreter and translator. His work has been most satisfactory, and we are glad that we are to retain his services to carry on the work in sericulture started by Professor Woodworth.

For next semester we have already secured the services of Mr. Sie Chia-shen, a graduate of the New York State College of Agriculture, and of Mr. Ch'en Chen, one of our own graduates, in addition to Mr. Ts'ien.

Mr. Bailie left early in October in response to Mr. Roger Greene's invitation to go North and help in the relief work for the flood sufferers. He has been away ever since, and is now in Manchuria on colonization service. I take it that Mr. Bailie will report to you directly the fine work which he has been doing.

Student Registration and Attendance.

The number of students who have registered in the College of Agriculture and Forestry during the year 1917-1918 is as follows:

Senior College.

Agricultural students	21
Forestry students	25

Junior College.

Agricultural students	32
Forestry students	2
Special students	5
Short course in Sericulture	73
Summer School in Agriculture	60
	218
Duplication	8
	210

As will be seen from the above table, 210 different students have been enrolled during the past year, with a total registration of 218. Of our regular students eligible to register in the Senior College of Agriculture and Forestry in the fall semester

all returned but three. One student left to go to France with the Chinese Labor Corps. All these students continued during the year, registering for the spring semester and all returning after the school was closed on account of the plague. This is the first time we have achieved such a record. Including the Junior College agricultural and forestry students, eleven of the 18 principal provinces, not including Java and Hongkong, are represented. Including Short Course and Summer School students 14 out of the 18 provinces have been represented during the year. The number of voluntary as distinguished from scholarship students studying forestry is still small. There are only three out of all the forestry students who are not partially or wholly subsidized. It has been suggested that the reason for the few voluntary students for forestry is that we have never had any trained foresters on our faculty. This has in the past been true. Now that forestry is represented by two teachers devoting their full time to it, the above reason can no longer hold true. It is not to be expected that the enrolment of voluntary forestry students will ever be as great as that of agricultural students. It is quite evident, I think, that our future forestry enrolment will be most largely dependent on the continued and increased support of the Central and Provincial Governments.

Short Course in Sericulture.

The short course in sericulture was designed to serve the same purpose as our short courses in the States, i.e. to give modern scientific methods and useful information to those directly engaged in sericulture, in a short period of time. The short course lasted ten weeks from April tenth to June nineteenth. Seventy-three students were enrolled from 12 provinces. The youngest student was 19 and the oldest was 51 years. The average age was 25 years and 5 months. Twenty-three or almost one-third were sent by Magistrates of Districts. Twenty-six were sent by Government Schools. The Civil Governor of Hupeh sent one student. Five were sent by Provincial and District Agricultural Associations. The rest were sent by Commissioners of Education and Industry, by Educational Associations, by missionaries, or came of their own accord. At least 80% of the students had some official connection. Fifty certificates were granted at the end of the course. No tuition was charged. The students paid $12.50 to cover room and board for the ten weeks.

The course consisted of a competition among the students in the practical rearing of silk worms, and in lecture and

laboratory practice. The lectures included such subjects as silk worm diseases (which cause very great annual losses), silk worm breeding, the rationale of Chinese practices in rearing silk worms, etc., etc. More than 240 different lots of silk worm eggs representing almost as many different strains were secured from all over China for the rearing work, and from this number 51 of the very best were selected. Of these, careful records are being made of weights, size, and strength of fiber for still further selection and experimentation.

The students were taught to identify the principal silk worm diseases, and to produce eggs that were free from diseases—about which practically nothing is known by the hundreds of thousands of silk worm farmers. Without doubt this has been the most constructive piece of experimental work and most practical teaching work that has ever been carried on in China in sericulture. With Mr. Ts'ien to continue this work, we can feel assured of the results, which will require a number of years to reach. Professor Woodworth has put us in touch directly, and in a position to help very greatly, with China's most important industry.

Summer School.

The purpose of the summer school was to offer opportunity to teachers and others interested in agriculture to take a number of courses in which only the more important things would be dealt with in a practical and brief way. Five courses were offered and every student was required to take them all; namely, Silk Culture, Injurious Insects, Improvement of Farm Crops, Soils, and Forestry. The course lasted four weeks, from July fifth to August second. Sixty students from thirteen provinces were enrolled. The oldest student was a Methodist pastor (ex-farmer) from Shantung, aged 57, and the youngest was a student aged 15. The average age of the class was 27 years. Of the 60 registrants, 12 or 20% were teachers, 6 were farmers, 1 each preacher and soldier, 35 were students, and 5 are unclassified; 29 or almost 50% were Christians, thus indicating that the summer school work in agriculture appealed to our Christian constituency as we hoped it would. Fewer students than in the short course, only about 20%, had official connections. One Magistrate in Anhwei sent in teachers for the course. Thirty-two certificates were granted.

The enrolment was much larger than we had anticipated, so that we were unable to give the students as much field and laboratory work as we should otherwise have done. The large

enrolment, however, has shown us conclusively the possibilities of such summer school work and we are planning already on the basis of this year's experience for a better and more extensive course next year, covering six weeks instead of four.

The cost of the Summer School was approximately $50 (Mex.) over and above what our expenses would have been without it. The fees for the course were: tuition $1, board and room $5, a total of only $6.

Mosquito Campaign.

Not the least of Professor Woodworth's contributions to China has been his Mosquito Campaign. I use the word "his" advisedly, because he has carried on the work almost single handed, outside the help which the University students volunteered. Had the cooperation promised by the Chief of Police been forthcoming, Professor Woodworth would have made Nanking mean to China what Panama has meant to the rest of the world, so far as mosquito control is concerned, by demonstrating that mosquito and malaria control can be completely and easily secured. Professor Woodworth divided the city into ten parts, and for each part appointed one student, who with five policemen would have been responsible for the work. Professor Woodworth, with or without the company of students or others, has made the complete rounds of the city, including everything within the city wall, at least once every two weeks since the campaign started in April. He himself has destroyed millions of larvae thus preventing not only their hatching into mosquitoes but preventing also countless future generations. Professor Woodworth has promised to write a full report on mosquito control in China after the campaign is over in the fall, which we will have published widely both in English and Chinese. The demonstration has already gone far enough to prove its entire practicability for all cities, towns, and villages in China.

Government Co-operation.

The relations which Mr. Bailie established with the Central and the Anhwei and Shantung Provincial Governments three years ago are still in force. Five forestry students are sent by Anhwei and three by Shantung. Four or five new students will come from Anhwei this fall. The scholarship from Kiangsi, held by Mr. Ch'en Chen, one of this year's graduates in agriculture, has been continued and a student appointed. Of the original $9,000 promised by the Central Government in 1915, only $4,000 has been received. Part of the student fees which they assumed in their contract is also unpaid. We trust

that as soon as a responsible government has been organized payment will be forth-coming. The University has continued to fulfill its part of the contract with the Central Government so far as the students were concerned. The present political and financial conditions of the country makes the extension of government co-operation extremely difficult, if not impossible. The large proportion of the short course students (80%) having official connection was most gratifying. In these most trying times, I feel that we are more than holding our own with the various governments and officials.

Forestry Fund Committee.

The Forestry Fund Committee continues its support of eight forestry students, and in addition has made a grant of $5,000 a year for three years for the support of teachers.

Missionary Interest in Agriculture.

This is one of the encouraging signs of the time. Not only missionaries but missionary bodies are considering the matter of agriculture in relation to their work. The Northern Presbyterian Mission has appointed Mr. J. L. Buck, a trained agriculturist, to their Nanhsuchou station in Anhwei, to devote full time to the development of their work. The American Board of Commissioners for Foreign Missions has appointed Mr. Charles H. Riggs, a trained agriculturalist, to their station at Shaowu in Fukien for full time agricultural work. Mr. Riggs in a recent letter states: "The people here seem quite enthusiastic over the agricultural work, having pledged something over $6,000 Mex. for the experimental farm, to be paid in the next three or four years. Also there are a number of young chaps interested, several of whom I hope will be going up to Nanking within the next few years." The South Chihli Mission has already developed agricultural work rather extensively as a part of their missionary program. Individual missionaries, in different parts of China, have started small gardens, taught their students to make germination tests of seeds, selection of seeds, etc., and many letters have come asking for help and advice in getting some agricultural work started for their students as part of their school work. I was asked to present a paper before the Advisory Council of the China Christian Educational Association at its annual meeting last February on *The Relation of Education in Agriculture to the Christian Movement in China*, and later on asked to prepare a statement....."which will set forth in detail the conditions which must be met in order to

bring information of modern agricultural methods to the people through the medium of our middle and primary schools." The East China Educational Association has asked me to present a half hour paper on *The Place of Practical Agricultural Education in our Middle and Lower Schools* at its next annual meeting in February. A number of prominent missionaries were personally interested in our Summer School and sent some of their teachers to take the work.

It seems to me that this interest is perfectly natural and logical, and is bound to grow into activity. Seventy to eighty-five percent of China's population is rural—their interests are tied up in agriculture. If our mission schools are going to educate their students for "life," it will have to be done largely through agriculture. I trust when the time comes the College of Agriculture and Forestry will be sufficiently well staffed and equipped to meet the demands that will be made upon us by the missions.

Experimental Work.

1. MULBERRY CULTURE. At the request of the International Committee for the Improvement of Sericulture in China we have undertaken an important piece of experimental work in mulberry culture. The first task is to secure the largest collection of different species or varieties of mulberry possible and then determine the best from all these on the basis of quantity and quality of leaves produced. This work was started on short notice in March, and already 96 different lots of trees have been secured, mostly from Chekiang province, the most noted of the provinces producing mulberry trees. While there are a certain number of duplicates among these 96 different lots, they represent a large and varied collection, which will require several years to classify. This coming spring, further collections will be made in other provinces, and collections will be secured from Japan, India, Italy, and France. We already have, without doubt, the largest collection of different mulberry trees in China, and with our foreign collections, we should have one of the largest collections in the world. This is only in keeping with the importance of the silk industry in China.

In addition to the work of collection and selection, cultural experiments will be carried on, including fertilizers, methods of pruning, propagation, etc. Steps are already being taken for the production of grafted mulberry trees on a commercial scale, which would also be done in counection with the International Committee.

I should also state that this International Committee is made up of representatives from the French, British, Italian, American, and Japanese Silk Associations of Shanghai, and the Chinese Cocoon Merchants and Steam Filatures Guild, also of Shanghai.

2. FARM CROPS. Variety tests with about 50 varieties of wheat, pedigree selection of both native and foreign corn and kaoliang, variety tests with about 50 different kinds of cotton, both American and native, and variety tests with about 75 varieties of rice are being carried on. We hope to extend this very important work this coming year, with Mr. Ch'en Chen giving his full time to it. Through our summer school students, we have arranged for the distribution of our best seed and the collection of local native seed for our own work.

3. FRUITS. Considerable experimental work has been done with both native and American fruits, about 100 different varieties of different fruits having been collected. Varieties that do best are propagated. Dr. Macklin is largely responsible for the fine collection of grapes and native peaches.

Forest Nurseries.

More than 80 mow (15 English acres) are in forest nurseries, containing 123 different species of native and foreign trees. The total number of seedlings and transplants is about 700,000, valued at $3,000. More than $1,000 was realized on the sale of nursery stock last year, and we hope the sum will be much larger this year. The enforced vacation from school work on account of the plague gave Mr. Sample and me three full weeks that were devoted entirely to the nurseries and the agricultural gardens.

Agricultural Gardens.

These form the organization under which the nursery stock, foreign vegetables, fruits, flowers, both native and foreign, and seeds are produced and sold. The receipts for last year were $2,389.87 and expenditures were $2,362.63, leaving a credit of $27.24. There were outstanding on July first collectable accounts for $119.32, and, including the value of the forest nursery stock, seeds, potted flowers, fruit stock, and plants estimated worth $1,000.00, we have assets totaling about $4,000.00. It must be noted that very little capital has been invested in the Agricultural Gardens that has not been provided from their income. In addition, all labor that has been expended on our experimental work has come out of the Agricultural Gardens, a considerable item appearing only as labor in the general expenditures. The Kuleo campus is under the care of the Agricultural Gardens, and in addition to considerable grading, about ⅞ of a mile of

barbed wire fence was built this spring. From the Gardens were donated and planted about a half mile of citrus trifoliata hedge and also 181 ginko as permanent and 70 Chinese ash as temporary road-side trees for the university campus, 170 populus lombardi along the south side at Kan Ho Yen, and 1000 maple locust, and elm among the old graves north of Swasey Hall.

A much needed green house and glass fronted Chinese building for vegetables and flowers will be added this fall, to be paid for by the Agricultural Gardens. A large shed, tile roofed, with concrete floor and two sides open, for drying and thrashing seeds, is much needed, and a compost pit should also be added during the winter.

The Agricultural Gardens were organized, as stated in my report to you for 1915-1916, to provide an opportunity to our students for field work and to maintain from its proceeds, utilizing student labor, an Agricultural Industrial School for country boys whose education would of necessity be limited to the lower grades. The first object has not been achieved in the measure that it ought and the second not at all. Nor do I see how we can get the full educational value out of our practical work until we have a trained foreigner here giving his full time to it. Our labor bill last year was over $1,500.00 representing between 6000 and 7000 days of labor, which with the organization of the industrial school could go towards student support and their education. With a large number of students around, better organization will be necessary. I hope the man for our field work will not be long in coming. It's our greatest need at the present time.

Colonization.

I want to report briefly the progress that has been made by Mr. Bailie's first colony at Lai-an-hsien, reports of which have always been included in former years to you. It is most encouraging and convincing of the value and practicability of this kind of work—the same kind of work that Mr. Bailie is now doing under handicap in Manchuria in connection with the Chihli flood relief measures. The following notes are taken from the report of the Rev. Charles Best, C. I. M., who has personally given much time and thought to the colony from the first, and is in very large measure responsible for its success.

"There are now 83 families, all self-supporting. Last year's harvest was very good. This year it has been still better.....A number of colonists have been able to purchase buffaloes or cows, and at least one man has been able to get a wife for his brother—and which cost about the same price as his buffalo, about $60.00....They have also refunded a portion of the capital received from the Colonization Association.....It is encouraging too, to see so many of them improving their homes....They have been encouraged from the beginning to plant trees, as well as to permit the wild ones to grow. The result is that many of their homes now present quite a pleasing appearance.....Last year in conjunction with the District Magistrate we started a nursery. On account of drought, etc., this was not a great success, although it was by no means a failure.....This spring large quantities of seed were sown, but they were all local trees that we knew would do well.....They include ginko biloba, pistacia chinensis, mulberry, Chinese ash, candleberry, chestnuts, pride of India, etc.....The weather has been most favourable for this work, thus making of the nursery this year a real success.....A few of our colonists are unwilling to work, and of course are making no progress. These we hope to weed out in the near future.....While we have made no religious restrictions whatever, I think that without exception every home has done away with its idolatry. And while as yet not many of them have accepted Christianity we are glad to say that a few have and I have access and the opportunity of preaching the Gospel in every house."

Publications.

Professor Woodworth's lectures on silk worm breeding and diseases have been translated by Mr. Ts'ien T'ien-ho and will be published in book form this autumn.

Mr. D. Y. Lin has had published both in English and Chinese a small pamphlet, "Forests and Chihli Floods"—the material for which was gathered on his trip to Peking in December. He has also had published an attractive volume containing many graphs and illustrations, "Seng Ling Yao Lang" (森林要覽). During the year he had a second edition of 3000 copies of his book "The Meaning of Forestry" (森林大意) printed.

Mr. Sample has prepared for publication a pamphlet on the "Management of Forest Nurseries," which will be useful for the amateur as well as those already having some practical knowledge of nursery work.

The writer has finished his text book on soils for use in middle schools. The translation is about finished and will be published shortly.

The translation of the book on "General Agriculture," the cost of which is being met by Mr. Yok Ping Han of Shanghai, is well under way and will be published soon.

The arrangement which was made with the Commercial Press for the financial support of a translator for the College of Agriculture and Forestry is still in force. Mr. Liu Ching-pan, one of the University graduates, is doing this work.

Agricultural Literature.

There is still a hopelessly inadequate agricultural literature in Chinese. There is practically nothing of college grade. Agricultural nomenclature is still largely not standardized. Japanese influence, in what literature there is at present, is very strong.

Pending the development of a much more adequate literature, our teaching work in the College of Agriculture and Forestry will have to continue in English. This however is no serious drawback, for the benefits which arise from being able to do their work in English much more than offset the extra time required to learn it. Summer school and short course work is all done in Chinese, either directly or through interpreters.

Religious Activity.

The Eddy meetings did much to stimulate the religious activity of our students, and a number of boys at the time and later on decided to accept Christ as their personal Saviour. Among these were some of our best boys. All of next year's graduating class in agriculture are Christians, and six out of eleven of the 1920 class in agriculture are Christians. Only four of the forestry students are Christians, but there is every reason to believe that a number of these will make decisions this coming year. Three of our six graduates were Christians. This data refers only to Senior College agriculture and forestry students.

Graduates.

Our first class of six students was graduated in June. Three of these have teaching positions, one returning to the College of Agriculture and Forestry as Assistant in Agriculture. One has a position with an American Consul. One returns to the University for further study in the Arts College. One has a position in a government agricultural school and one a position in a mission middle school.

Land.

The College of Agriculture and Forestry seems to be no further along in the acquisition of a suitable piece of land for its work than it was four years ago. We were able to rent a good piece of land for the mulberry experiment but this is the last piece of good land available that is contiguous to the University lands which we are now using. We shall have to continue to use the University land temporarily until we can get our own farm and become permanently established thereon.

Men Needed.

We have immediate need of the following men: (1) a man to take charge of the Agricultural Gardens, nurseries, and all other outside work, who should have had experience in general farming and horticultural work; (2) a thoroughly trained botanist able to teach plant physiology and dendrology, in addition to general botany courses; (3) a trained economic entomologist; (4) an agricultural chemist. All these men should be capable of carrying on research work.

Acknowledgments.

I want to take this opportunity to acknowledge my indebtedness to all my colleagues who have shared the year's work. Professor Woodworth has been a rich source of inspiration and new ideas besides accomplishing a prodigious amount of work. During his visit in February, Mr. Bailie aided greatly by pushing the plans for the Short Course in Sericulture and establishing relations with the International Committee for the Improvement of Sericulture in China.

JOHN H. REISNER

August 1, 1918.

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SHANGHAI:
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1919

Faculty and Students of the first Summer School session of the College of Agriculture and Forestry.

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FOR THE YEAR ENDING AUGUST, 1919

BY

JOHN H. REISNER, DEAN

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University of Nanking

The College of Agriculture and Forestry

Faculty

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TS'IEN T'IEN-HO, M.S.A., Sericulture.

ʒWOODWORTH, CHARLES WILLIAM, M.S., Special Investigator and Lecturer on Entomology.

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*On furlough. †On colonization service in Manchuria. ‡Spring semester. ʒAutumn semester.

Report of the Dean for 1918-1919.

The most important developments of the past year have been in connection with our sericultural and mulberry work; the cotton improvement work; the very remarkable increase in interest on the part of the missionary body in agricultural education as a part of the mission program; the development of our field work, particularly sales of seeds and nursery stock; the acquisition of the first piece of land for our permanent experiment station and farm; co-operation with the Governor of Shansi; action by the Board of Trustees looking toward a more adequate support for the College of Agriculture and Forestry; the organization of an agricultural experiment station; and the establishment in China of a $5,000 loan scholarship fund for forestry students.

Sericultural and Mulberry Work.

With the exception of the mulberry orchard, this work has been carried on with the financial assistance and co-operation of the International Committee for the Improvement of Sericulture in China, of which Mr. H. Madier (French) of Madier Freres is Chairman, and Mr. A. Jost (Swiss) of Sulzer-Rudolph is Honorary Secretary and Treasurer. The organization of the committee is largely due to the efforts of Mr. Ting Ju-ling (Chinese), also a member of the committee, who has large silk interests, and has been the most effective pioneer in bringing about practical improvements in silk culture. British, Italian, Japanese, and American interests are also represented on the Committee. A monthly appropriation of 4,000 taels is paid to the Committee by the Chinese Maritime Customs, with Government approval, from voluntary taxes placed on raw silk. Mr. Vieil, a French expert sericulturist, is in charge of the work of the Committee. A total of $3,858.00 was appropriated by the International Committee to

carry on the work undertaken by the University for the current year. The chief undertaking of the Committee is the production of silk worm eggs according to the Pasteur method, and distribution of these certified eggs to the farmers. The first year's work showed an incidence of diseased moths of 70 per cent, and results this second year still show an incidence of 70 per cent of disease in moths produced from the first year's seed. This gives some idea to what extent the silk worms have become impregnated with disease, and the large task of eliminating it in the enormous quantity of silk worm seed annually needed for the Chinese silk crop. Investigations by Mr. Ts'ien at the University, with about twelve lots of silk worms representing as many sections of country, show an incidence of disease ranging from 49 per cent to 87.5 per cent, with an average of 66 per cent. The production of certified eggs of a good variety and the maintenance of a proper supply of mulberry constitute without doubt the most important practical problems of the silk industry.

The work we are doing in this connection will be discussed as follows:

Mulberry Production.—Quantity production of mulberry has been undertaken at the rate of 100,000 grafted plants the first year and 150,000 plants the second year, etc., a working capital of $1,200 and $1,500 being provided respectively for the first and second years by the International Committee. Thereafter the work will be self sustaining. The purpose is to produce good plants from productive varieties, supply them to the farmers at cost, and stimulate greater mulberry planting. Part of the agreement entered into with the International Committee is as follows:

1. That the University of Nanking proceed at once to produce 100,000 grafted mulberry trees for sale and distribution in the spring of 1921.

2. That the University take steps to produce 150,000 grafted mulberry trees for sale and distribution in 1922.

3. That the amount of production for 1923 be determined by the experience gained in the management and sale of the 1921 crop.

4. That the International Committee and the University of Nanking shall co-operate in the distribution of these trees.

5. That the trees shall be raised as economically as possible, and sold at cost price, in order to encourage mulberry plantations.

6. That the International Committee furnish the University of Nanking the necessary capital, which, on the basis of the estimates given below, would be $1,200 for the first year and $1,500 for the second year, payments to be made as follows:—$600 March 1, 1919; $600 November 1, 1919; $750 March 1, 1920; $750 November 1, 1920.

7. That after the second year, the returns from sale of trees shall be used as capital to carry on the work of succeeding years, it being understood that, if additional initial capital is required to produce quantities greater than in the first and second years, such capital will be furnished by the International Committee, if the University desires them to do so.

8. That the University of Nanking carry on the work as efficiently as possible, but that the International Committee guarantee them against losses which are beyond their control, such as losses due to drought, etc.

9. That the following estimates be accepted as the initial working basis:

Estimate of cost of quantity production of mulberry per mou of land (66' x 100'), 3,200 mulberry trees per mou.

Production of seedling, 30c. per 1,000	$1.00
Cost of transplanting, 50c. per 1,000	1.60
Cultivation first year	2.00
Fertilizers (both first and second years)	2.00
Grafting, 40c. per day, 250 trees per day	3.20
Cultivation second year	2.00
Digging, packing, distribution, $1.00 per 1,000	3.20
Rent of land	3.00
Overhead, $6.00 per 1,000	19.20
Total per mou.	$37.20

Cost per 1,000 trees, approximately $12.00.

(The market price of mulberry trees is ordinarily from $25.00 to $60.00 per 1,000, depending on size, age, and quality.)

Mulberry Experiment.—Experiments are being carried on in the production of mulberry by cuttings. This method, while common in the West, is unknown and certainly unused in China. The present outlook leads us to believe we have succeeded in adapting methods to Chinese use which will mean the saving of one and one-half years in time, and considerable in cost, in mulberry production. Experiments are also being carried on in pruning, fertilizing, grafting, culture, etc.

Mulberry Collection.— During the past two years, 1918, 1919, extensive collections of native, grafted, and ungrafted mulberry have been made, with the view to careful study and selection of most desirable varieties for propagation. Collections have already been made in Chekiang, Kiangsu, Kiangsi, and Hupeh provinces, and the provincial collections will be continued. Foreign collections are being arranged for from Japan, India, Italy, France, and the United States, looking forward not only to one of the biggest collections in China, as it already probably is, but to one of the best in the world. The experimental and practical value of such a collection is evident.

Mulberry Orchard.—This spring, at its own expense, the University set out a mulberry orchard of over 30 mou (between five and six English acres), 6,500 trees, capable of producing sufficient leaves for the production of about fifty piculs of cocoons. In addition to this, the leaves of eleven mou (about two acres) of mulberry, comprising the collection referred to above, will be available, making our leaf capacity sufficient to raise about sixty-five piculs of cocoons. The mulberry orchard will also furnish cuttings for propagation work. We can thus supply our own leaves in large quantities, of good quality, at a low price, and be independent of market supply.

Production of Certified Silk-worm Eggs.—Arrangements had been most satisfactorily concluded with the International Committee whereby we would undertake the commercial production of silk worm seed according to the Pasteur method. For this purpose two adjoining Chinese houses, belonging to the University, were thoroughly over-hauled, and well adapted to the raising of about eight piculs (one picul equals 133 pounds) of cocoons. Seed was furnished by the International Committee, and rearing was well under way when the south building, in some as yet unknown manner, caught fire and was destroyed. The crop was also destroyed. It was too late in the season to secure another supply of seed, though a small quantity of small worms was sent up by the International Committee from one of their stations. The accident was most unfortunate, as every care was being taken to bring the crop through in the best of condition. This loss made it impossible for us to carry out our original plans for egg production this year. The burned house, however, has been rebuilt, and we are planning to go forward again next spring.

The present quarters are only temporary, and we need a good sericultural building that will accommodate the production of silk worm eggs from at least fifty piculs of cocoons. This is one of the most important things we have undertaken, and one that we must develop as far as possible. With our large, self-controlled, mulberry orchard to furnish, in a few years, an abundant supply of mulberry leaves, with our general equipment, ease in securing satisfactory workers both skilled (for microscopic work in testing moths) and unskilled, I feel confident of our being able to make this work successful in every way.

Sericultural Investigations. — Investigations are being carried on along the following lines. The first is utilization of the autumn crop of mulberry leaves, which in every respect is as good as the spring crop. There seems to be a tradition

that the crop should not be used, but from a scientific standpoint there is no objection to using it. If the worms were started about September first, the heavy feeding would come toward the end of the month, soon after which time the leaf has finished functioning. The value of the silk secured should greatly offset any possible deterioration of the mulberry. The matter needs demonstration. In addition breeding work is being conducted in the effort to combine the hardiness and quality of the native stock with the greater production of the foreign stock. Selection is also being undertaken for the elimination of certain undesirable qualities in several species that give high silk production but of inferior grade.

Short Course in Sericulture.—A three months' course in sericulture has been instituted as part of our regular work. Practical work is emphasized, supplemented by lectures, reading, and laboratory exercises. The cultural work includes rearing of both spring and summer crops. A special study is made of breeding, particularly of selection, and of diseases. Much time is spent on examination of moths for the presence of pebrine so as to make the students fully competent to produce certified seed according to the Pasteur method.

This year's course lasted from April tenth to July tenth, having been interrupted by the student strike. It speaks well for Mr. Ts'ien, however, to note that he was able to hold the class of twenty-six together to complete the work. Twenty-four were granted certificates. The youngest student was sixteen years old, the oldest student forty-six, and the average age twenty-four years. Eight of the eighteen provinces were represented: Shantung with eight students, Kiangsi with five, Anhwei and Shansi with three each, Hunan and Kiangsu with two each, and Hupeh and Chekiang with one each. About seventy per cent of the students were sent by agricultural associations, about twenty per cent by officials, and the rest were private students. Three excellent students were sent by Governor Yen Shi-shan of Shansi.

Short Course in Sericulture. Left hand side, top, students receiving their mulberry leaves; Middle, changing the silk worms on to clean paper and leaves; Bottom, removing the finished cocoons from the "mountain." Right hand side, top, specimens of "Dragon Snout" variety of silk worm; Bottom, rearing room with frames and baskets.

Faculty and Students of the first Short Course in Sericulture.
For details of the short course see page 8.

A Group of Junior and Senior College of Agriculture and Forestry Students, and Faculty.

The general ability of the students was much above that of the previous year. We advertised the fact that no more than thirty students would be accepted in the course. There were forty applicants of whom only twenty-six were accepted. All had had some previous sericultural experience, which made it possible to do a much better and higher grade of work.

The expenses for the course were $19 for the three months, allotted as follows: board $15, registration $2, and laboratory fees $2.

We need not only for our short course in sericulture but also for other short courses that are contemplated, such as forest nursery work, canning, etc., dormitory facilities for about sixty students. When we get our sericultural building mentioned above, it should be built with a story and a half fitted up for dormitory purposes.

Extension Work in Sericulture.—This is a promising field of work and as yet practically untried. Cultural practices, particularly with reference to light, temperature, and sanitation, in the country districts, are in need of improvement. Extension work by lectures and demonstrations seem to offer the only means for bringing about the necessary changes. We should undertake work along this line as soon as possible.

Cotton Improvement.

The development of the cotton industry is one of the most outstanding industrial developments in China to-day, and with this interest in cotton manufactures, there is no less interest in the improvement and extension of cotton culture. There is a particularly keen interest in the introduction of "foreign" cotton, mostly from the United States. It would not be overstating the situation to say that China is having a "foreign cotton culture craze," which, while having several advantages, is certainly fraught with dire consequences to the future culture of foreign varieties in China, if the matter is

not intelligently and effectively handled, as will be pointed out later.

According to reliable data, China ranks third in the production of raw cotton, with almost 2,000,000 bales of 500 pounds each. This year the area in cotton was increased thirty per cent, due largely to the high prices paid for cotton in the past several years, and the better profits offered to the farmer by planting cotton. The latest figures show a total of 1,401,566 spindles in operation thoughout China at the present time, with 250,000 under construction and 250,000 more contracted for. Thus is shown the actual interest in both cotton industry and culture, and the importance and necessity of increasing raw production.

The cotton work carried on so far by the College of Agriculture and Forestry has had to do mostly with the trying out of foreign varieties. The result of our own work and that of others working independently show fairly conclusively that certain foreign varieties can be grown successfully in China. The problem now so far as foreign cotton is concerned —and it is a national problem—is to learn (it can be done only by careful and rather extensive experimentation) what variety is best adapted to a certain section of country, and then to produce seeds for distribution to the farmers. The production of such seeds will require from three to six years of careful selection, and should be carried on only by well-trained men. The necessity for the selection of only one variety for a region is due to the fact that where two or more varieties of cotton are grown in proximity to each other crossing occurs and deterioration of the product invariably results. This has already happened to the Chinese varieties, and the problem here involves the production of pure strains, and then keeping them pure, which will be exceedingly difficult in general practice, except where the farmers of a large community can be persuaded or forced to replace their impure varieties with selected seed. A hopeful feature of the

whole problem is that Chinese and foreign cotton do not cross, so that pure strains of foreign cotton can be introduced into sections where the Chinese cotton is impure without causing deterioration in the former. The production of pure seed from good varieties, either foreign or native, and keeping it pure in the general field constitute the biggest cultural problems in connection with cotton production. There is probably none or at best very little pure foreign cotton seed in China to-day. The method of foreign introductions must all be revised.

In order to determine what foreign varieties of cotton were best adapted to different sections of China, a big co-operative experiment was organized this last spring, with pure seeds of standard test sets issued by the United States Department of Agriculture, and forwarded to us through the kindness of Mr. Julean Arnold, United States Commercial Attaché at Peking. The experiment included eight provinces and twenty-five locations. These stations will be visited this fall, selections will be made for planting next year, and the work continued until some one variety shows superiority and proves to be worth cultivating extensively. All varieties, including the best one, which after the first year are no longer pure will be discarded, and pure seed from the original source of the good variety imported. The seed of this must be kept pure, selected, and increased, until general distribution is practicable. This is a rather long process, but necessary, if any regard at all is given to the future successful growing of foreign staples in China.

This cotton improvement work is being supported by the Cotton Mill Owners' Association of China and the Shanghai Cotton Anti-Adulteration Association, who are providing the salary and expenses of Mr. J. B. Griffing, and by the Chinese Cotton Mill Owners' Association, who are covering the expenses of our cotton experiment station. The following letters will show our relation with these organizations :—

Chinese Cotton Mill Owners' Association,
24 Hankow Road.
Shanghai, China.
April 12, 1919.

DEAR Mr. REISNER:—

The Cotton Mill Owners' Association has decided to ask you to establish a cotton experiment station in Nanking. The Association will pay $600 annually to cover all the expenses in the station. If it is not enough, please let us know and we will consider it at our general meeting.

The Association also wishes to ask you to recommend a graduate of your College to be stationed at Shanghai as Secretary of the Cotton Improvement Committee of the Association, in order to facilitate us in getting into close touch with you.

Yours sincerely,
Chinese Cotton Mill Owners' Association.
Per WANG SUNG MING.

The Cotton Mill Owners' Association of China.
Shanghai,
27th May, 1919.

DEAR Mr. REISNER:—

I am in receipt of your letter of 22nd instant, together with enclosures, for which I thank you.

At a committee meeting of this Association held to-day, it was decided to guarantee the sum of Mex. $2,000 per annum for three years for the purpose of securing the services of Mr. John B. Griffing, whose application and credentials you enclosed, to work in conjunction with you on the improvement of cotton and who will be attached to the University of Nanking. The Shanghai Cotton Anti-Adulteration Association has agreed to guarantee a similar amount for the same period.

We shall require a list of expenses when the expert arrives and this will be placed before the two Associations.

I trust that you will be able to arrange matters satisfactorily and that success will attend these efforts.

Yours sincerely,
JAMES KERFOOT.

Mr. J. B. Griffing comes highly recommended by Mr. Walter K. Swingle of the Bureau of Plant Industry, United States Department of Agriculture. He will arrive in China this fall, in time to join Mr. O. F. Cook, cotton expert of the United States Department of Agriculture, and party on an extensive trip covering the important cotton districts.

Visit of Mr. O. F. Cook to China.—In this same connection must be noted the arrival in China, on August tenth, of Mr. O. F. Cook and Mr. H. F. Loomis, assistant, from the United States Department of Agriculture, Office of Crop Acclimatization. Mr. Cook is without doubt the highest authority on cotton in the world and it is a very great privilege to have him here with us. A two months' itinerary is being arranged by the writer that will take him through the most important cotton growing centers in China. It is our hope that by his observations and suggestions the cotton cultural problems of China may be seen more clearly, and that plans may be worked out for their solution.

Field Crops Improvement Work.

1. *Corn.*—Improvement of native corn by pedigree selection has been carried on for four years with good results. Seed for distribution to farmers next spring is being produced this year. Reports from selected seed corn sent into Honan Province last year state that it was far superior to the native corn. Some work has been done in acclimatizing one of the large yellow dent varieties of corn from the United States. Results have been poor until this year, when the prospects for a good crop are the best we have had. Corn is one of the more important local fall crops.

2. *Rice.*—Lack of good rice lands greatly hinder this work. Selection work has now been carried on for four years with about seventy-five varieties of lowland rice. Because of its first importance as a food crop, this work should be greatly extended.

3. *Wheat.*—Promise of financial help in carrying on this work has been given by the Chinese Flour Mill Owners' Association. Variety yield tests are being carried on with about 100 native and foreign varieties of wheat. Last year co-operative variety tests were carried on with fifteen co-operators in five provinces. It is still too early to judge of

results, variation in yield being very marked between the best and poorest. No introduced variety has given as good results as the best native variety. The improvement of wheat culture is important in view of the increased demand on the part of a rapidly growing flour industry, and the probable effect on the food supply if China continues to increase the area in cotton.

4. *Fruits.*—Considerable experimental work has been done with both native and introduced fruits. This season's harvest has shown the adaptability of at least one variety each of foreign peach and apricot to our conditions here. There has been a splendid crop of grapes, and several new varieties are being added to the list recommended adapted to Chinese conditions. In all about 100 varieties of fruits are under observation and experimentation. Dr. Macklin is largely responsible for the large collection of grapes and native peaches.

Agricultural Gardens.

This is the organization under which all our field work is carried on and products sold. These products include nursery stock, foreign vegetables, fruits, flowers, and tree, flower, and vegetable seeds. The total sales last year were $4,100.00 compared with $2,389.87 for 1917-1918. Nursery stock and seed sales for February and March were over $2,500.00. Some daily shipments were consigned to ten of the eighteen major provinces. The results appear to be most satisfactory. Several items need special attention.

1. *Seed sales and distribution.*—This past year, in addition to the sale of more than $1,200 worth of foreign vegetable seeds, about 200 pounds of Chinese cabbage seed, which had been improved by selection, was exported to the United States. This year we are raising one ton of the seed with full confidence of securing a ready market. Tree seeds were also exported to the value of about $100 gold. Forward orders have already been taken for more than this amount and we

hope to develop it into a profitable and big business. Tree seeds were supplied (sold) at cost price for forty nurseries—thirty-one to district magistrates, agricultural societies, or Chinese individuals, and nine to foreigners, mostly for school nurseries. This year we are making preparation for a three-fold increase.

2. *Field Houses.*—During the year a field house 25×80 feet has been added, open on the south side, with a cement floor covering one half, and the other half bricked. This supplies us with a place for rainy day work, and for cleaning and temporary storage of seeds, packing, etc. A green house 20×50 has been constructed entirely of Chinese materials, including glass, but is not entirely satisfactory. A few minor changes will be necessary this fall. A glass-roofed room about 25×50 has been added to the south side of the old field house, thus giving us our 2,000 square feet under glass, which will be sufficient until we move to permanent quarters. Other minor improvements have been made. No more new buildings will be necessary if we can move to our permanent site in a reasonable time.

3. *Labor.*—Since February we have averaged about thirty permanent laborers, and hope to keep them "permanent," so that we shall be able to train them into something more than mere coolies. With our developing field work, including mulberry, field crops, and seeds, greater intelligence and training are becoming more necessary. To illustrate, next spring there will be at least 100,000 trees to be grafted and only trained men can do it. We must not only train but keep men after they have been trained. A scale of higher salaries has been instituted, and the laborers are required to keep a savings account in the University Savings Bank (Shanghai Commercial Savings Bank), to which idea and practice they take very well. Already about twenty accounts have been opened, from the foreman down. A generous system of housing and some land for a garden about each house must be

incorporated into the plans for our permanent farm. In addition to the thirty regular laborers, day laborers up to fifty have frequently to be added during busy seasons. Our monthly labor bill has been averaging between $250 and $300 per month.

4. *Educational Value of Agricultural Gardens.* — As stated in several of my previous reports, the Agricultural Gardens were organized "to provide an opportunity to our students for field work and to maintain from its proceeds, utilizing student labor, an agricultural industrial school for country boys whose education would of necessity be limited to the lower grades. The first object has not been achieved in the measure that it might, and the second, not at all. Nor do I see how we can get the full educational value out of our practical work until we have a trained foreigner here giving full time to it. Our labor bill this last year was almost $2,500, representing about 10,000 days of labor, which with the organization of the industrial school could go toward students' support and their education." In the last year several profitable enterprises—e.g., seeds—have been developed, which, with other lines that could be developed, would make the institution quite self-supporting. For our permanent farm, particularly, the right man must be found to develop one of the best things the University will find itself some day doing.

Forest Nurseries.

The forest nurseries comprise about forty mou, forty-four species, mostly native, over 700,000 seedlings and trees, with estimated value of between $3,000 and $3,500. This season has been rather unfavorable, and the nurseries are not so good as last year. The number of seedlings, however, is about the same, and their money value somewhat greater. About $2,000 was realized from the sale of nursery stock last year.

Missionary Interest in Agricultural Work.

The increasing interest in agricultural work on the part of missionaries, missions, and missionary organizations has been one of the most encouraging developments of the past year. Public opinion is fast becoming crystalized with reference to its value as an adjunct to our evangelistic and educational work. It is being realized more and more clearly that in agriculture we have the logical means for making a very large share of missionary education fit for life, which now in large measure "unfits" the student to take up what would naturally be his place in life—on the farm. Chinese agriculture stands condemned and as a failure from the standpoint of the "human product" which 4,000 years of it have given to society. It needs new life — a new outlook — a Christian spirit; and this should appeal to the church as a worthy task. Our educational work can help bring about this new day for the Chinese farmer—80 to 85 per cent of China's 400,000,000 people—and the missionaries are beginning to realize it.

Some of the outward signs of this interest are the prominent place on the programs of the annual meetings of the Shantung-Honan Christian Educational Association and of the East China Educational Association which were given to papers and discussions on the place of agricultural work in mission middle and primary schools. During the summer an agricultural conference was held on Kikungshan, and one of the regular sessions of the Kuling Annual Summer Conference was given over to the presentation and discussion of agricultural work. Articles on agricultural educational work appeared in *The Chinese Recorder*, *The Educational Review*, and *Millard's Review*. At the last Honan-Shantung Educational Association meeting and at the Central China Educational Association meeting definite action was taken regarding agricultural work. The Kiangan Mission of the Presbyterian Church North also took definite action.

The action at the meeting of the Honan-Shantung Educational Association was as follows:

Resolved, that the Association give the Agricultural Committee of the Association the following powers:

1. To write the various boards and missions supporting the College of Agriculture at Nanking as follows:

"The Honan-Shantung Educational Association hereby expresses a desire that the College of Agriculture at Nanking be better staffed and equipped, and we hope that those concerned will take the matter up and provide support whereby the College may be able to fill the big need of trained Christian teachers and assistants for agricultural missionary work."

2. To inform the various boards and missions that it is the conviction of the Honan-Shantung Educational Association that the great need for agricultural missionaries is, *at present*, in such centres as the College of Agriculture at Nanking.

3. To write the Foreign Missions Conference of North America as follows:

"It is the desire and hope of the Honan-Shantung Educational Association that the Foreign Missions Conference of North America will reconsider Dr. Kenyon L. Butterfield's invitation to hold a conference on Agricultural Missions."

4. To write a carefully-worded letter asking the various missions in China to consider the question of Agricultural Missionary Work at their next meeting.

The following actions were passed in May by the Kiangan Mission of the Presbyterian Church North at their annual meeting :—

That the Kiangan Mission place on record its conviction that agricultural work has an important place to fill in connection with evangelistic and mission work, and heartily recommend it to the serious consideration of other missions.

We would further state that as a result of several years experience with agriculture work in the Kiangan Mission, we believe the most promising method at the present time to develop this work is the strengthening of the College of Agriculture and Forestry of the University of Nanking in order to train Chinese Christian teachers and assistants for carrying on the work.

Therefore we would ask that the Board act favorably on the request which will be made by the University of Nanking Board of Managers asking that our quota of four men for the University of Nanking be increased to five, the fifth man to be a permanent member of the College of Agriculture and Forestry.

The Kiangan Mission at the same meeting voted the following resolutions to the Post War Conference:

VII. In regard to the question of industrial work, we recommend that emphasis be placed on the importance of distinguishing between industrial and agricultural work.

We would also recommend the importance of emphasising agricultural work in our missionary enterprise:

(1) because of its great educational value;

(2) because it is easily introduced into lower and higher primary schools in the form of school gardening and nature study, and as elementary agriculture in higher primary or middle schools, where it can have a large influence on the rural population of China; and

(3) because it is a less expeusive form of training and can be utilized in both the evangelistic and educational side of our work.

Mission industrial work is greatly needed when it contributes (*a*) to the development of new industries which are likely to become indigenous to China, or (*b*) to the improvement of old industries. Industrial chemistry, such as is being introduced by Mr. Speers of India and by Mr. Thomson at the University of Nanking, is to be recommended rather than industries of the sweat-shop type.

VIII. In regard to the question (I) (*a*) "What more can be done to reach distinct classes of the population and to unify these in the Church," we would suggest that steps be taken to meet the needs of the farmers of China, who represent some 80 or 85% of the population of this country, by agricultural missions.

At its annual meeting held in August, the Central China Christian Educational Association passed the following resolution:

"That the Association ask the China Christian Educational Association to appoint a committee on agricultural education to consider, in consultation with the provincial associations, the development, in a few suitable centers, of agricultural courses in schools of middle and normal grades, with a view in the first instance to the providing of teachers of agriculture in the primary schools."

A great many inquiries for trained assistants have been received from missionaries who want to get agricultural work started. The actions noted above show what the University's relation to this movement is expected to be. Considerable permanent reinforcements to the teaching staff are imperative, if we are to do this training work which we should and will do.

It is noted with great satisfaction that the Presbyterian Board at home has already approved the action passed by the Kiangan Mission noted above, and that the Methodist Episcopal Board North and the Foreign Christian Missionary Society have approved of the additional man for agriculture.

$5,000 Loan Fund for Forestry Scholarship.

On June second, the Forestry Fund Committee of Shanghai made a grant of $1,000 per annum for five years, beginning September 1919, to be used as a loan fund for forestry scholarships. Students benefiting from this fund will repay their annual loans successively beginning with the first year out of college. In this way the loan fund becomes self-perpetuating.

Organization of Agricultural Experiment Station.

Last fall the Executive Committee of the Board of Managers approved the organization of an Experiment Station, as recommended in the following letter from Professor Woodworth. The letter sets forth very clearly the desirability of such an organization, and needs no comments. The largest share of our work falls within the usual sphere of experiment station activities, so that such an organization should make its administration easier. Up to the present we have not differentiated between the work of the College of Agriculture and Forestry and the Experiment Station, but it is desirable to do so. Professor Woodworth's letter follows :—

November 5, 1918.

J. H. REISNER,
Dean of the College of Agriculture and Forestry,
University of Nanking,
Nanking.

My Dear Sir :—

I desire to urge the following development of the organization of the College of Agriculture and Forestry.

1st. That you organize an experiment station staff with yourself as Director and such members of the faculty of the College of Agriculture

Two Chinese and two foreign plows used in a plow demonstration on the College of Agriculture and Forestry farm. The verdict was strongly in favor of the foreign plows.

Lecturing to the crowd who had come to see the demonstration of one-handled foreign plows, that could plow deeper, and were of much better construction than the Chinese plow.

The foreign and Chinese plows being compared in plow demonstration, The "Kentucky Pony" plow in the foreground was ploughing eight inches deep as against five inches with the Chinese plow in the backgronnd.

and Forestry as may be engaged in research work, each with a title to indicate the character of the work in hand, as Horticulturist, Entomologist, Chemist, etc.

2nd. That all publications issued by the University giving the results of such work be issued under the title "Report" or "Bulletin" of the Agricultural Experiment Station of the University of Nanking.

3rd. That each publication include title page with a résumé of the contents, in English, and that these bulletins and reports be sent as exchanges to similar experiment stations in all parts of the world. This can be done without postage through the Smithsonian Institution.

These suggestions are made for the purpose (*a*) that the scientific work done shall receive recognition among scientific men and (*b*) that the library may receive regularly the publications from all parts of the world devoted to agricultural research, and (*c*) that this organization may bring your agricultural work into conformity with other similar institutions in the United States and other parts of the world.

Yours sincerely,

C. W. WOODWORTH.

Land for Permanent Farm and Experiment Station.

One of the most hopeful experiences of the year was the purchase by the University of the "Ying" property of 126 mou (twenty-one English acres) located to the northwest of and adjoining our present Kuleo property. The 126 mou are composed of separated fields, but the land for the most part is good. The cost was $9,000.00 or $70.00 per mou, the cheapest land bought by the University for some time. A total of at least 1,000 mou, in the general location of the Ying land, will be required for the farm and experiment station. It is an ideal location, the land is not expensive, and is well adapted to the various purposes it will be needed for. Thirty mou have already been planted in mulberry orchards, and the balance is being cultivated by us. No permanent buildings (unless it be a sericultural building) will be put up before more land has been acquired.

In the meantime we continue to use the vacant university lands, and, in addition, this spring took over the new Ginling College lands until that college is ready to build. Altogether about 400 mou are under cultivation. The fact that this land is comprised of twenty-six distinct pieces, surrounded

or traversed by twenty-nine public or semi-public roads, and extends one and a half miles extreme north and south, and one half mile east and west, will give some idea of the difficulty of administration of our field work, and the desirability of having our land all in one piece, where it can be properly laid out, roads built, and improvements developed according to plan.

Co-operation with Governor Yen Shi-shan of Shansi.

Governor Yen is distinguished by being one of the most progressive and hard working officials in China. He is but thirty-six years old and is the only Military or Civil Governor who has held office consecutively since the 1911 Revolution. He became interested in the College of Agriculture and Forestry through friends in Taiyuenfu, Mr. F. A. Nixon, Postal Commissioner, and Mr. H. R. Williams, Y. M. C. A. Secretary. After determining to send students to us for training in agriculture and forestry, he opened a special department in Shansi University where they could be prepared for entrance along with students being prepared for the Union Medical College, Peking. In April he sent three students for the short course in sericulture. In July the writer went to Taiyuenfu to give the entrance examinations to the students he desired to send to us. Twenty-one took the examinations—eighteen were accepted for Junior College. In addition, he desires to employ two of this year's forestry graduates—we can probably send him but one.

In appreciation of the work being done by the College of Agriculture and Forestry, Governor Yen made a personal contribution to the University of $10,000, $2,000 being payable each year for five years.

Government Co-operation.

It is encouraging to note that in all cases when provincial forestry scholarships have become vacant through graduation this year, other students have been appointed to them. This

applies to the five scholarships maintained by Anhwei Province, and three scholarships maintained by Shantung Province. Kiangsi still continues its one scholarship in agriculture. The statements made in my report last year regarding our relations with the Peking Government still hold good, namely that of the original $9,000 promised in 1915 only $4,000 has been received. Part of the student fees which they assumed in their contract is also unpaid. The University has continued to fulfil its part of the contract with the Central Government so far as the students are concerned. Any large increase in Government co-operation is difficult, owing to extreme political uncertainty. The new relations we have established with the Governor of Shansi as noted above stand in happy relief against the general political background. Notice has just come that the Governor of Kansu, China's distant north-western province, is sending two students for forestry. About ninety per cent of the short course students in sericulture had minor official or semi official connections, and through our forest nursery and seed work we are coming into contact with an increasing number of district and other minor officials.

Forestry Fund Committee.

In addition to the grant of $5,000 per annum for the support of teachers for three years, the Forestry Fund Committee, holding in trust unused funds from the famine of 1913, in response to requests by us, made the following grants, as noted in their letter of June second.

Loan fund	$5,000
Scholarship for Mr. Li	3,750
Continuation of present scholarships... ...	840
	$9,590

The loan fund for scholarship was referred to above. The scholarship was granted to Mr. Li Shwen-ch'ing, one of this year's graduating forestry students, for three years graduate work at the Yale Forestry School.

Colonization.

In following out the excellent precedents established in previous years, I am including, in this report mention of the early colonization schemes at Lai-an-hsien and Purple Mountain, out of which the College of Agriculture and Forestry grew. In the Rev. Charles Best's annual report on the Laian colony, he says that the colonists have had a good year and on the whole continue to prosper. Some progress has been made with the forest nursery and a considerable number of trees have been set out on their own land by the colonists. Because of local objections to the securing of more land, the Laian colony is probably as large as it can become. There are eight-three families on the land.

The Purple Mountain colonization work has largely developed into a reforestation project. Last year 700,000 pine seedlings were planted on the mountain with good results. The mountain is beginning to show millions of green trees all over it, and with its favorable location along the Shanghai Nanking Railway, where it is seen by hundreds of passengers daily, Purple Mountain will, as the trees grow larger, become increasingly important as a practical demonstration of what can be done with many thousands of mountains similar to it.

Needs in Men, Land, and Buildings.

I. *Our biggest need is for men.* It has been for five years. Considerable permanent relief seems to be in sight as a result of the action of the Board of Trustees meeting in New York in June, as follows:

> President Bowen's appeal for an additional man from each of the co-operating Boards upon the staff of the University for the Agriculture and Forestry Departments was read, and after full discussion of the developments in these departments and the extraordinary opportunity open to the University in this line, it was voted to direct the Chairman and Mr. Williams to formulate a statement and recommendations for presentation to the co-operating Boards that they appoint an additional man for these departments.

The Presbyterian Foreign Mission Board, as noted above, immediately approved the action of the Kiangan Mission (see page 18). The Foreign Christian Mission Society, as part of their regular university quota, are sending out a married couple for agriculture. It is hoped that not only the present co-operating missions in the University will increase their university quota by one man for agriculture, but that other missionary societies with work in China will join in on agriculture. Statements quoted above make clear the important place Nanking holds in the development of agricultural work in the missions, and to fill this place, an adequate teaching staff is necessary. The statement prepared and sent to President Bowen on May sixth, with the exceptions noted above, still holds true and I think is worth while including at this point.

"There are now five teachers giving full time to the College of Agriculture and Forestry, three returned students from America and two foreigners. Mr. D. Y. Lin and Mr. Sample are responsible for forestry; Mr. Ts'ien, Mr. Sie, and I for agriculture. Mr. Ts'ien from now on will be devoting practically his whole time to sericulture, which means that he is not available for regular teaching work. It should be noted that all expenses connected with our sericultural work are furnished by the International Committee for the Improvement of Sericulture in China. Mr. Sie is President of the University Alumni Association, and that, with the big undertaking for raising funds which the alumni have assumed, and Mr. Sie's relation to it, means, to all practical intents and purposes and with the full approval and encouragement of the University, that no small share of his time and energy must be taken from his agricultural work. My own time is being divided among administration, field, and experimental work, and during the past term I have not been able to teach. I desire in this connection to point out that not only has our field work been entirely self-supporting, but it is because of the work already accomplished along this line that we have

been able to approach cotton interests, wheat interests, the International Sericultural Committee in mulberry experiment and production, and to develop practical interest in forestry among an increasing number of Chinese, as, for example, by supplying this last spring tree seeds for over thirty nurseries which are being undertaken by them. Without our practical work, we would be a book department pure and simple. In the extension of this work we shall find our most important developments and make our greatest contribution to China, at the same time proving of greatest help to the missionaries who are in increasing numbers becoming interested in agriculture as part of their own work, looking to us for leadership and help.

"I have gone into the above in some detail because of the criticism which might arise that three men ought to be able to do the teaching necessary. I think I have shown conclusively the utter impossibility of this under present conditions, with three classes in Senior College and a number of subjects in Junior College to be taught. Moreover we do not want those who are teachers alone, who can only transmit what they were taught, but those who can influence agricultural conditions through the medium of our practical and experimental work. This means that the men whom we should secure should be men who have taken graduate work and, preferably, who have had practical experience in some of the larger agricultural institutions in the States.

"I feel sure we can secure more and more help, financial and otherwise, from the Chinese as we develop, but we can not look to them to establish the basic part of our work from which we can expand. With an adequate 'basis in men and preliminary equipment' (G. $1,000 would probably more than cover our investment in permanent equipment, including buildings, for the College of Agriculture and Forestry since we started in 1914), we can look to them for the 'expansion.' Moreover the missionaries are becoming

interested and want to start agricultural work in connection with their schools. For this, nature study, school gardening, club work must be organized, together with the training of teachers, which will require summer schools, and the introduction of agricultural work into our own lower grades, including a course of study in the normal course of the Middle Schools It is a narrow and wrong conception of our work to consider that it relates only and directly to Chinese agriculture; our most important contribution will be to make the work of Christian missions more effective in becoming a part of the every-day life of the people, a need which they see and are beginning to understand.

"The salary of not a single man in the College of Agriculture and Forestry is being paid by the co-operating Missions. There is not a salary of a single man in the department guaranteed for over two years. We are living from hand to mouth. What permanence we have as a department depends on the University, not on the co-operating Mission Boards. All salaries for our teachers, with the exception of Mex. $2,400, are secured from funds *outside* the University. All but G. $600 come from China. The $2,400 in salary paid by the University is considerably offset by tuition received from agricultural and forestry students. The argument will be advanced, and it is not without merit, that the University is furnishing class rooms, heat, houses (one house only), administration, etc., for which the College of Agriculture and Forestry does not pay. I would point out in answer, that the University could not at the present time get along with a single building, room, or teacher less without the College of Agriculture and Forestry than they now have. It might be somewhat presumptuous to say that so far as the University is concerned, the College of Agriculture and Forestry is straight gain. It certainly can't be considered a very heavy liability, and I think the general attitude is that it is considerable of an asset. It is pressing that responsibility

be assumed for the following men as a minimum permanent working basis in addition to those on the staff at the present time :

"1. A man to direct field work. He should have wide, practical training, with agricultural education, and be able to assume responsibility for garden, field, and *nursery* work. A good knowledge of methods and practices of plant propagation is essential.

"2. A man with experience in the improvement of field crops, *especially cotton*. [Mr. J. B. Griffing.] Secured in China, see page 12.

"3. A man with experience in farm engineering, including drainage, and farm machinery. Should be able also to make bricks, build roads, etc., and should be of an inventive turn of mind.

"4. A man in animal husbandry. Special emphasis on *hogs*, *poultry*, *sheep*, *water buffalo*, *cattle*, named in order of importance.

"5. A man with experience in school gardening and nature study, with horticultural and pomological training.

"6. A botanist, able to do research work. Should have had good training in identification work. A knowledge of dendrology would be most useful.

"7. An entomologist, who has *specialized* in economic *entomology*.

"8. A horticulturist with experience in pomological work if not covered by 1 or 5.

"9. A soils expert.

"10. An agricultural chemist.

"11. A man with training in rural economics and farm management.

"3 to 5 are interchangeable in point of need.

"The need for men for forestry I do not consider so pressing as the need for men in agriculture. Mr. Sample and Mr. Lin can handle this work very easily between them for

another year or two, though the sooner the men are secured who will constitute a permanent staff, the better it will be. As for agriculture, the need for men is not alone determined by the number of students or classes, but by the nature of the work to be done. Where obligations for classes and students have to be met, the need becomes more pressing. The majority of our students will graduate in June 1919 or February 1920, but there will be classes from Junior College along, and I feel we may safely look forward to an increasing enrolment. The Forestry Fund Committee, I understand, will continue their scholarships, also Shantung. Anhwei has already sent students in addition to those originally sent, and the Governor of Shansi is sending a number of men. A turn for the better in Chinese politics will make it possible to add to the governments already represented. The removal of the deposit requirement for non-scholarship students, which seems to have been a hindrance in the past, will probably increase the number of voluntary students, which is most desirable. Mr. Lin has already presented a good statement of the needs of forestry teachers, which has been sent to Dr. Williams, Professor Toumey of Yale Forest School, and others, and steps are being taken by Dr. Williams and friends in America to find support for the development of the forestry work. The order of need for new men would be :—

a. Silvics and silviculture
b. Forest products
c. Dendrology
d. Propaganda and extension work
e. Forest management and engineering.

"Mr. Lin is, without doubt, better suited for (*d*), propaganda work, than for any other line of work, but he should be backed up by the practical work of the other teachers. In this connection I desire to point out that forestry in China seems to be developing from the bottom upwards, i.e., by individuals, agricultural societies, district magistrates, prov-

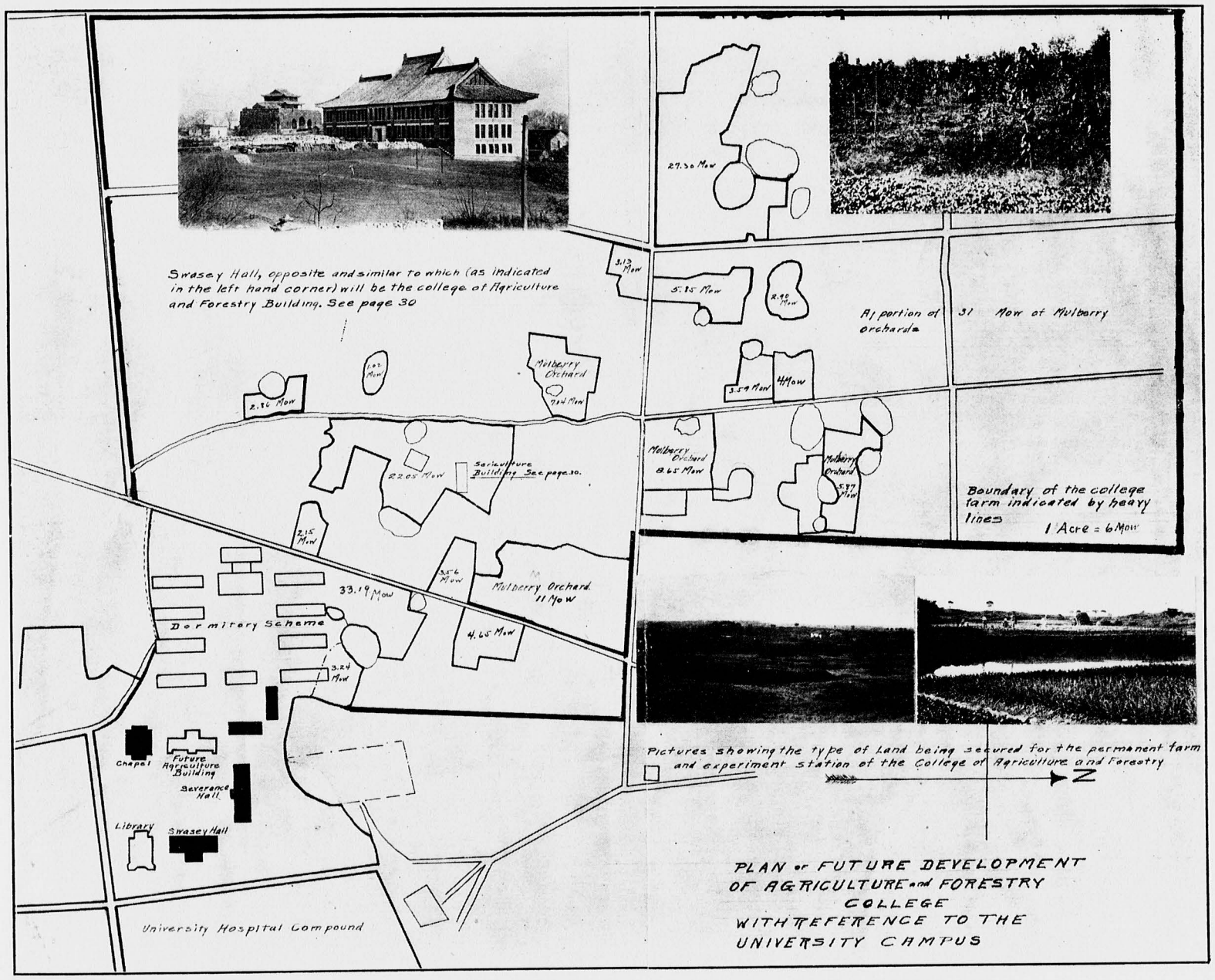
inces, and last and least, by the Central Government. The Kiangsu First Forest Station supplied trees or seeds in the spring of 1919 to 125 magistrates, agricultural societies, companies, or individuals, and the University supplied thirty-four. We sent out, rather late, a small list of seeds and trees, in Chinese, to a number of agricultural societies and magistrates, with most encouraging results. This it must be understood is more closely related to our field work than to teaching and suggests again what I have already mentioned, that not the least of our contribution will be through this part of our activities, and we can't carry them on without an adequate staff any more than we can do our teaching."

II. *Land.*—We need 1,000 mou of land, that will cost approximately $50,000 G. A good start on it has already been made (see "Land" on page 21). An additional $50,000 G. will be needed for fences, roads, drainage, irrigation, laborers' houses, farm buildings, field houses, stock, and machinery.

III. *Building.*—We need a large building corresponding to Swasey Hall, for class rooms, laboratories, and offices, for exclusive use of the College of Agriculture and Forestry. Our present quarters are entirely too crowded, not adapted to our needs, and little relief will be afforded even when Severance Hall is completed and a few more rooms are turned over to us in Swasey. Such a building is provided for in the general lay out of the Kuleo campus and would cost, at present prices of materials and construction, about $85,000 Mexican, including equipment. (See cut.)

We need a sericultural building, that will combine rearing rooms, facilities for producing certified silk worm eggs according to the Pasteur method, and a dormitory for short course students. Such a building, 30 × 100, two and one half stories high will cost about $20,000 Mex.

IV. *Technical Equipment.*—We need G. $5,000 for technical equipment for agriculture and forestry field work and laboratories.



See pages 21 and 30.

Summer School.

We were not able to continue our summer school in agriculture this year, because of lack of teachers. It will be given a prominent place in our work just as soon as adequate provision can be made.

Faculty and Teaching.

Professor Woodworth left us in November, after rendering us very valuable and much appreciated service. His short stay brought with it a number of important innovations which we are trying to make permanent, such as the short course in sericulture, summer school in agriculture, etc., which add greatly to the practical value of our work. But greater than these things was the inspiration he brought to us as a teacher and colleague.

Mr. Sie Chia-shen, B.A. of Nanking 1914, M.S.A. of New York State College of Agriculture 1918, took up his work in the autumn of 1918.

Mr. Ch'en Chen, B.S. 1918, one of our first graduates, was assistant in agriculture during the past year. He was successful in competing for one of the graduate fellowships in the United States offered by Tsinghua College, and has left for graduate work in the New York State College of Agriculture.

Mr. Li Chuin-k'ang, B.S. 1919, one of our own graduates, took up his work on July first as assistant in agriculture.

Mr. Li Tsih-hsing, B.S. 1918, one of our own graduates, will begin work September first as assistant in agricultural chemistry.

Mr. Chao Tsung-ting, B.S. 1918, one of our own graduates, takes up his duties on September first as assistant in agriculture and University Chinese Secretary.

Mr. Li Tai-fang, B.S. 1919, one of our first graduates in forestry, became assistant in forestry on July fifteenth.

Mr. George E. Richey, B.S., Iowa State Agricultural College, is due to arrive in October, as a regular member of the faculty. He comes under the Foreign Christian Missionary Society.

Mr. J. B. Griffing, B.S., Kansas Agricultural College, will arrive in February to take up his work permanently. He makes a preliminary trip this autumn in order to travel with Mr. Cook. His work will be cotton improvement.

With Mr. Ts'ien Tien-ho devoting his time largely to sericultural work, the writer devoting his time to field and experimental work, in addition to administration work, our teaching staff has been greatly weakened, and it is with the greatest difficulty that we are being able to fill out a schedule and give the students the work they should have. Mr. D. Y. Lin and Mr. J. L. Sample can handle the forestry teaching and Mr. Sample has been teaching general botany to agricultural students in addition to his forestry classes. Special note must be made of the excellent assistance being given by our own graduates, more of whom we could use if they were available.

Student Registration and Attendance.

All the old students in the Senior College of Agriculture who were eligible returned for both semesters last year, adding greatly to what was last year, already, an enviable record. During the spring semester forty-two students were registered in the Senior College, seventeen in agriculture and twenty-five in forestry. In Junior College there were twenty-five men in agriculture and five men in forestry, making a total of seventy-two students in both the Junior and Senior Colleges. Twenty-six students were enrolled in the short course in sericulture.

Graduates.

In June 1919 thirteen men graduated in forestry and four in agriculture. Ten more will graduate in forestry in February 1920.

Four of our 1918 graduates have good positions, and are doing well. The other two go to America this fall for graduate work.

Of our 1919 graduates, two in agriculture have good positions, and two will go to United States for graduate work in agriculture. Of the forestry graduates, one has gone to America (Yale Forest School), eight already have excellent positions, mostly in forestry work, the conditions of four are unknown, and we have three positions waiting to be filled. We could place more in both agriculture and forestry if they were available. The question "what will your forestry graduates do" has been answered most satisfactorily. The outlook is, and this applies also to agriculture, that we shall annually be able to place in good, influential positions more students than we shall be graduating.

Mr. Bailie's Resignation.

I do not want to conclude this report without expressing my appreciation of the valuable services which Mr. Bailie has rendered the College of Agriculture and Forestry. I often wonder, who but Mr. Bailie would have pushed its establishment and made its organization a reality? Had he done only this—and he did infinitely more—his work, and the plans he made for the future of the school, would have been eminently worth while. He goes to his new work with our full knowledge and appreciation of what he did for us, and with best wishes to him in his new duties.

Acknowledgments.

I want to take this opportunity to acknowledge my indebtedness to all my colleagues who have shared, so heavily and so well, the year's work. It has been a very deep satisfaction to feel, during my frequent and sometimes prolonged absences, that everything was being so well taken care of and in such good spirit.

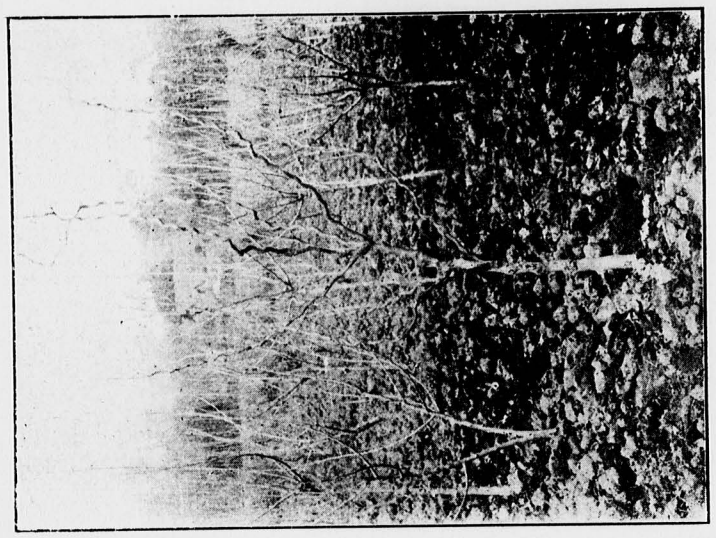
Special acknowledgment is made of the help and encouragement given in the year's work by Mr. C. C. Nieh, Vice-Chairman of the Chinese Cotton Mill Owners' Association; Mr. S. M. Wang, of the Heng Foong Cotton Mill; Mr. T. K. Yung, President of the Chinese Flour Mill Owners' Association; Mr. James Kerfoot, Secretary of the Cotton Mill Owners' Association of China; Mr. A. C. Clear, General Manager of the Shanghai Nanking Railway; Mr. Walter K. Swingle, of the United States Department of Agriculture; and Mr. Julean Arnold, United States Commercial Attaché, American Legation, Peking.

UNIVERSITY OF NANKING BULLETIN

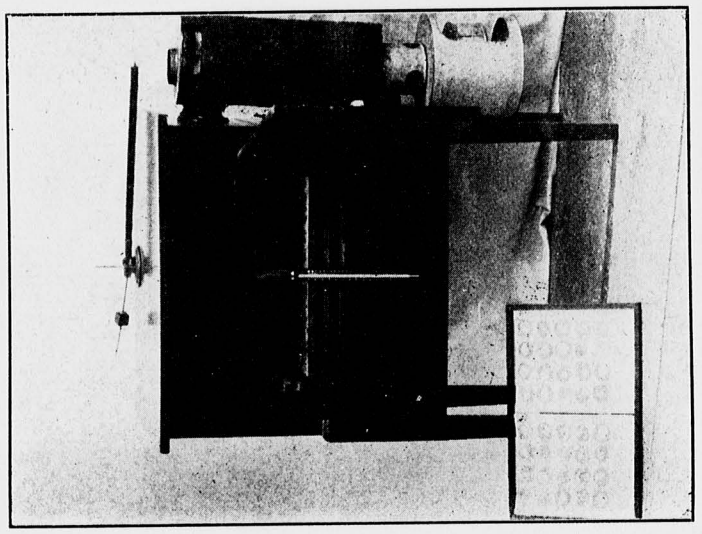
REPORT OF THE COLLEGE OF AGRICULTURE AND FORESTRY

1919-1920

VOLUME FIVE, NUMBER FIVE



A glimpse at the collection of mulberry varieties from different provinces. The tree in the foreground with the spiral branches is known as the "Dragon" mulberry, and is a good variety in addition to being ornamental. Some of the university buildings appear, though the "visibility" is poor, in the distance.



The newly-invented Nanking University silkworm incubator.

Vol. V. UNIVERSITY OF NANKING No. 5.
BULLETIN

REPORT OF THE
COLLEGE OF AGRICULTURE
AND FORESTRY

1919-1920

BY

JOHN H. REISNER, DEAN

SHANGHAI:
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1920

Nanking, 26 June 1920

Dr. J. E. WILLIAMS, *Acting President*,
University of Nanking,
Nanking.

DEAR DOCTOR WILLIAMS:

I take pleasure in submitting herewith a brief report of the work of the College of Agriculture and Forestry during the past year. This report is being written somewhat before the end of the report year, and hence is not wholly complete. The report in the main, however, gives an adequate résumé of the year's work.

Sincerely yours,

JOHN H. REISNER, *Dean*.

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REISNER, JOHN HENRY, B.A. (Yale), M.S.A. (Cornell), Dean of the College of Agriculture and Forestry and Director of the Experiment Station. (On furlough after May 1920.)

BUCK, JOHN LOSSING, B.S. (Cornell), Acting Dean of the College of Agriculture and Forestry (after May 1920); Farm Engineering and Farm Management.

SIE KIA-SHEN, B.A. (Nanking), M.S. (Michigan), Associate Dean of the College of Agriculture and Forestry (after May 1920); Animal Husbandry and Plant Pathology.

CHAO CHUNG-TING, B.S. (Nanking), Associate in Agriculture.

FENG RUI, B.S. (Nanking), Associate in Cotton Improvement (spring semester).

FOLK IM-CHEUNG, B.S. (Michigan), M.S. (Columbia), Chemistry.

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REPORT OF THE DEAN FOR 1919-1920

Sericultural and Mulberry Work

It is impossible to give in my report here a complete account of the sericultural and mulberry work, because of the detail that would be necessary. The time has come when this report should be gotten out separately, setting forth fully the results of our work along these lines. The following, however, will outline briefly the main developments and results of the past year.

Our report to the International Committee for the Improvement of Sericulture, submitted early last December, was approved by them, as well as the enlarged budget asked for the work for the present year. The total amount requested (which has already been received) was $2,820 as against $2,683 for the preceding year. In addition two payments of $600 and $750, total $1,350, have been received as capital on mulberry production. The total capital guaranteed for this purpose was $2,700, all but $750 of which has been paid. In addition to the grants made by the International Committee, the University has invested, in buildings and mulberry orchard, $1,749.56. For our sericultural work, as it should be developed, we should have an annual income of $10,000, to be used on salaries, egg production, extension work, investigations, and publications.

The annual report, illustrated, was published in "Millard's Review," Shanghai, and "The American Silk Journal," New York City.

SERICULTURAL INVESTIGATIONS

Prevalence of Pebrine. Mr. Ts'ien T'ien-ho utilized the opportunity afforded by the short course, to which students had brought eggs from their own districts for their rearing work, to make a study of the prevalence of pebrine. The

results of his investigations with twenty-eight different lots of silkworms from widely separated sections of the country showed an average incidence of disease of sixty-two per cent. This is probably the most reliable and inclusive information that has been secured in China, showing as it does the general prevalence of the disease and suggesting the tremendous problem involved in eradicating it from the industry.

Yield of Silk. The opportunity presented by the short course for gathering information about the relative yields of silk from different varieties of silkworms was taken, with the result that, in twenty-eight different lots, the quantity of silk reeled from two hundred selected cocoons of each variety showed a range of from .93 oz. to 1.99 oz. The best was more than twice as good as the worst, and this indicates the range for improvement which is attainable by careful selection and propagation only of the best.

Silkworm Incubator. Mr. Ts'ien has adapted an American egg incubator for use in hatching silkworm seed. The matter of the temperature regulator has given greatest concern, but tests being made at this writing are sufficiently good to call it successful. There is a big need for such a machine, and active steps will be taken to make it a commercial success, adapted to the need both of schools and of farmers. The present commonly used method of hatching out the seed by rearing the egg card next to the body is undesirable, because of the irregularities of the temperature and poor ventilation.

New Method of Individual Egg Production. There are two commonly used methods of certified egg production, the European and the Japanese, by which individual layings of the moth are obtained, and the individual moths segregated until they can be tested under the microscope. The European method, which has a small paper bag in which the moth is placed to deposit her eggs, and kept until microscopic examination has taken place, is better adapted to present conditions

in China than the Japanese method, but it has the serious objection of making the eggs difficult to handle. The bags must be cut open and pasted on cardboard, or they must be removed from the paper and kept loose. The Japanese method is too complicated and allows room for too many errors to be well adapted where the incidence of disease is as high as it is in China.

Mr. Ts'ien has worked out a combination of features of both methods, that maintains the card feature of the Japanese and conserves the individual features of the European method. A small cardboard box, ventilated, with an easily removable ring inside, holding a removable piece of paper on which the eggs are deposited, and a box lid constitute the necessary equipment. The amount of labor involved is possibly more than by the bag method, not more than by the Japanese method. The amount of space needed is but half larger. The cost is not greater than either, and the best features of both are conserved. We are experimenting with 7,000 of these boxes this year, but the present outlook is most hopeful that they will succeed. It will be one of the greatest contributions yet made to the work of certified egg production.

Hybridization. A number of crosses were made last year, the results of which will not be available until after the present cocoon season is over.

Purifying of varieties. Much work is being done on the purifying of strains for future crosses, and for a more careful study of silk yields. This work is absolutely fundamental and necessary.

Undescribed diseases. Two undescribed protozoa have just been discovered by Mr. Ts'ien. The symptoms of the diseases are distinct from the commonly found pebrine. Tests will be made to determine whether or not the diseases are hereditary. An unnamed and undescribed bacterium has also just been found, on which more work will be carried on.

The study of silkworm diseases in China by a high expert is a pressing need.

Other investigations being carried on are comparison of food consumed by different varieties of silkworms, variation in time required from hatching to spinning, raising worms from cold storage eggs, rearing of summer and autumn crops, etc.

Egg Production

The arrangement which was entered into with the International Committee last year concerning certified silkworm egg production, but which could not be carried out because of the loss of the crop when our sericultural building burned, has been carried forward to this year. At the writing of this report, the rearing season is about half over, and conditions are favourable for a good crop of cocoons, from which, after careful selection, seed will be produced.

Short Course in Sericulture

The short course in sericulture this year lasts for three months, from March 25 to June 30. Forty-two students are enrolled from seven provinces, as follows : Kiangsu, eleven; Hunan, eight; Shantung, six; Honan, five; Chekiang, four; Anhwei, four; Hupeh, four. Thirteen students were sent by district magistrates, thirteen came on their own initiative, eight were sent by agricultural schools, five were sent by agricultural associations, and three were sent by experiment stations. The average age of the students is twenty-three years, the oldest being thirty-nine and the youngest eighteen. Twenty-nine middle schools are represented, and four higher primary. Forty-one of the students were formerly in government schools, and only one from missionary schools. There are eleven Christians, two Mohammedans, and twenty-eight Confucianists.

The type of short course student appears to be changing somewhat, more coming from the teaching or prospective teaching class than direct from the farm. Mr. Ts'ien's suggestion that a change be made in the course, making it six months in duration, and adapting its content to the preparation of teachers and extension workers in sericulture, is a good one and should be put into force as soon as possible. This immediately raises the question of a short course for farmers, the practicableness of which at the present time, in comparison with extension work reaching him directly in his village and home, is questionable. The silk season is the farmer's busy time, when he cannot drop his work for six weeks or longer—or at least he will not until he has more preliminary information about the value of the course than he has now. Extension work would open the way to persuade him to come to a short course session, and in the meantime be serving a much larger number of people.

Mulberry Collection

The mulberry collection work was continued this year, principally in the province of Kiangsu, and somewhat in Hupeh. About sixty different lots were secured, from all sources, probably including a number of duplicates. The mulberry collection now represents the work of three years, covering the provinces of Chekiang, Kiangsu, Kiangsi, Anhwei, and Hupeh. It contains about twelve hundred trees covering fifteen *mow* of land.

Mulberry Production

The mulberry production is going along successfully, although the past season has not been particularly favourable. This spring we grafted 76,000 mulberries, and indications are now that there will not be much over a seventy per cent take, whereas normally we should expect at least ninety per cent.

Two hundred and fifty thousand seedlings were transplanted this spring, for grafting next spring and for sale and distribution in the spring of 1922. This is a hundred thousand more than the original plans called for, but we feel justified in doing it, because of the small cost of production, and because of the fact that we shall not have ready for sale the amount originally expected from first-year work. It is too early to estimate cost of production, but indications are that we can produce much cheaper than the estimate originally accepted.

Mulberry Experiment

Our mulberry experiment with cuttings last year was not successful, due first to too little callousing and, second, to unfavourable weather conditions in the early stages of growth. With a longer time for callousing, the appearance of the cuttings at this time is good and they appear to be taking root in good shape.

Coöperation with Chinese Customs, Chefoo

We have coöperated with Mr. A. Sugden, Commissioner of Customs, Chefoo, in the work of his committee, formed to improve the silk industry of Shantung. We have furnished considerable information, seed for starting an oak nursery, oak trees for transplanting, and have recommended several Shantung men, who attended the short course in Sericulture last year.

Visit of American Silk Mission

On April 9 and 10, the members of the American Silk Mission visited Nanking and the work in sericulture and mulberry being carried on at the University. It is hoped that their visit will mean the establishment of some basis of coöperation between the American Silk Association and the University. The Mission included Mr. Charles Cheney,

President, and Mr. Ramsay Penguet, Secretary-Treasurer, both of the American Silk Association and the United States Conditioning and Testing Company; Mr. D. E. Douty, General Manager, United States Conditioning and Testing Company; and Messrs. E. J. Stehli, J. D. Dunlop, and W. C. Cheney.

Cotton Improvement

Space will not permit a detailed account of our cotton improvement work during the past year, and hereafter it is hoped that this report can be made separately and fully by Mr. Griffing. The year's work centers about the coöperative experiment with foreign introductions carried on in seven provinces with twenty-five coöperators; the visit of Mr. O. F. Cook, head of the Office of Crop Breeding and Acclimatization, United States Department of Agriculture; the securing of the services of Mr. J. B. Griffing through the generous cooperation of the Cotton Mill Owners' Association of Shanghai and the Shanghai Cotton Anti-adulteration Association. The expenses of our work last year were guaranteed by the Chinese Cotton Mill Owners' Association.

Résumé of Last Season's Coöperative Experiment

Name and location of coöperators.

Below are given the names and locations of those who took part in the experiment. It should be noted that the locations include widely varying climatic conditions and offered excellent opportunity for studying the behaviour of these standard test sets under different conditions.

Province	*City*	*Coöperators*
Honan	Kaifeng	Bishop W. C. White
,,	Chengchow	Mr. W. W. Lawton
,,	Hsuchow	Mr. C. O. Forsberg
,,	Kioshan	Dr. O. C. Behrents
Hupeh	Hankow	Bishop L. H. Roots
,,	Anlu	Dr. Ed. Cundall

Hunan	Yochow City	Mr. George Bachman
,,	Hengchow	Mr. C. H. Derr
,,	Chengchow	Mr. P. H. Dowling
Kiangsi	Nanchang	Dr. Alie Gale
,,	An I Hsien	Mr. H. Lamb
Anhwei	Anking	Bishop Huntington
,,	Luchowfu	Mr. Justin E. Brown
,,	Chuchow	Dr. E. I. Osgood
,,	Nanhsuchou	Mr. J. L. Buck
,,	Pochow	Mr. Wade Bostick
Kiangsu	Nanking	University of Nanking
,,	Wusih	Mr. T. K. Yung
,,	Nantungchow	Mr. S. Z. Kwauk (Agricultural School)
,,	Shanghai	Chinese Cotton Mill Owners' Association
Chekiang	Kashing	Mr. S. C. Farrior
,,	Ningpo	Mr. C. B. Day

Standard Test Set of Cotton Seeds

The list of eight varieties had been carefully made out by the United States Department of Agriculture, after years of experimenting and experience, and is known as a standard test set. It included varieties adapted to wide variations in climatic conditions and varying among themselves as to type of plant, length of lint, etc. It contained the following eight named varieties :

1. King
2. Acala
3. Durango
4. Columbia
5. Lone Star
6. Trice
7. Egyptian
8. Sea Island.

Descriptions of the more important of these eight varieties are given as follows in seed distribution pamphlet number forty, of the Bureau of Plant Industry, U. S. D. A.:

"*Acala* is a large-bolled variety, introduced into the United States from Mexico in 1907; with lint 1 1/16 to 1 3/16 in., usually 1 1/8 full, with good drag and extra strong; clear white without creamy tint; percentage of lint, 32% to 35%. It matures earlier than Lone Star or other big boll cottons.

"*Durango* is a long-staple cotton introduced and acclimatized by the U. S. D. A. The lint is of excellent quality and attains a length of 1¼ inch under favorable conditions. Lint percentage, 32% to 34%. It is earlier than Columbia.

"*Columbia* is an early long-staple, big boll variety, originating from a simple plant found in the Russell Big Boll variety in 1903. The lint is very strong, from 1 1/4 to 1 7/16 inch in length, fine, silky, and very uniform in length; percentage of lint, 29% to 33%; season early in comparison with the older long-staple varieties.

"*Lone Star* belongs to the Texas Big Boll type and was bred in Texas by the U. S. D. A. as Columbia, developed from a single plant found in a field of Jackson cotton in 1905. The lint is 1 to 1 1/8 in. in length, very strong and of uniform length of fiber, 38% to 40%. The Lone Star is undoubtedly the best variety now available for general planting in the Texas blackland belt and adjacent regions. The variety is being grown extensively in Texas, Oklahoma, and Arkansas.

"*Trice* is an early maturing, short-staple variety, with fine lint 7/8 to 1 inch long, percentage of lint, 28% to 33%; season early.

"*King* is an early maturing, short-staple variety, its earliness being one of the best features, but generally considered inferior to Trice."

No description is given of *Egyptian* and *Sea Island.* Because of their lateness of maturity, they showed no promise whatever at any of the stations. Both are *long* staples, being the longest staples under cultivation.

Results of Experimemts

The experiments were carried on as uniformly as possible at all the experiment stations, the same sets being used and planted in the same order, so as to give a uniform basis of

comparison. In general, Trice proved most satisfactory. In no case did Egyptian or Sea Island show any signs of promise, though at the station in Nanking a number of the bolls opened. It was evident that the season was too short and not dry enough. After Trice, which was much more promising than any of the other tested varieties, Acala and Lone Star were the most promising, and certainly at the stations visited, and from the results examined, it would not appear necessary or advisable to experiment further with any other than these three varieties, the others all being discarded. No attempt was made to get quantitative comparisons, because of the relatively little value they would have on the basis of the extent of the individual experiment.

A So-called English Cotton

At Tangshan, in North China, and near Tientsin, large areas of foreign cotton were found cultivated under the name of "English cotton." It is said to have been cultivated about thirty years. The staple is known in the market as "Tung Ho" and commands a high price. This cotton has become thoroughly acclimatized, and though very uniform at the present time, careful selection would doubtless net good results. The improvement of this cotton should probably receive as much attention as the introduction and acclimatization of Trice. It is not impossible that there is a close relation between this cotton and the foreign cotton of Shensi and that grown about Laohokou, Hupeh, in increasing amounts, which demands highest market prices.

Insects and Diseases

As a result of numerous observations, it would appear that the seriousness of cotton insect pests and diseases is not fully realized, and that more vigorous steps should be taken towards a thorough study of the problems involved. The

situation is serious enough to warrant the securing of the best ability that can be found. It is an experienced expert's, not an amateur's, job.

The pink boll-worm, so destructive in Egypt, was found in every station or place visited north of the Yangtze River, and in Yochow, Changsha, Wuchang, Nanchang, and Anking. It was not found in Nanking nor was it found in the East China section. It was found in Nanchang, in the foreign cotton which was being grown on land that probably had not been grown to cotton for many years past. It is inconceivable that it could have been introduced with the cotton seed, as the insect is not found in the United States. In Chengchow, Honan, it was found in seeds found in ginned and baled cotton shipped for Shensi. It was abundant in the fields of Chinese cotton about Changteho.

The leaf-hopper insect and disease were found everywhere, more damaging in some places than in others, and varying in intensity, locally. They were found in Shanghai, Nantungchow, Kashing, but probably not causing damage of economic importance. At Wusih, they undoubtedly were of economic importance. They could be seen in cotton fields as we passed them on the train. The cotton at the government station at Wuchang was very badly damaged by them. Both Chinese and foreign cotton were attacked. At Changsha, the disease was also very bad. It was found in Nanchang, where cotton had not been grown for many years, as noted above. It was serious in Anking. It had done considerable damage in fields of Chinese cotton in and about Nanking. It also attacked the foreign cotton in Nanking. A factor that makes the leaf-hopper insect and disease so baffling is the fact that they undoubtedly have other host plants, having been found on soy beans, on "wu tung" seedlings, and on peach trees.

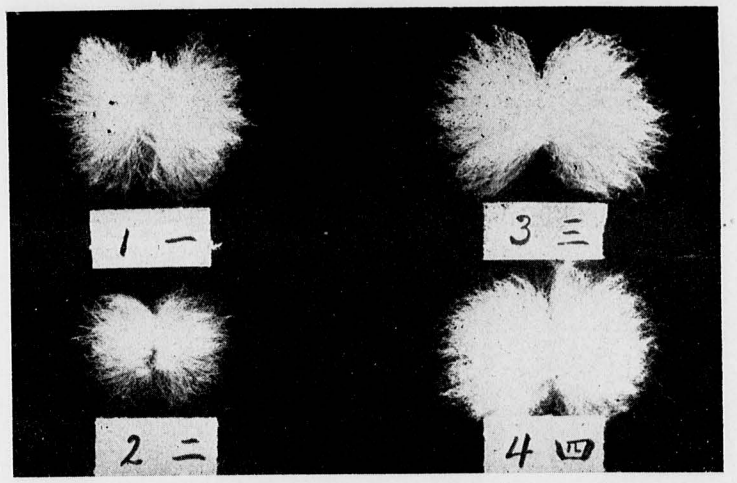
Other diseases and insects found were angular leaf spot and the red spider, but their economic importance was not nearly so great as the two above named.

Mr. Cook's Visit to China

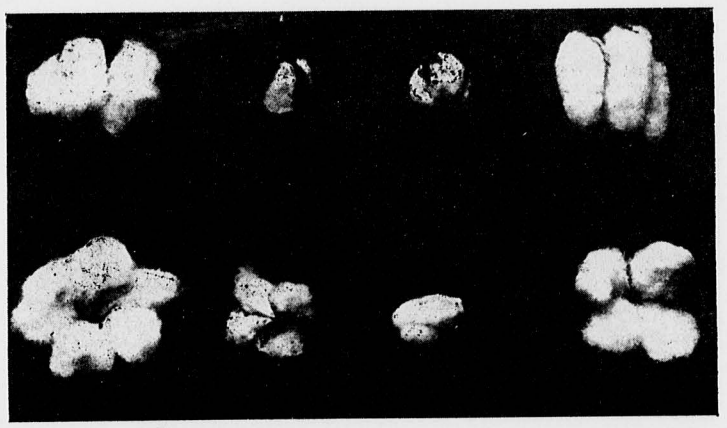
On August 10, Mr. O. F. Cook, cotton expert of the United States Department of Agriculture, came to China and made his headquarters at the University. About September 1, Mr. J. B. Griffing arrived and remained for about a month. Mr. Cook left November 1. An itinerary was arranged for Mr. Cook, and besides representatives from the Chinese Cotton Mill Owners' Association being invited to accompany Mr. Cook on his trip, representatives were also invited from the Ministry of Agriculture and Commerce, Peking. Mr. C. C. Nieh was along part of the trip, particularly the trip to Nantungchow, and Mr. Yeh made the whole trip, so that brief mention only will be necessary here.

The itinerary included Wusih, Shanghai, Nantungchow, Chuchow, Nanhsuchow, Tientsin, Peking, Paotingfu, Changteho, Chengchow, Hankow, Wuchang, Yochow, Changsha, Nanchang, Anking, and back to Nanking, thus allowing a good view of the more important cotton areas in China. Among the more important matters developing from this trip are the following :

Pure Seed. Before Mr. Cook's arrival, it is safe to say no one in China fully realized the important relation between successful cotton culture and pure seed. (Mr. Swingle. the year before had emphasized the fact also.) From the standpoint of pure seed production, it is safe to say that not a single individual or experiment station had so far been successful in developing pure stands of uniform character of any foreign staple. The experiments of the University of Nanking had in mind the determining of varieties for different sections, to be followed by development of pure seed farms the following year or as soon as the best variety for a region could be determined. (This will be possible this year, on a limited scale. Lack of trained personnel is the greatest problem in this connection.)



No. 1. American Cotton. No. 2. Common Chinese Cotton.
Nos. 3 and 4. Selected Chinese Cotton.



Left : American cotton from good seed.
Left centre : Degenerate American cotton.
Right centre : Common Chinese cotton.
Right : Improved strain of Chinese cotton.

Constant selection and roguing on seed farms for foreign cotton will be essential and necessary. It must not be understood that pure seed from the United States will give uniform plants in China that produce pure seed. This is because of the variation that is induced by change in climatic conditions. Constant selection is necessary in the United States to keep out all variations from a given type, and if this is true of seed planted year after year under similar soil and climatic conditions, how much more is care in selection necessary when the factor of acclimatization is introduced.

The introduction of large quantities of foreign cotton at this time is undoubtedly a very questionable policy, and the general distribution of foreign seeds, unacclimatized, will doubtless prove of no avail or benefit to the cotton cultural interests. China is already more or less polluted with upland (foreign) staples, and the greater the amount of introduction without scientific selection in China first, the more difficult it will make successful foreign cotton culture.

Plans for 1920 Season

The work of the present year will be chiefly along two lines, the acclimatization and establishment of pure seed farms of certain foreign varieties, particularly Trice, and the careful testing out of a number of individual selections of Chinese cotton made during Mr. Griffing's trip last autumn. This line of work, particularly, shows signs of great promise, more, probably, than the introduction of foreign staples. There are nine cotton stations, as follows:

Nanhsuchou, in Anhwei, where we are coöperating with Mr. J. L. Buck, agriculturist of the Presbyterian Mission.

Tungko, Kiangsu, north of the river, where we are coöperating with Mr. T. S. Kuo, formerly head of the First Provincial Agricultural School, Nanking.

Nanking, Kiangsu, four stations, one in coöperation with the Government Teachers' College.

Shanghai, where we are coöperating with the Shanghai Baptist College and St. John's University, and

Nantungchow, where we are coöperating with Mr. Chang Chien.

The working budget for the year, excluding Mr. Griffing's salary expense account, is $4,903, which includes one item of $2,700 for salaries of assistants, an item of $800 for travel, and an item of $300 for printing and propaganda.

The total budget for the year generously guaranteed by the Cotton Mill Owners' Association of China (largely British) and the Shanghai Cotton Anti-adulteration Association is $8,903. A word of appreciation is due for the fine way in which they are supporting us in our plans.

Work in Botany

In addition to the teaching of Botany, much emphasis is being placed on the building up of a large herbarium. To this end, two collectors have been secured, who are devoting full time to collecting and caring for herbarium specimens. There are now in the herbarium about 1,500 mounted specimens, including about four hundred named species. The year's objective is to increase the mounted specimens to at least 4,000, and to name them as rapidly as possible.

Mr. E. D. Merrill, of the Bureau of Science of the Philippine Islands, is coöperating with us in the identification of specimens which are sent to him. Plans are under way in cooperation with Mr. W. T. Swingle, of the United States Department of Agriculture, whereby Mr. Merrill may be able to spend a definite time at Nanking. Duplicate specimens of all collections are being made with the idea of supplying them for a small monetary consideration to other institutions

or in exchange for specimens desired for our own herbarium. In all of this work we have the coöperation of Mr. Swingle.

We are coöperating in a botany exploration along with twelve colleges and forty-eight high schools (all Chinese), to be made under the direction of Mr. S. S. Hu, of the Government Teachers' College, in the provinces of Hunan, Kweichow, Fukien, Chekiang, Kiangsi, and Yunnan. Our obligations entail four semi-annual payments of $250 each, in return for which we receive a definite amount of herbarium material. Mr. S. S. Ts'ien will be actively engaged in the exploration and identification work, the details of which are not fully worked out.

Our botany work should be developed into one of the most important things we have undertaken.

Forest Dendrology

The lack of suitable text-books—or in fact any text-book—on Chinese forest dendrology has been a serious handicap in our forestry teaching. To help fill this need Mr. Sample in coöperation with his students has been working on a compilation of descriptions of important Chinese timber trees and shrubs. About 250 species have been so treated. The following books have been used as reference:

1. Plantæ Wilsonianæ.
2. Flora of Kwangtung and Hongkong (Kew Gardens miscellaneous bulletins).
3. Icones of the Forest Trees of Japan, by Shirasawa.
4. Chinese Forest Trees and Timber Supply, by Shaw.
5. Cyclopedia of Horticulture, by Bailey.
6. Shrubs of the United States, by Apgar.

Agricultural Gardens

As noted in last year's report, this is the organization under which all our field work is carried on and the products

sold. These products include nursery stock; vegetables; fruits; flowers; tree, flower, and vegetable seeds; and spraying materials. The Agricultural Gardens are maintained wholly through the sale of these products. The proceeds for the past year were $7,000.00 as compared with $4,100 for 1918-1919 and $2,400 for 1917-1918. Several items need special attention.

1. *Seed sales and distribution.* The number of people who have been served through our seed distribution and sales is conservatively estimated at over thirteen hundred. Seeds were sent to every province in China. Over nine hundred orders have been filled this spring from Nanking. Seeds are also on sale in Shanghai and during the summer at Kuling and Mokanshan. Most of the seeds are raised by us, and the rest are brought in quantity from seed firms in the United States and repacketed. Our seed sales to other countries, principally to the United States, increased five hundred per cent, while our sales to Chinese, both in numbers and value, increased three hundred per cent during the past year.

2. *Tree seed collections.* Last year our tree seed collections and purchases totaled about six tons, practically all of which were resold. The collection included more than forty principal species, among them Pyrus calleryana, the wild pear, which is being used as a stock for grafting against the pear blight; the purest supply of this species has evidently been located by us. Last year seeds were collected from six provinces.

3. *Buildings.* In addition to the field house, 25 ft. × 80 ft., built last year, we have had to build adjoining thereto another house, 25 ft. × 60 ft., to be used as a storage and seed room. It is hoped that this will be the last building necessary before we move to our permanent quarters. The rapidly developing activities of the Agricultural Gardens made the building a pressing need. By using material from several old Chinese houses, the cost was only about $200.

4. *Administration.* A superintendent for our field work or a manager for the Agricultural Gardens must be secured at once. The work will occupy his entire time, and require several high-grade assistants. At present the administration of the Agricultural Gardens is a big task, and must be sandwiched in with the many other duties of not only the Dean, but of other members of our faculty, including the University Treasurer, who has collected all accounts. Mr. Sie and Mr. Ritchey have also given much time. With the advent of Mr. Li Tai-fang and Mr. Hwang Tsung, two of our graduates, more responsibility has been allocated, but there is much that can not be turned over. More organization which we are instituting will make administration easier, but the very rapid growth of the work to a large extent offsets this. The matter can never be properly handled until it becomes one man's full responsibility.

Because of the way in which our land is scattered over a mile from north to south, and a half-mile from east to west, the cost of the item of labor alone is increased at least twenty-five per cent. The administration of it is also very much more difficult. The problem of housing and feeding the workmen is constantly with us. We shall always be confronted with these problems until we move over to our permanent land and into our new buildings.

Work of the Experiment Station

It has seemed best not to undertake further organization of the experiment station until the writer's return from furlough, when the matter will have to be taken up and detailed organization and relationships worked out. The outstanding features, which naturally come under the experiment station, are comprised in our work in sericulture and mulberry and cotton, which have all been treated separately. In addition the following experimental work should be noted:

Wheat. Variety tests for yield are being continued with about one hundred varieties of native and foreign wheat. The *rod row* method is being used.

Corn. Ear to row tests are being continued with selection of native corn. The yield from our selected seed was double that of neighbouring fields last autumn. There has been a big demand for the improved seed.

Rice. It seems impracticable to continue much further on rice experiments until better rice land is obtained and some one secured who can devote full time to the work.

Fruits. This spring, through the courtesy of the United States Department of Agriculture, nineteen varieties were added to our already large collection of grapes. Many plants of several of the Muscadines and both purple and while Concords were distributed this last spring. Out of a large orchard of seedling peaches a half-dozen have been found of particular promise. In all about a hundred varieties of fruits are under observation and experimentation. Dr. Macklin is largely responsible for the large collection of grapes and native peaches.

Sugar Beet. Cultural experiments with sugar beets in Kiangsu, Anhwei, and Shantung provinces were made last year and a much more extensive experiment is under way this year.

Missionary Interest in Agricultural Education

No part of our work has a more hopeful outlook than our relation to the development of agricultural work in some of its many phases by missionaries throughout China. Missionary interest in agricultural education has increased greatly during the past year as evidenced by the actions of all the local Christian educational associations of China, as well as by the Central Association, by the programme laid out by the Methodist Quadrennial Programme Statement Conference held in Peking in February, and by the action of the Nanking

Theological Seminary. Recently the "International Association of Agricultural Missions," promoted by missionaries interested in mission agricultural work throughout the world, has been organized in New York City with an executive secretary, which should do much to awaken and quicken interest both on the home side and on the mission field in this new and rapidly developing mission activity.

The China Christian Educational Association through its Executive Committee, and on the basis of the very favourable action taken by the provincial Christian associations, passed the following resolutions:

"1. That it is our conviction that the time has come to make agriculture a part of our educational activities and that it is desirable to prepare a suitable programme for the carrying out of the same, to be included in the Interchurch World Movement.

"2. That the Executive Committee of the China Christian Educational Association be empowered to appoint a committee on agricultural education, whose duty it shall be to prepare an "All China" programme looking toward the introduction of agriculture into our mission schools through the development of provincial normal training centers for the suitable preparation of teachers. This committee shall also prepare a list of factors that shall be used in determining the location and establishment of such training centers.

"3. That the Executive Committee of the China Christian Educational Association be empowered to act on the findings of the Agricultural Committee and present the matter to the China Continuation Committee for their approval and recommendation for inclusion in the Interchurch World Movement."

In accordance therewith an Agricultural Committee has been appointed which will meet shortly to plan out an "All China" programme. Mr. Buck is a member of this Committee, of which I have the pleasure of being chairman. A budget

of $728,000, for the "establishment of four provincial training centers in agriculture for the preparation of teachers of agriculture and extension workers" has already been approved by the C.C.E.A., and recommended to the Interchurch World Movement.

One of the most interesting and outstanding developments has been the inclusion of agriculture in the curriculum of the Nanking Theological Seminary, as a required course. A teacher to take care of this work will be secured as soon as possible. Funds are already available. This is the most direct recognition ever made by missions in China that the rural church worker, whether evangelist or preacher, should have a particular training that will better fit him for service among the rural people.

The seven Methodist Conferences of the Methodist Church (North), at their Quadrennial Programme Statement meeting held in Peking in February, formulated the most comprehensive programme for linking up, through agriculture, the various phases of mission work to the life of the people among whom they are working, that has ever been formulated by any large missionary society anywhere in the world.

Three of their actions are given below. The first, dealing with theological education, is possibly the pioneer resolution of its kind in China. The second and third actions should do much to clarify the problems of mission industrial and vocational work, for which there is a great need indeed, but in which missions have never been very successful. The actions are:

"That special efforts be made to prepare ministers for country as well as for city churches. We urge that in connection with each school of religion a specialist in agriculture offer such courses as deal with agricultural production, rural economics, rural sociology, and that the vital relationship between these courses and practical evangelism be kept constantly before the minds of the students.

"We recommend the importance of emphasizing agricultural work in our various missionary enterprises, because agriculture represents China's pre-eminent industry and because of its educational, vocational, and self-help features.

"We recommend that industrial education, so far as the Church is concerned, should be built upon a background of agriculture, and that other useful arts entering into agriculture, such as bamboo work, masonry, blacksmithing, etc., should be taught in the proportion of the relative importance of these arts. Industrial work, specialized in character and requiring large capital with restricted opportunity for service, should be discouraged."

Our services are being called for by more and more missionaries. We have requests for more trained teachers than we can supply. More missionaries are sending students to be trained. During the last month, we have had requests from the large missionary societies to send teachers to their annual summer conference of paid workers to awaken interest in agriculture and forestry.

Our responsibility to this whole movement is very great, for it seems evident that this is to be the only College of Agriculture and Forestry north of the Kwangtung border under missionary support. We shall have to serve, for geographic if for no other reason, at least 80% of the missionary body, and more than this per cent of China's population.

Support from Coöperating Mission Boards

The recommendation of the Board of Managers at their fall meeting, 1919, that the coöperating boards increase their quota in the University by one man, the extra man to be designated to the College of Agriculture and Forestry, was approved by the Board of Trustees. Mr. Ritchey was appointed immediately by the Christian Mission, and either Mr. Buck is, or I am, being supported by the Presbyterian

Board. There has been some delay in final action by the Baptist Board, but the way now seems clear for the appointment of a man. The writer hopes to be able to find some one acceptable to the Methodist and Baptist Boards during furlough, for immediate appointment.

Report of Committee on Agricultural and Forestry Schools

There should be a place in this report for the actions taken at the meeting of the East China Association of Colleges and Universities held in Shanghai last autumn, in the form of a Report of Committee on Agricultural and Forestry Schools, because of its bearing on the College of Agriculture and Forestry. It should be said that the actions have not met with the approval of the Canton Christian College, and the University is in agreement with them that a careful survey should be made with reference to agricultural education in China. This will in large part be fulfilled by the present Committee on Agricultural Education, appointed by the China Christian Educational Association. I should like to point out, however, that for geographical reasons and adopted mission policy with reference to development of our higher institutions of learning, the College of Agriculture and Forestry at Nanking will have to serve at least 80% of the missionaries, and 75% of the population of China. The report follows :

"*A. Requirements of an Agricultural School in China.*— It is obviously impossible for your committee, without expert knowledge and without time to consult authorities on the subject, to arrive at definite conclusions in this matter, but certain facts throwing light on the question may be cited.

"It is believed that the estimates of the University of Nanking for staff and funds needed to carry out its plan of development during the next five years are at least not excessive. The present staff and maintenance cost of the College of Agriculture and Forestry, with proposed additions, are as follows :

Staff :	*Present*		*Proposed Additions*		*Total after 5 yrs.*	
	Number	Cost	Number	Cost	Number	Cost
Foreign ...	5	$5,573	11	$44,000	16	$49,000
Chinese ...	8	2,622	3	6,400	11	9,022
Total ...	13	8,195	14	50,400	27	58,022
Sundry expenses		14,569		55,000		69,569
Total ...		$22,764		$105,400		$127,591

"That this is probably a modest estimate is confirmed by consideration of the costs of agricultural schools in the United States. The Massachusetts Agricultural College, not one of the largest institutions in the United States, had, in the year ending June 30, 1916, an income of $503,125, besides $116,000 for experiment station and extension work. Its staff for the college alone was sixty-one men and one woman, and, including experimental station and extension work, ninety-eight men and five women. Considering that at present rates of exchange missionary salaries average considerably higher than college salaries in the United States, even a severely restricted programme on a missionary basis must cover over $100,000 per annum, and with normal growth should soon require two or three times that figure.

"*B. Only Schools of High Standard Desirable.*— It is believed that any school representing the Christian Church should have the highest possible standards, certainly not lower than those planned for by the University of Nanking. This is particularly true of institutions in such important centers as Peking, where the government schools have the largest measure of support, and where there are also experiment stations and technical bureaus of the different ministries, employing highly trained Chinese and foreigners.

"*C. Only One Complete School Recommended.*—The cost of a high-grade school being so high, as indicated in the

above figures, and considering the limited funds available for Christian educational work in this country, as well as the difficulty of securing large numbers of experts willing to serve on a missionary basis, your committee feels that it would not be wise to recommend the establishment of more than one agricultural or forestry school of college grade under mission auspices in China.

"*D. University of Nanking.*—As the University of Nanking has already organized a college of agriculture and forestry, and by its successful work hitherto has secured a remarkable degree of recognition from Chinese provincial governments, as well as from manufacturers and farmers, your committee recommends that its application for additional staff, maintenance allowances, and equipment be heartily endorsed. Nanking has the additional advantages of central location, being within easy reach of the wealthy cities and farming districts of the lower Yangtze region, and accessible by an easy journey of only a little over a day from such northern centers as Peking and Tientsin, with Tsinanfu still nearer. It is near and in close touch with one of the most, perhaps the most, influential and enterprising industrial communities in China. The university possesses a large area of available land, and can easily secure more when required.

"*E. Canton Christian College.*—The committee doubts whether it would be wise to develop a complete agricultural school at Canton. Since agricultural courses have already been successfully started in the college, it would seem appropriate that a certain amount of junior college work should be offered in agricultural subjects, but that students should be encouraged to go to Nanking for their strictly professional course. It is believed that it would be desirable to establish some relationship between the agricultural school at Nanking and the agricultural department of such a school as Canton, with a view to fuller coöperation in scientific work and teaching.

"*F. Other Colleges.*—In those colleges which have not already organized agricultural or forestry courses, it is recommended that no steps be taken to establish them in the near future, but that students interested in agriculture be advised to go to Nanking. The needs of the general arts and science courses, as well as those of the professional schools to which the other universities are already committed, are so great that it seems imprudent to attempt at present such a new department as agriculture, which is already being undertaken elsewhere. This recommendation is not intended to limit or discourage the giving of such instruction on agricultural subjects as might reasonably be regarded as part of a general education.

ROGER S. GREENE
WARREN H. STUART } *Committee.*

Shanghai, October 24, 1919."

Coöperation

WITH THE UNITED STATES DEPARTMENT OF AGRICULTURE

During the past year the College of Agriculture and Forestry has coöperated in a number of ways with the United States Department of Agriculture.

In the late summer and autumn, during Mr. Cook's visit to China to investigate the matter of Chinese cotton culture, we looked after all matters of itinerary, arrangements, etc., and the writer accompanied the visitors on all their travels while in China. Seeds of Ulmus pumila, Pyrus calleryana, Gingko biloba have been secured for the Department. We are now trying to locate a supply of Amygdalus davidiana seed for them. They have sent us during the year nineteen varieties of grapes, sugar beet seed, a grafted pistach nut (Pistachia vera) tree, probably the first to get to China, etc.

In March the writer received cable instructions, through the American Consul at Nanking, to secure for the United States Department of Agriculture cuttings and bud wood of the Changsha October Mandarin orange, and of the wild Ichang lemon, all of which was done.

In late April, too late for the undertaking to be carried out, the writer received an authorization from the Bureau of Crop Physiology, United States Department of Agriculture, to proceed into Hunan, Hupeh, and Szechwan provinces to collect "buds, seeds, nursery stock, and other propagating material of early ripening orange of the Satsuma type, the wild Ichang lemon, and other promising citrus fruits, for trial in these regions of the United States formerly infested or now infested with Citrus canker."

It would be mutually helpful to both the United States Department of Agriculture and ourselves if some permanent and official basis of coöperation could be worked out. Steps are now being taken with Mr. Swingle and Mr. Merrill, of the Philippine Bureau of Science, whereby Mr. Merrill can spend regular periods at Nanking assisting in the development of our botany work. Acknowledgment is made of the very great help Messrs. Swingle, Cook, and Fairchild, of the United States Department of Agriculture, have at various times been to us.

Coöperation with the Governor of Shantung in Establishing a Forest Service

Early in January the Civil Governor of Shantung extended an invitation asking us to help him forward his plans for the development of forestry work in his province. The invitation was accepted and Mr. D. Y. Lin was released to go to Shantung for a few months. When Mr. Lin arrived at Tsinanfu, he immediately went ahead and selected a large tract of land, about 120 *li* south of Tsinanfu, and began his planting operations there. During this spring more than

500,000 trees were planted and as many as 3,000 *mow* of land were seeded. To get the work done, between 500 and 600 laborers were employed daily. Three forest stations have been established and two more will be added. To carry on the work at these stations Mr. Lin is employing at present twelve technical men, three of whom are graduates of our Forestry Department. Plans for three large provincial nurseries are already under way and it is expected that these three nurseries will be able to take care of the province-wide reforestation programme which Mr. Lin has prepared to be submitted to the Provincial Parliament. The Shantung Forest Service is now established. It has for its headquarters a good-sized temple specially set aside by the Civil Governor for the purpose. Judging from the support it has and the progress it has made during the past few months, the Service ought to be on a permanent and effective basis soon. This is the largest piece of extension work in forestry yet undertaken, and Mr. Lin is to be congratulated on the splendid way in which he has secured interest and support.

Government Coöperation

The cordial relations which we have had with several of the provincial governments have been maintained, and in several instances coöperation has increased. The five forestry scholarships maintained by the Anhwei government have been increased to ten, and there is now pending an increase of from three to five forestry scholarships from Shantung. There are thirteen students, eleven in agriculture and two in forestry, on scholarships from Shansi; one student from Kiangsi province on agricultural scholarship; and one on forestry scholarship from Kansu. Thirteen of the forty-two short course students in sericulture were sent by magistrates of districts, and five from the semi-official agricultural associations.

We have sent three of our forestry graduates to Shansi, where all have responsible positions. Three of our graduates

hold good positions in the newly organized Forestry Service of Shantung (see page 28). Our relations with the Peking government still stand as stated in my last annual report; that is, they still owe a balance of $5,000 on the original agreement plus student fees, which were advanced by the University.

Forestry Fund Committee

In addition to the grant of $5,000 a year for the support of teachers for three years, the Forestry Fund Committee maintains two full scholarships and a loan fund of $5,000, established last year, $1,000 becoming available each year for five years.

Contributions

In September 1919 His Excellency Li Shun, Military Governor, and His Excellency Tsi Yao-ling, Civil Governor of Kiangsu Province, each contributed $3,000 Mexican to the work of the College of Agriculture and Forestry. This is the largest contribution ever received from Chinese sources by the University.

Through Mr. Thomas H. McConnell, Special Factory Representative of the Ford Motor Company, a Fordson Tractor outfit has been presented to the College of Agriculture and Forestry through the firm of Dodge & Seymour, Ford agents, Shanghai.

A gift of one hundred gold dollars has been received from Mr. C. Osmund Bullis, of El Centro, California, for the purchase of agricultural books for the College of Agriculture and Forestry.

The American Trading Company presented three "Mow Sung" plows for demonstration and use.

The Eastern International Corporation, through Mr. E. C. Hawley, now of Rogers, Brown & Co., presented two "Kentucky Pony" plows for demonstration and use.

The Bean Spray Pump Company of San Jose, California, has sent us for use and demonstration two power spray pumps. They have already been used to advantage on the University grounds.

Grateful acknowledgment is made of these important contributions to our work.

Professor Woodworth Scholarships

The Professor Woodworth scholarships have been established by Mr. E. E. Luther, secretary of the California Spray Chemical Company, in honour of Professor Charles W. Woodworth, who was in 1918 special investigator and lecturer in entomology in the College of Agriculture and Forestry. The payment of such scholarships is to be made from the sales of spray chemical materials which they are sending to the University on consignment for sale. (See Sprays and Spray Materials, page 33.) These scholarships are to extend for five years, not to exceed a total of $200 per year, thereafter on renewal of the arrangement by the California Spray Company.

Mr. Luther was one of Professor Woodworth's students in the University of California, and this is one more of the many good things that Professor Woodworth has brought to the student company here, who held him in such high regard. We are under many obligations to Mr. Luther for his generosity in establishing the scholarships.

School Nurseries and Arbor Day

A movement to popularize Arbor Day and to give it a greater significance was started through the publication and distribution of "School Nurseries," a bulletin in both English and Chinese. This is the first bulletin covering the subject to be issued in China in either English or Chinese. The bulletin contains detailed information for the starting and maintaining of small forest nurseries as part of the school

work. Lists of species of trees for South, Central, and North China were made out and seeds supplied for one-half and one *mow* nurseries capable of producing about 15,000 and 30,000 seedlings, at the rate of $1.50 and $3.00 respectively. Although the bulletin was issued rather late, seed sets were sent into every province, except Kwangsi and Kansu. The Commissioner of Education of Shantung Province put his stamp of approval on the plan by ordering and paying for 500 copies for distribution to the schools under his jurisdiction. We have already supplied many schools with seeds, and are planning to push the "School Nursery" idea next season, until, we hope, thousands of schools will be enrolled. The Chinese edition was prepared by Mr. Li Tai-fang, one of our graduates in Forestry.

Plans for Extension Work

We have secured the services of Mr. Hwa Peh-hsiung, one of our 1920 graduates in Agriculture, for extension work in the country round about Nanking and extending to Chinkiang. We hope to coöperate very closely with the various missions in this territory and have them utilize our services as fully as possible. The plan of the extension work will be similar to that used in the States; a limited programme, which we have suited to local conditions, will be carried out. This will include plow demonstrations for deeper plowing, extension of the sericultural industry, including mulberry plantings, school nurseries for all the primary and middle schools, extending the fruit industry, etc.

Demonstration of American Plows

A demonstration of two types of an American-made, one-handled, Chinese-fashioned plow was held last December on the University farm. Both plows were one-handled, the one with a wooden beam and the other steel throughout. The former was donated to us by the Eastern International

Corporation, and the latter by the American Trading Company —both firms of Shanghai. The plows were evidently the first of their kind demonstrated in North China. The general verdict was strongly in favor of the foreign-made plows, which were compared in a plowing demonstration with the Chinese locally used plows. They are better constructed, more usable, and more efficient than the native implement.

Much can be done in the way of demonstrating American-made machinery, and while much of that commonly employed on farms in the West can not be used, there are many implements which, with slight adjustments or changes, could be adapted to meet great needs and great markets. The introduction of better machinery into use by the Chinese farmers can not be looked upon other than as a very important step in the improvement of their agriculture.

Sprays and Spray Materials

In order to be of more practical service to the many people who send us specimens of injurious insects and diseases, and ask for information concerning their control, we are stocking in connection with the Agricultural Gardens seed service spray pumps and spray materials. A spraying chart is being compiled, as well as methods of mixing the various sprays recommended. It has never been very satisfactory, either to ourselves or those who need help, to be compelled to tell them to use a certain spray, when the closest available material was in America, and so on. By having the necessary parts on hand, we shall be able to do a good piece of service not only to our foreign friends but also to an increasing number of Chinese who are becoming interested in scientific control of insect pests and plant diseases.

Land

Good progress is being made in securing land for the permanent farm and experiment station. Since January 1,

about forty *mow* of land have been bought, ranging in price from $32 to $75 per *mow*. There are at least six more deals "hanging fire," including about 100 *mow* of land, the purchase price of about all of which is in hand. We have proceeded slowly with the idea of keeping down the price and establishing precedents for more active buying in the future.

With the securing of about 150 *mow* more of land, we shall be in a position to proceed with the improvements on the land, such as drainage and roads, and with the building of our permanent buildings.

Administration

The administration duties devolving upon the Dean of the College of Agriculture and Forestry are more than can at present be properly cared for without much more assistance, particularly secretarial. During the year the writer has had to be absent from Nanking over four months, which included over 10,000 miles of travel, in nine provinces. He has been responsible for the administration of the Agricultural Gardens, including all field and experimental work, except sericultural. The income from the Agricultural Gardens, as noted in another place, amounting to over $7,000, necessarily entails a large amount of detail, as everything that comes in goes out in expenditures. Between Mr. Chao's office and the Dean's office, often working together, 10,322 pieces of second-class mail were sent out, 2,370 pieces of first-class mail (letters), and about 1,000 registered parcels. How much more went out we cannot say. Miss Purcell generously wrote all of the more important letters, of which carbon copies were wanted, and has taken care of all the copying work, which was much. In fact, without Miss Purcell's help it would have been utterly impossible to have done what has been necessary to do, to keep up. In addition, we have been called on for reports, plans, etc., to say nothing of committee and other general

work that has to be done where there is a student population who have to be taken care of in class as well as out. The taking over by Mr. Moss of all registration work and centering it in the College registrar's office has been more than appreciated.

Too much cannot be said of the capable way Mr. Chao Chung-ting has taken care of the rapidly increasing Chinese part of our work. These duties have never before been handled with the attention they are now getting, and it is with a very deep sense of appreciation that I say this. Mr. Chao, since September, has sent out some 1,300 odd Chinese letters, which gives an idea of the volume to which this phase of our administrative duties has grown during the year. During my absence in September and October, Mr. Sie Kia-shen very efficiently and well looked after the administration of my duties. I hope the recommendation that I made in April, regarding "an Associate Dean of the College of Agriculture and Forestry, who must be Chinese, whose authority shall be similar to that of the Dean and whose duties shall be those pertaining particularly to our Chinese constituency," will receive the support of the Board of Managers, and be acted upon promptly and favorably.

The point I want to make is, we need more administrative help. I hope we shall always need more. The need for a secretary is urgent, and of an associate dean just as urgent.

Faculty and Teaching

Our faculty is larger and stronger than it has ever been before. There are now nine foreign trained men, four Chinese and five American, devoting full time to the College of Agriculture and Forestry, either teaching or carrying on special investigations, as in sericulture and cotton. There are four associates in agriculture and forestry and four assistants. In addition, the entire faculty of the Junior College is devoting

part of its time to junior college agricultural and forestry students.

Mr. J. L. Buck, B.S., 1914, New York State College of Agriculture, came in February to take up the duties of acting dean during the furlough of the writer. He is also teaching Farm Management and Farm Engineering.

Mr. George E. Ritchey, B.S., Iowa State College of Agriculture, arrived in January with Mrs. Ritchey, and is teaching Agronomy. Mr. Ritchey has had two years' experience in the Philippines, and came directly from Cornell College, Iowa, where he had been teaching.

Mr. Ts'ien Sung-shu, B. S., University of Illinois, came in February. He is teaching Botany and developing the herbarium. Mr. Ts'ien spent one and a half years in the University of Chicago, and one-half year at Harvard studying Botany. For the previous three years he had been teaching in the First Provincial Agricultural School of Kiangsu.

Mr. John B. Griffing, B.S., 1904, Kansas State Agricultural College, B.A., Drake University, M.A., 1913, Columbia University, arrived in February with his family, to take up the work of cotton improvement. Mr. Griffing made a preliminary trip to China last fall. From 1913 to 1918 he was head of the Department of Agriculture, Tempe Normal School, Tempe, Arizona, and from 1917 to 1919 manager of the Griffing Cotton Company and special investigator for the Firestone Tire Company.

Shao Teh-hsing (ex-1918) began work February 1 as associate in cotton improvement.

Feng Rui, B.S., 1920, began work in April as associate in cotton improvement.

Ran Ying-hwa, a graduate of our first short course in sericulture, 1918, began work in February as assistant in sericulture.

Ts'ü Liang-fu, a graduate of the First Provincial Agricultural School, Nanking, began work in February as assistant in botany.

During the year Li Chuin-kang, B.S., 1919, and Shen I-chen, B.S., 1919, were both forced to resign on account of ill health.

Mr. Sample, after three years' of faithful and earnest work in forestry, upon fulfilment of his term of service after the present semester will return to his home in Indiana.

Students

There are thirty-seven students enrolled in Junior College Agriculture, twenty in Junior College Forestry, twenty-one in Senior College Agriculture, and four in Senior College Forestry, making a total of eighty-two students. During the autumn semester there was a total of ninety-two students enrolled. Of the total number, twenty-six are on government scholarship, or thirty-two per cent. There are forty-one students enrolled in the first year Junior College, the largest beginning class we have had since the College of Agriculture and Forestry was started in 1914. This, compared with the enrolment of forty-four students, first year Junior College of Arts, indicates the increase of students in agriculture and forestry.

Graduates

Eleven students in Agriculture and ten students in Forestry graduate in June, making a total for three years of twenty-one graduates in Agriculture and twenty-three in Forestry.

Publications and Reprints

By the College. During the year the following publications have been issued by the College of Agriculture and Forestry:

1920 Nursery Stock and Seed List, in English, 20 pages, 4,000 copies.

1920 Nursery Stock and Seed List, in Chinese, 12 pages, 2,000 copies.

Practical Guide for Forest Nurseries, in Chinese, 20 pages, 3,000 copies.

School Nurseries, in English, 22 pages, 1,000 copies.

School Nurseries, in Chinese, 22 pages, 2,000 copies.

The Jenschow (Szechwan) Industrial School, in English, 2 pages, 3,000 copies (reprinted from the *Chinese Recorder*).

A Rural Work in India and a Suggestion for Christian Workers in Rural China, in English, 2 pages, 3,000 copies (reprinted from the *Chinese Recorder*).

Practical Demonstration of a Sino-American Plow, in English, 4 pages, 3,000 copies.

Report of the College of Agriculture and Forestry, 1918-1919, in English, 34 pages, 800 copies (reprinted from the President's Report, University of Nanking).

Cotton Seed and Cotton Improvement in China, in Chinese, 6 pages, 1,000 copies (translated from *Millard's Review*).

Cotton Seed and Cotton Improvement in China, in English, 11 pages, 500 copies (reprinted from *Millard's Review*).

Announcement of Short Course in Sericulture, including Short Report on Mulberry and Sericultural Work, in Chinese, 3,000 copies.

Recent Developments in Agricultural Education under Missionary Auspices, in English, 15 pages, 500 copies (reprinted from the *China Mission Year Book*, 1919).

Methodism and Agriculture, in English, 4 pages, 5,000 copies (reprinted from the *China Christian Advocate*).

Foreign Missions and Agriculture, in English, 4 pages, 5,000 copies (reprinted from the *Chinese Recorder*).

The above publications or reprints have had a wide circulation. Several of the Chinese pamphlets were reprinted in full, in the vernacular press. Many acknowledgments have been made of them, particularly from Chinese sources.

A publication fund is fast becoming a necessity, if we undertake any greater publishing activity than was attempted

this year. The Agricultural Gardens has carried the greater part of it—because there were no other funds available.

Five hundred copies of the "School Nursery" bulletin, in Chinese, were requested by the Commissioner of Education of Shantung Province, who also paid for them.

The Nursery Stock and Seed List, in English, was sent out to about 3,000 missionaries and 600 community people. The pamphlets on "Rural Work in India and a Suggestion for Christian Workers in Rural China," "The Jenschow Industrial School," and "Sino-American Plow," were enclosed in the Nursery Stock and Seed Lists sent to the missionaries. The Nursery Stock and Seed List, in Chinese, with the "practical directions for forest nurseries" and the sericultural announcement enclosed, were sent to all the forest nurseries, magistrates, and agricultural societies in the ten provinces closest to Nanking. The bulletin on forest nurseries has been very widely called for.

The Faculty in Print. The following articles written by members of the faculty have appeared from time to time during the year, since the last report was written.

By D. Y. Lin:

"Wood Oil." China Bureau of Public Information, August 1919.

"Wood Oil." Far Eastern Review, September 1919.

"Forestry and the Great European War" (in Chinese, reprinted in many Chinese papers).

"China and Forestry" (a small illustrated book).

By John H. Reisner:

"The Place of Practical Agricultural Education in our Middle and Lower Schools." The Educational Review, July 1919.

"Missions Plus Agriculture in China." The Trans-Pacific, December 1919.

"Methodism and Agriculture." China Christian Advocate, May 1920.

"Recent Developments in Agricultural Education under Missionary Auspices." China Mission Year Book, 1919.

"Some Problems of Commercial Fertilizers in China." Millard's Review, September 1919.

"Progress of Forestry in China in 1919." Millard's Review, May 24, 1919.

"Cotton Seed and Cotton Improvement in China." Millard's Review, January 31, 1920.

By J. Lossing Buck:

"Agricultural Class at Nanhsuchou after 4,000 Years." The China Press, January 22, 1920.

By Ts'ien T'ien-ho (C. L. Chien):

"A Study of the Chinese Silk Industry." Science, October 1919.

"A New Theory of Organic Evolution" (translation). Science, November 1919.

"A Condemnation of the Premium Bonds." The People's Heart, April 1920.

"How to Promote the Silk Industry of China." The People's Heart, April 1920.

By Ts'ien Sung-shu (S. S. Chien):

"Evolution of Plants." Science, November 1919.

Needs

Because of the writer's early departure for furlough he can not go into the details of our needs. There are several, however, which should be called to your especial attention.

1. A permanent building for the College of Agriculture and Forestry for administrative, laboratory, and teaching work, is a pressing necessity. Our present quarters are hopelessly inadequate. The fact that at present writing the

Dean's office is being used by six of us as an office ought to be sufficient evidence of the need. For a building corresponding to Swasey Hall, equipped, $80,000 Mexican is required at the present rates of construction.

2. A sericultural building, to house our sericultural work, is needed at once. Mr. Ts'ien is much hampered without it, in his important experimental work. Such a building, 43 ft. × 126 ft., two and a half stories, will cost about $25,000 Mexican. A building 43 ft. × 86 ft., as above, will cost about $18,000.

3. Houses for the faculty must be secured at the earliest possible date. Not a single family in the College of Agriculture and Forestry has its own house. There are now four families on the field, with two more promised by the cooperating boards, so that for the faculty definitely in sight we need six houses.

4. Land is being secured slowly but surely (see under Land, page 33). About 1,000 *mow* is needed, which will cost approximately $60,000 to $70,000, and $25,000 to $30,000 additional will be needed for improvements and permanent buildings.

5. The need for faculty will be somewhat relieved when the men available from the boards and the Methodist Centenary Fund are on the field. They should be appointed in the order designated in the last annual report.

6. Administrative help, as indicated in the section under Administration, should be forthcoming this present year.

7. A Publication Fund, whether as endowment or pledged annual grant, should become available as early as possible.

8. An emergency grant of $3,000 for equipment in Botany, Soils, Forestry, Farm Engineering, Reference Library, etc., is needed, until we can get into our permanent building.

Acknowledgments

It gives me real pleasure to acknowledge my indebtedness to all my colleagues who have shared the year's work. It is indeed a very great privilege for me to be thus associated. That we have carried on as far and, if I may say, as well as we have, has been due to the hearty support and coöperation which has always been forthcoming and which is the surest assurance that we are all working together with a common purpose and ideal. I bespeak for Mr. Buck the same help and support which I am sure will be forthcoming from us all.

Special acknowledgment is made to our rapidly increasing number of friends outside the University for their encouragement and help, and in many cases to a large share of cooperation which has so readily been given.

UNIVERSITY OF NANKING BULLETIN

REPORT OF THE COLLEGE OF AGRICULTURE AND FORESTRY

1920-1921

VOLUME SIX, NUMBER FIVE

Vol. VI. UNIVERSITY OF NANKING No. 5.

BULLETIN

REPORT OF THE COLLEGE OF AGRICULTURE AND FORESTRY

1920-1921

SHANGHAI:
Printed at the Presbyterian Mission Press
—
1921

Nanking, 30 July 1921.

MY DEAR DOCTOR BOWEN:

In answer to your request, it gives me great pleasure to submit to you the report of the College of Agriculture and Forestry for the year 1920-1921.

Respectfully yours,

J. LOSSING BUCK,
Acting Dean.

To President A. J. Bowen,
University of Nanking,
Nanking, China.

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WILLIAMS, JOHN ELIAS, B.A., D.D. (Marietta), Vice-President of the University and Chaplain.

REISNER, JOHN HENRY, B.A. (Yale), M.S.A. (Cornell), Dean of the College of Agriculture and Forestry and Director of the Experiment Station; Collaborator, Office of Crop Physiology, Bureau of Plant Industry, United States Department of Agriculture. (On furlough.)

BUCK, JOHN LOSSING, B.S. (Cornell), Acting Dean of the College of Agriculture and Forestry; Farm Engineering and Farm Management.

SIE KIA-SHEN, B.A. (Nanking), M.S. (Michigan), Associate Dean of the College of Agriculture and Forestry and Director of the Summer Schools; Animal Husbandry and Plant Pathology.

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CHAO CHUNG-TING, B.S. (Nanking), Chinese Secretary; Associate in Agriculture.

CHUN WOON-YOUNG, B.S. (Syracuse), M.F. (Harvard), Dendrology and Entomology.

FENG RUI, B.S. (Nanking), Associate in Cotton Improvement.

FOLK IM-CHEUNG, B.S. (Michigan), M.S. (Columbia), Chemistry.

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TS'IEN SUNG-SHU, B.S. (Illinois), Botany.

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YU CHIA-TEH, B.S. (Peking), Associate in Chemistry. (Autumn term.)

NOTE. This list does not include the Instructors in regular Junior College courses in Economics, English, Geology, History, Mathematics, Physics, Religious Education, and Zoölogy which are required of students in agriculture and forestry.

REPORT OF THE ACTING DEAN FOR 1920-1921.

Functions of the College.

There are educators in China, as well as elsewhere in the world, who are demanding in this age that education should contribute directly and solely to the financial income of the student. Especially is this true of agricultural and industrial forms of education. The ever increasing emphasis that is being placed on this vocational training indicates that the College, because it is an agricultural one, is meeting, in so far as it can, the demands of the present time. Yet it is with a sense of deep responsibility that those of us who are engaged in Christian agricultural and forestry work continue our efforts from year to year, for here lies a great opportunity to direct this type of education into its proper place in life, which is a far higher one than the materialistic trend of the day would lead one to believe.

In view of this modern tendency, it may be well to state our position and to indicate the real functions of the College. Those who are thoroughly acquainted with the work of the colleges of agriculture in the United States and with their faculties will understand what is meant in this statement: *many of the colleges of agriculture in the United States are doing some of the best home missionary work that is being carried on anywhere in the country.* This is true because emphasis is not confined to the income of the farmers alone but also extends to farm life—with the chief aim, better farmers. Dean A. R. Mann of Cornell University says 'Farming is a mode of living.' Time and again in the writings and speeches of the agricultural leaders of America and other leading agricultural countries, such as Denmark, for instance, we find similar statements, placing the emphasis not on greater yields but on the human result. Dr. Warren H. Wilson of the Department of Church

and Country Life of the Presbyterian Board of Home Missions says that the faculty members of many agricultural colleges are rendering valuable service in connection with the church work of various communities. Dr. Wilson finds them always ready to assist with lectures and demonstrations, all of which teach the farmer how to live a Christian life in a true, well-balanced, and practical way.

A fear is felt by some that education is becoming too vocational in nature, and there is a grave danger here. However, the fact should not be overlooked that agricultural education as it is conducted in the United States and certain other countries is often on a wider cultural basis than is commonly understood by those not in close contact with this phase of educational work. Many of the subjects in the curriculum of the agricultural college offer great opportunity for touching on the spiritual, social, and cultural side of life, and it only remains for the teacher to make the application.

With the agricultural colleges in other countries emphasizing the human product as compared with the material product of the farms, how much more should this be the aim of this College, which is a part of the Christian movement in China! The function, then, of this College is so to direct the development of agriculture in this country that the emphasis will be placed on the man rather than on the crop. To do this, the staff of the College should be composed of men who lead not only in the technique of their subject but also in the technique of making better farmers and farm families. Since the reason for the existence of the College is the saving of human life and souls, this statement of the function of the College should make it clear that we are trying to direct agricultural education into the proper channels to prevent it from becoming too materialistic, either as an education or in its bearing to the man on the land.

Sericultural and Mulberry Work.

The sericultural and mulberry work is carried on in coöperation with the International Committee for the Improvement of Sericulture. This Committee approved the last annual report of the Sericultural Department and generously made a grant of $4,000 to help to carry on the work this year.

During the year Mr. Ts'ien T'ien-ho, who is in charge of the sericultural and mulberry work, has brought about important developments for the successful improvement of the silkworm industry. Special attention is called to the various inventions of Mr. Ts'ien's which are absolutely essential to scientific work in sericulture.

Considerable interest is also manifested in the silk producing districts. In one place the Silk Cocoon Merchants have offered ten dollars a picul extra for cocoons produced from our certified seed (eggs).

The following is a brief résumé by Mr. Ts'ien T'ien-ho of the year's endeavors.

Sericultural Investigations.

Egg Production. From the four piculs of cocoons obtained in the spring crop, and after a careful selection from them, 27,722 layings of eggs were produced by the new egg laying method which we invented last year. These eggs are being tested microscopically for the most injurious silkworm disease in China, namely, pebrine. It is, of course, too early yet to tell what percentage of disease prevails, but indications are that it is going to be less than last year, when it averaged 62%.

Successive summer crops of worms are being raised, and a total of five crops will be reared this year. The proposed building for sericultural work is an imperative need for successful rearing.

Hybridization. Two years' experiment on the hybridization of different strains of silkworms has yielded interesting results. It was found that in a cross between a colored variety and a white variety the first generation is always colored. If the cross is between darker colored and lighter colored varieties, like yellow and green respectively, the first generation always shows the darker color as a dominant character. On the other hand, a cross between a three moulting variety and a four moulting variety often gives rise in the first generation to worms whose character always follows that of the

male parent, as far as the number of moultings are concerned. This is what is called genetically sex-linked character. In every case, except the last one, the results of which were difficult to observe, the second generation showed Mendelian segregation of characters very well, but did not follow the Mendelian ratio because too few worms were left at the time of spinning cocoons.

Purifying of Varieties and Breeding. However, our main work was not in hybridization but in purification of different strains of silkworms. Pure breed varieties of silkworms are very difficult, if not impossible, to secure in China, and it is necessary first to purify some of the best Chinese varieties by pedigree breeding and careful selection before we can go any further. With this end in view, we selected twenty varieties and many duplicates from last year's stock and reared them in five newly-invented silkworm rearing cases. Each rearing case contains ten drawers, in each of which is reared one variety of worms from a single laying of eggs. If any one of them proves to be pure and uniform right at the start, it will be multiplied as quickly as possible in future years and regarded as a pure variety which will then form the basis for crossing work. If, on the other hand, there are worms which are impure or have been mixed with other eggs, they will be either discarded or selected again. The results of this year's work was very gratifying.

The Silkworm Rearing Case. The silkworm rearing case, which has been mentioned, contains ten drawers and these drawers are so fixed at the bottom that they can be opened but cannot be taken away. Each drawer has a screen cover, and the sides are also screened except the front one, so that the worms can neither crawl out of the drawer nor be suffocated to death. The front side is partly detachable. The droppings and leaf remains can be removed from the drawer with the aid of a brush by opening the front side and letting the worms crawl on a piece of net put over the worms and covered with fresh leaves. The idea is that the worms when once put in a certain drawer shall never be allowed to leave it until they have completed their life cycle, hence all the danger of mixing is thus avoided. The whole case is 5′ 11″ high, 1′ 9″ wide, and 2′ 8″ long; and the individual drawer is 3⅞″ high, 1′ 6½″ wide, and 2′ 5¾″ long.

The New Cocoonage. When the worms in the drawer of the rearing case were ready to spin cocoons, they were put in a new cocoonage as a place to spin cocoons on, instead of on ordinary straw 'mountains' which are not suitable for use in the drawer. The cocoonage is composed of a wooden frame with a number of removable wooden or bamboo bars in it. The bars are one inch high, and ⅞ inch between the bars, while the width and length of the frame is just a little bit shorter than those of the drawer so that it can be put right in the drawer. The bars are not necessarily put in place all at once, which would deprive of room the worms still feeding on leaves; but

they are one by one regulated to the number of worms ready to spin cocoons. This is the great advantage of this new device, because it makes the rearing of worms and the spinning of cocoons at the same place possible.

The new cocoonage is also adapted for general usage, if the frame is put on the silkworm tray and the worms between the bars. It would have the following advantages, if so used :—

(1) It is sanitary, because the bars, if varnished, can be washed and kept clean. Furthermore, the frame must be put over a piece of paper, which prevents the fluid excreted by the dead or living worms from spoiling the drawer of the tray below.

(2) It saves space, because it can be put in the drawer or tray, thus doing away with the need for a special room.

(3) It is cheap, because a cocoonage, once made, can be used for many years, provided it is carefully handled. The initial cost is probably four times more than that of the straw 'mountain.'

The Silkworm Egg-laying Box. Although this was an invention achieved last year, several important improvements have been made since. It now consists of a round box, 1.2 cm. high and 4.8 cm. in diameter, having several small holes on the lid for ventilation purpose and one large hole and four cardboard legs about 3 mm. high at the bottom of the box, and contains a removable piece of paper on which the eggs are deposited. The hole at the bottom of the box facilitates the removal of the paper in the box, since, when necessary, one may stick a finger into it. The four legs insure air space between the boxes, when they are put one above the other for the sake of economizing space. When in use, a fertilized female moth is put in the box, the wings are kept flat on both sides, the lid is closed, and the moth lays the egg on the paper. The moth can be examined under the microscope for pebrine later on.

The Dry Oven. The last thing which has been worked out this year is a new dry oven, which is composed of two sections, the lower section containing an ordinary kerosene lamp with a short metal chimney and the upper section being a galvanized iron box containing ten trays, each 14″ by 14.″ The chimney is 2¾ inches in diameter on the top and 4¾ inches at the bottom. The diameter of the oil container of the lamp is 6 inches. The whole thing is 25½ inches high, 14 inches long, and 12½ inches wide. The function of the oven is primarily to dry a large number of slides and cover glasses, used in connection with the microscopic examination work, in a very short time. This saves time and labor in drying them as compared with the hand method and also reduces the percentage of breakage. It is also adapted for general biological work. This oven is capable of drying more than 100 slides in less than five minutes, and the lamp in the lower section has no smoke whatsoever.

Progress with Mulberry Culture.

Grafting. Last winter, over 21,050 young wild mulberry trees were dug up from the nursery and grafted by the Western root grafting method. After grafting they were buried under moist sawdust and later transplanted into the field this spring. They came through very successfully.

We also root grafted by a Chinese method 93,750 mulberry trees in the open this spring, making a total of 114,800. These are also doing well.

These trees will be sold to silk growers at cost in the spring of 1922.

Mulberry Collection. As we have already made collection from Hupeh, Kiangsi, Anhwei, Chekiang, and Kiangsu provinces, representing the most important silk growing sections of this country, we decided to begin collection of mulberry varieties from Japan this year. After a careful study of catalogues of Japanese nurseries, schools, and experiment stations, twenty varieties were chosen and bought from Japan, making a total of two hundred and forty trees. These trees were carefully planted in a piece of well prepared ground, and, in spite of late arrival, they are growing most satisfactorily.

Courses in Sericulture.

Special Course in Sericulture. In view of the fact that the students in the Short Course in Sericulture, which we have offered for the past three years, did not receive sufficient training during the spring months, we decided to change our plan by offering a special course in sericulture in lieu of the Short Course. This course, lasting for one year, will be composed of class work, field practice, and laboratory exercises, the aim being to give the students an intensive training in every phase of sericultural work, both theoretical and practical, in order that they may be well equipped and prepared to undertake any work necessary for the promotion and development of the Chinese silk industry. The distinct features of this course are that there is no summer vacation, the term beginning 10 September 1921 and ending 21 August 1922, and every student is required to write a thesis on something that he has investigated independently of his regular studies of the year. Up to the time of writing, ten students have already been chosen for this course from eighteen candidates who took the first entrance examination held July first at Nanking and some other cities; undoubtedly more will pass the second entrance examination to be held in September.

Course given at the Summer School. A course on Problems of Sericulture was also given at the Summer School which lasted six weeks beginning July fourth and ending August twelfth. Seventeen students attended the class.

General Matters.

Coöperation with Nanchin School, Kiangyin. At the invitation of Nanchin School, Kiangyin, we entered into an agreement with them, whereby we assist in developing the silk industry of that district by furnishing a man to conduct an experiment station under the auspices of Nanchin School and the Kiangyin Silk and Cocoon Guild. The Guild supported the scheme with $500 for the current year, while the Nanchin School provided land, buildings, leaves, and labor.

Accordingly Mr. Ma Chen, an assistant of the Sericulture Department, was sent to undertake this work, his salary and travelling expenses being paid by the Kiangyin Silk and Cocoon Guild. By hard and persistent work, he succeeded in producing a little over 7,000 layings of eggs, and is now rearing the summer crop with the coöperation of the Nanchin School staff.

This marks the beginning of our direct extension work along the line of silk improvement, and we are hoping that it will prove a great success.

Participation in the International Silk Exposition in New York City and in the Silk Fair at Lyons, France. Upon the advice of Mr. Julean Arnold, Commercial Attache of the American Legation at Peking, fifty-five articles, largely composed of statistical tables, charts, pictures, and silk samples, were prepared and we had the good fortune to have Mr. Ting Ju-ling, Head of the Chinese Silk Mission to the Exposition, take them over to New York City. In addition, several thousand copies of a pamphlet outlining the work that we have been doing at the University were circulated in the Exposition ground. The American Silk Association became interested and saw fit to make several thousand reprints of this pamphlet and to distribute it to its thousands of members throughout the United States. A number of pictures, which constituted part of our exhibits, were also photographed and printed in the *Silk Guide*, a silk journal of great eminence in America, upon the request of the editors of the said journal.

Soon after the International Silk Exposition in New York was over, these exhibits were sent to France by Mr. Ting for the Silk Fair at Lyons. They were very well received by the French public also, and at the close of the exhibition they were presented as a gift to a French University upon the special request of the authorities of that institution of learning.

Plans for 1922.

As sericulture is a very big subject involving many branches of study, we cannot begin to undertake them all with the limited amount of money and men at our command.

Our work can be further improved and expanded very rapidly if we can have more help, especially in the way of finance, either from generous individual or public organizations in addition to what we have

been receiving from the International Committee for the Improvement of Sericulture in China and from the University itself.

The following is a tentative plan for our work for 1922:—

(1) To offer a special course in Sericulture as described above.

(2) To raise fifteen piculs of cocoons for egg production.

(3) To graft 250,000 mulberry trees.

(4) To expand the mulberry orchard as much as available land will permit, so that in a few years the University will be in a position to give large quantities of leaves to the farmers in return for cocoons at the end of the silkworm season. This should prove a means of promoting the silk industry in Nanking.

(5) To carry out further experiments by entering into agreements with a selected number of farmers to raise for the University silkworms from eggs furnished by the University, and to sell the cocoons to the University at a somewhat higher price than they would get from the market per picul of cocoons. The University will use the cocoons for egg production purposes. This is a plan to induce the farmers to use only those eggs which have been tested microscopically as well as to help ourselves in expanding our egg production scheme.

(6) To continue silkworm breeding experiments.

(7) To continue mulberry collection from Japan, Italy, and France.

(8) To start investigation work on silkworm diseases. This will be undertaken by Dr. Charles S. Gibbs, an Agricultural Bacteriologist, who will arrive in September for this purpose.

(9) To inaugurate a circuit lecture plan.

(10) To coöperate with the University in holding a Farmers' Week.

(11) To publish pamphlets and circulars to be distributed to silk growers as part of our educational scheme.

Cotton Improvement

Considerable progress has been made during the year in the cotton improvement work, the finances of which are generously provided by the Cotton Mill Owners' Association and the Shanghai Cotton Anti-adulteration Association. The budget guaranteed for this year is the same as for last, i.e., $8,903.

It is gratifying to see the tangible results which have already been made possible through the coöperation of these Associations and to know that within a short period the Chinese farmer will be receiving improved cotton seed.

The complete report of the cotton improvement work has already been printed, hence only a summary of that report, as outlined by Mr. J. B. Griffing, is given here:—

American Cotton Results

The work of last year has been directed largely along two lines, the acclimatization of American cotton and the improvement of Chinese cotton.

Pure seed imported from America was grown on the University farms and in coöperation with stations at Nanhsuchou, Tunko, Nantungchow, Shanghai, and with a farmer near Nanking. The yields at the interior locations were very satisfactory, in spite of the fact that the arrival of the seed was a little late for most favorable planting. At Nanhsuchou the American cotton gave a yield on the best plots of 174 catties per mow as compared with a yield of 96 catties of Chinese cotton.

At the University farm the fields were both heavily rogued and then selected so that yields cannot be figured, but on similar soil, at the Nanking station of the Chinese Mill Owners' Association, there was a yield, from seed which we supplied, of 185 catties per mow, while their best Chinese cotton was 111 catties per mow. The farmer near Nanking on rather light upland made a little over 100 catties per mow and is expanding his area this year.

American cotton at Shanghai and Nantungchow was not a success, and these districts can probably best be served by an improvement of Chinese cotton combined with a crusade against the pink boll worm.

Chinese Cotton

In Chinese cotton improvement we have been successful in creating a new and superior variety of Chinese cotton with lint from one inch to one and one-eighth inches, of fine quality and color and heavy yield. Of this selection there were but seven plants, but the seed from these has planted between two and three mow, which will give a commercial sample of lint this year and seed for more than 100 mow next year.

Three other improved strains of Chinese cotton are also being propagated for maximum multiplication in a pure state.

Selection Work

During the fall 6,000 selections were made of the American cotton in the acclimatization work, and 15,000 selections were made in Chinese cotton fields. These samples were all given careful laboratory study throughout the winter and the best saved for propagation.

It is only by a combination of field selection, careful laboratory selection, and roguing, that success may be attained in acclimatizing American cotton.

The average quality, percent lint, lint index, etc., of the American cotton was lower than in America, but the specimens finally selected for planting were superior to the average in America.

Roguing Difficulties

The policy of roguing the cotton grown on the lands of coöperation did not prove very satisfactory and it will be advisable greatly to expand the area grown directly by the University. At the same time it is necessary to carry on a campaign of education in order that a pure supply of seed so establishad may be properly spread and maintained.

Methods of Culture

A number of investigations were made in methods of culture and production costs and five different machines have been devised and used experimentally in cotton cultivation. We are now ready to recommend the use of a machine of a type which can be made locally at a cost of about four dollars Mexican; this can cover twenty times the area in a day which a man can hoe.

An investigation was made of the insect pest of the Pootung district, and a general study of the pink boll worm situation. The former insect may possibly be kept in check by the use of a certain poisonous dust (calcium arsenate) applied by hand dust guns. The pink boll worm can be checked by fumigation of seed. It will not be practical to fumigate all the cotton seed planted in China, but the pink boll worm can be checked in all areas where seed control is established. That is, by developing improved seed areas on a community basis and by controlling the seed supply, the improved seed can be fumigated and the pink boll worm be reduced to a minimum in all areas under such control.

Ginning

The cotton of farmers in the neighborhood of Nanking as well as the University cotton was ginned on the small hand gin by operating from the beginning of the season in the fall until about China New Year. The expansion of a pure seed supply by the University, the gaining of control of the pure seed situation, and the establishing of a pure seed center at Nanking will depend upon securing a small power gin. A three horse power kerosene engine equipment could handle the product of 2,000 mow during a run of one hundred days.

Training of Personnel

In the training of personnel the fund which was designed to cover the work of six assistants has been stretched to cover a total of twelve assistants, besides nine others who have done cotton work and paid their own expenses. The work of a large number of assistants not only develops a large personnel but makes possible a large amount of cotton work.

In educational work demonstration lectures have been delivered at eleven different schools or community centers to the extent of seventy different lectures. An educational exhibit has been maintained at the University, which has been explained several times a week to visiting students, gentry, and others seeking agricultural information. A class in cotton culture and one in plant improvement have been given in the University throughout the year. In all the work emphasis has been placed on the practical activities in the field.

Publications

The publications of the department are given on page 32 and need not be repeated here.

Plans for 1921

The work projected for the coming year will be largely concentrated on creating a high quality of acclimatized seed from the selected American stock and in multiplying in the most rapid manner the improved Chinese cotton already secured. Because of the difficulties involved in roguing cotton on the lands of others, the area of pure seed grown by the University will be expanded by the leasing of land and operating the same directly. It is hoped that by practising strict economy the expanded area will be made self-supporting. The selection and breeding plots at the University for this year cover about seventy mow. In addition to this the University has purchased 150 mow of good land outside the city wall, of which sixty mow are planted to American cotton, and another tract has been leased on which nearly one hundred mow have been put in. By establishing a ginning unit that can gin the cotton of the adjoining farmers, a pure seed area will be established and expanded at Nanking.

American cotton seed will be acclimatized at Nanhsuchou and Chuchow. At the former place the Presbyterian Mission donates the use of land up to twenty mow, and at the latter station fifty mow of land have been donated by the gentry for the work.

For the Chinese cotton work, the breeding plots will be located at the University at Nanking and expansion areas are being established at Kiangyin where the gentry have donated the use of twenty mow of land and at Shanghai where we have rented twenty mow.

The search for superior Chinese cotton types will be limited to the fields that are already planted with selected seed.

Special attention will be directed to investigation of insect problems; the campaign for prevention of the entrance of boll weevil; and the establishing of ways and means of checking the damage of the pink boll worm.

In training personnel the maximum number will be given work which the fund provides and invitations are being extended to organizations to send young men to participate in the practical work, paying their own expenses. A short course in cotton will be conducted during the summer at the University and a regular course throughout the year.

Demonstration lectures will be given at schools and in communities wherever opportunity offers. The exhibit will be greatly enlarged, and a set of stereoptican slides will be prepared for extension work. The literary propaganda will be continued through the press by publishing bulletins and translations. This we have found to be one of the most important phases of the work.

Work of the Experiment Station

The principal work carried on in this field of endeavor is in the experiments in cotton and sericulture which have been already described. Other experiments which are becoming increasingly important each year are as follows:—

Wheat

Of the 100 varieties grown and harvested in 1920, twenty-four were discarded as not worthy of future trial. The remaining varieties were again planted in rod-row tests in the autumn of 1920. Five of the best varieties grown in 1920 were sown in plats and gave a yield of over forty bushels to the acre.

Some work in individual selection has also been done with the expectation of securing superior plants.

Rice

Rod-row variety tests are also being carried on with rice. One hundred and ten varieties were planted this year in order to test out those of the best quality and show the larger yielding capacity.

Corn

The corn improvement work is still being continued. During the past year a large number of orders were filled for improved seed. In fact the demand was much greater than the supply of seed.

During the past year the experiments with wheat, rice, and corn have been carried on by Mr. Ritchey, in addition to his other duties. As he states, one of the biggest needs of

this work is trained men who can take charge of the details of the various experiments.

Fruits

Progress has been made this year in grafting peaches and apricots, which will be ready for sale next spring. Seedlings of the more common fruits are being raised as stock for next year's grafting.

Grapes

As has already been stated in previous reports, Dr. W. E. Macklin has been carrying on the experiments with grapes. His experience has covered a sufficient period of years to warrant a summary of results obtained.

One of the best grapes is the *Agawam*, a delicious sweet grape which ripens the last of July and in early August. *Moore's Early*, a dark purple grape, ripens at the same time and does nearly as well.

Many varieties of *Muscadine* grapes from the Southern part of the United States have been tried with a fair degree of success. Some of these are:

Scuppernung, a light yellow or red grape, ripening in September. It is quite sweet and makes good jelly, juice, or jam. It ripens unevenly and the ripe ones fall off too easily.

Thomas, the sweetest of all Muscadines, ripening in September. It is reddish and ripens unevenly.

James, the largest of the Muscadines. It is black, ripens fairly evenly and into October. It is satisfactory, but not very sweet.

Smith, similar to the James but not so large.

Luola, ripens through October and hangs on well. It is not sweet.

Flowers, similar to the Luola.

Black Early, is the earliest of Muscadines and ripens in late July and early August quite evenly.

The *Purple Concords*, *White Concords*, and *Niagaras* do very well for family purposes. On a commercial scale they would not pay, due to injury by wasps, bees, and mosquitoes. They are not liked much by the Chinese.

The *Pierce* and *Catawba* do fairly well, but ripen unevenly in August, and the first fruit to ripen draws flies and wasps.

Of the finer European and California grapes, the following have been tried: *Malaga*, *Muscat*, *Thompson's Seedless*, *Flaming Tokay*, *Dettier of Beyrout*, *Sultana*, and *Sweetwater*. Some of the fine grapes from Shansi, Shantung, and Chihli have also been tried. The damp weather of the Yangtze Valley causes all these varieties to become diseased. Black spots appear on the young leaves, flower clusters, and stems, and later the whole plant turns entirely black as if burned with sulphuric acid. When the disease is mild, the fruit is only partially destroyed. After a few years the vines get dark and rough and then die.

Insects. There are three different borers which injure the vines. When the grapes are pruned, the vines should be burned. Chances of injury are less when four or five stems are allowed to grow from the main stem near the ground. If the borer injures one or two stems, other branches are still left.

A very large number of orders for grape vines were filled this past spring. Indeed, the demand was greater than the supply.

Notes on Curriculum Courses

Forest Dendrology

One of the greatest needs in Forest Dendrology is about to be filled with the publication of a book on Chinese trees by Mr. W. Y. Chun of this department. Mr. Chun has written the publication in English and Mr. S. S. Ts'ien will supervise the translation of it into Chinese. It will probably be off the press in the autumn.

Preliminary work in the investigation of Chinese woods is well under way, and has been partially carried on with the help of the students in the Dendrology class.

Mr. Chun's valuable collection of Hainan plants amounting to 2,000 specimens has been purchased and added to the Herbarium.

Entomology

A class of twenty-four students were given a practical course in Entomology by Mr. Chun during the spring term.

The correspondence regarding insect pests is increasing each year and considerable time is required for answering these letters and recommending the proper sprays.

Agronomy

During the year, a course in General Farm Crops was given by Mr. G. E. Ritchey to a class of fifteen students, a course in Farm Crop Improvement was given to eight by Mr. Griffing, and a course in Soils to seven students by Mr. Ts'ien T'ien-ho. Next year two terms of work in Advanced Farm Crop Improvement and two full years in Soils will be given, thus making a thorough course in Agronomy. Mr. Ritchey finishes his first year's language work this year and will be giving his entire time to this department in the future. The teaching he has done this year has been in addition to his language study.

Botany

Mr. S. S. Ts'ien has been kept very busy this past year with the herbarium work, in addition to his regular teaching. There were four Botany classes with a total of forty-eight students.

The emphasis in the herbarium work has been placed on the collection of local plants about Nanking. A total of 6,534 specimens were collected during the past year, of which 3,118 have been mounted. There are 892 species in the Herbarium,

of which 752 are identified. The total number of mounted specimens is now 4,618. Mr. W. Y. Chun's valuable Hainan collection of 2,000 specimens has also been added to the Herbarium, making a grand total (including those already in the Herbarium at the beginning of the year) of 8,534 specimens.

Plans are still under way for the securing of the services of Mr. E. D. Merrill of the Bureau of Science of the Philippine Islands. It is hoped that part of Mr. Merrill's time may be spent at Nanking.

The Herbarium can undoubtedly be made more than self-supporting through the sale of specimens to schools, institutions, and arboretums, as well as to private herbariums.

Forestry

In the spring the forestry students were given special field work at the Lou-shan and Ming Tomb planting stations, and were taken to Shantung to inspect the forests about Tsingtau and the Shantung provincial forestry work.

The Forestry Department is making its contribution to the re-afforestation of China more by sending out graduates to take responsible positions in nursery stations and planting work than it is in direct re-afforestation. All our graduates are holding responsible and important positions.

Plant Pathology

During the autumn Mr. Sie had a class of ten students in Plant Pathology. In addition to his teaching and administration duties, he also added a considerable number of plant disease specimens to the Herbarium of the Plant Pathology Department.

Farm Management

Farm surveys and other important surveys relating to Farm Management are under way in coöperation with the other departments, especially the cotton and extension

departments. Individual undergraduate students who are specially qualified are also making surveys during their summer vacation. In this way it is hoped to gather information which is essential to the understanding of the farmer's problems and to the effective teaching of a course in Farm Management adapted to Chinese conditions.

Farm Engineering

Cultivators. During the past year Mr. J. B. Griffing has had several shovel cultivators made locally which he is using for the cultivation of his cotton and which are also being used for cultivation of other crops on the University Farm. The cultivator saves a large amount of labor and does the work even better than a laborer and his hoe. The device is simple and can be used by any farmer. It is reasonable in price and can be made anywhere in the country. This cultivator can be used for other crops such as corn, beans, and gaoliang, and should prove a labor and money saving device to the farmers. It will also enable the farmers to use otherwise idle animals. It is a very common practice for the farmers to be out in the field hoeing their crops, while animals are resting contentedly at home.

Plows. The best plows that have come to our attention are those manufactured by the Oliver Chilled Plow Company. Mr. C. J. Sellers, a representative of the company, brought two plows to the University last year. Both plows are one-handled, but one has a wooden beam and the other an iron beam. The one-handled iron beam plow is the same in general construction as a two-handled Oliver plow which we have had on the farm for two years and which has only just come to need a new share, due to the old one having been broken. The promising feature about these plows is the chilled mould-board and share, which wear a long time without the necessity of renewal. Then, when it is worn out, instead of re-sharpening as in the case of the steel share, a new share can be bought.

This is not a heavy expense owing to the infrequency of the need for a new share.

The Oliver people have generously promised to send us a shipment of various styles of their small plows for demonstration in various sections of China. Upon arrival these plows will be sold to any one upon receipt of the cost price of the plows.

Land

Considerable land additions have been made during the past year. About thirty *mow* (including a few fish ponds) were purchased inside the city and 150 *mow* were purchased outside the city one and a half miles beyond the Taiping Gate. One hundred and fifty *mow* were also rented outside of the Shuntze Gate for a period of five years at $350 a year. The Taipingmen farm cost about $3,700. Both pieces of land are being used largely for cotton. However, the Shuntzemen farm has about thirty *mow* of mulberry orchard which are being used by the Sericultural Department and there are about fifty *mow* of rice land on the Taipingmen farm, which will be used for rice experiments in the future.

Landscape Gardening

Initial steps were taken this spring for the beautifying of the campus with a large collection of different species of shrubs. The work has been undertaken by Messrs. W. Y. Chun and S. S. Ts'ien, and they have made a good beginning by planting different species of shrubs and trees. These were secured largely from the Yokohama Nursery Company, the Shanghai Parks, through the generosity of Mr. J. MacGregor, and from our own nursery. The plants that are not represented in our own nursery will be used to some extent for propagation work.

It is planned to continue this work of landscape gardening with the idea of having it form part of what is hoped will be an arboretum.

Agricultural Gardens

The Agricultural Gardens is the organization under which all our field work is carried on and the products sold. These products include nursery stock, vegetables, fruits, flowers, tree and vegetable and flower seeds, and spraying materials. The proceeds from the gardens maintain the entire organization, including the experimental work in fruits, wheat, corn, and rice.

The sales for the past year were $11,194.89, as compared with $7,000 last year, $4,100 for 1918-19, and $2,400 for 1917-18.

The number of orders filled this year was over 2,500. About 2,000 people were served, as compared with 1,300 last year. The value of tree seeds sent to the United States was doubled and gave a return of about $1,100 gold. A great many of the nurseries are anxious to secure the rarer seeds from China for ornamental, shade, or forest purposes, and fruit seeds for grafting stock.

Not only do the seed and nursery stock sales meet a long felt want in China, but the business is helping students to earn their way through the College. Mr. T. C. Tang is giving nearly half his time to the seed sales and is in charge of the seed room. In return for this he is given free tuition, board, and fees. Other students help Mr. Tang during the rush season at the rate of ten cents an hour. Miss Priest, after her arrival, took over the supervision of the office details connected with the execution of the orders and the making out of the bills and the large amount of correspondence connected with the orders.

Extension Work

In the Vicinity of Nanking and with the Local Missions

Mr. Hwa Peh-hsiung, graduate of the Class of 1920, has been faithfully carrying on one of our most important and promising phases of work. In any effective extension work it is necessary to know something of the conditions with which one is dealing, and for this reason it has been necessary for Mr. Hwa to make investigations into the economic and social conditions in the rural communities. Mr. Hwa has been using survey blanks in order that his investigations may be systematic. The work of investigation has always been combined with lectures to the government and mission schools of the locality, with talks with individual farmers on better farming, with developing an acquaintance with the local district leaders, especially with those who have a deep interest in the improvement of agriculture, and with the distribution of the College bulletins. The results of this work are shown in the growing correspondence from individuals in the localities visited by Mr. Hwa and in the purchasing of farm implements, spray materials, etc., from the College. Some persons have even come in to visit the College.

This work has been carried on in close coöperation with the local missions, and enthusiastic reports are given by both the Chinese and foreign evangelists. Mr. Hwa very often combines his agricultural talk with one on Christianity, at other times he gives one or the other. The Chinese pastors always seize the opportunity to use agriculture as a point of contact when Mr. Hwa visits them. Mr. Hwa says, 'I found the preachers and pastors of different churches are all very anxious for me to give lectures in their churches, so that they can make a good contact with the audience, thus giving them an introductory opportunity to win them step by step to Christianity.'

Mr. Hwa spent two months during the spring in famine work in Shantung, and in the connection had opportunities to do some direct extension work in agriculture.

Farmer's Bulletin

The first of what is to be a series of farmer's bulletins has been published by the College of Agriculture and Forestry. The pamphlet is written in simple language ('bei hwa') by Mr. Shao Teh-hsing. The subject dealt with in this first bulletin is 'Deeper Plowing.' The front page has a symbol of Chinese agriculture, i.e., the plow and rice heads. On the back page there is a simple statement about Christianity, and the recipient of the bulletin is urged to go to the nearest evangelist or pastor to learn more about the Gospel.

The first edition of 10,000 has already been disposed of to mission stations, which are using them in conjunction with their evangelistic work. Another edition of 20,000 is just off the press. The bulletins are paid for by the missions using them, thus making this phase of the work self-supporting at the cost price to us. All but a thousand of the bulletins have been disposed of in North China, where the need for better plowing is so evident.

All the publications of the College are used in extension work and a list of these may be found under the section of this report dealing with publications. (See page 32.) Many of these do not, however, reach the ordinary farmer, but are used by schools, experiment stations, agricultural associations, and individuals interested in the development of agriculture.

There are many phases to the extension work that should be carried on by the College. Not the least of these is the giving of lectures, illustrated and otherwise, to the various mission and government schools in the neighbouring provinces. Most of the students in these schools do not even know that there are large opportunities for the boy who studies agriculture. They think of it as many people do, in-

cluding the farmer himself, that one does not learn to farm by studying books.

This kind of extension work must be undertaken by the College just as soon as it is possible to do so. With visits to these schools, community lectures should also be given. A month's time devoted to this work would reach thousands of people.

Summer School

This summer (1921) the College is giving five courses in the Extension Summer School. These courses are General Agriculture, Agricultural Education, Cotton Culture, Soils, and Sericultural Problems. The total number of students registered in agricultural subjects is thirty-five. Most of them are taking several of the agricultural courses. The majority of the students to attend are teachers and evangelists from the missions, most of them having been sent by the missions. One of the most serious difficulties that the missions have in starting agricultural work, such as school gardening and simple teaching of the underlying principles of agriculture, is the lack of qualified teachers. It is hoped that with these summer courses, missions will be enabled to proceed with the work they are anxious to undertake.

Missionary Interest in Agricultural Education

Missionary interest in agricultural education is still increasing. Letters are continually coming to us with various requests and questions. Some ask regarding the possibility of securing one of our graduates. Owing to the big demand for our graduates, we usually have to write back and suggest that they send us a student with the idea that he return to the mission to take up agricultural work. Then, too, the demand from the government schools and experiment stations for our men is much greater than we can meet. Other letters ask how to start agricultural work in the schools; some ask us to send a representative to an educational meeting to present the opportunities in agricultural education. Just a few days ago we had a request to send a representative to give a series of lectures to the theological students of Shantung Christian University on the relation of the pastor to his country church and constituency.

If one wants any further evidence of the interest in agricultural education, one has only to realize that most of the summer school students were sent by the missionary body from long distances, requiring as much as a week's time to reach Nanking. Another year a much larger representation is expected, because the summer course will be better advertised and will be announced earlier. In fact, the students who have come this year will be one of the best advertisements.

In May 1920, an important action was taken by the Agricultural Committee of the China Christian Educational Association, which concerns the College, and is as follows:—

> In view of the increasing demand among missionaries for Christian trained teachers of agriculture, school gardening, and nature study, and for agricultural extension workers, and, owing to the fact that this need is not now being adequately met, we recommend that men and money for agricultural missionary work be sent to such missions and institutions as can train Christian men for the purpose of meeting the above mentioned needs.
>
> This will mean the placing of agricultural missionaries and financial support in such places as the College of Agriculture at Nanking and the Canton Christian College for the purpose of strengthening these institutions, and in secondary training centers such as those already recommended by this Committee, and in normal schools. We recommend that requests from these institutions be given first consideration.
>
> We consider it inadvisable at the present time for a mission to place an agricultural missionary in a mission station which is not planning to develop a large work along this line, or which has not the purpose of training teachers and leaders. It should also be remembered that one foreigner can do little without a number of properly trained assistants and these are very hard to secure at present. We believe that more rapid progress in agricultural missions can be made by the concentration of agricultural missionaries in training centers of college and secondary or middle school grade and in normal schools.

Coöperation

Support from Coöperating Mission Boards

Four of the coöperating missions now have representatives on the staff of the College of Agriculture and Forestry. The Northern Presbyterians have two, the Foreign Christian Mission one, the Northern Methodist one (arriving in September), and the Northern Baptist one (arriving in September). This hearty support from the Mission Boards is greatly appreciated and the return to the missions will become increasingly felt as the work develops.

Individuals

Acknowledgment should be made to the very large number of individual missionaries and others who have coöperated in various ways, such as collecting plants or seeds, securing information, etc.

United States Department of Agriculture

As in the past there has been close coöperation between the College and the Department of Agriculture. Seeds, plant specimens, and information of various kinds have been secured and exchanged.

One of the most advanced steps in this coöperation is the arrangement made between Mr. Walter T. Swingle of the Department and Dean Reisner of the College whereby Miss Katherine H. Wead, B.A. (Smith), of the Department of Agriculture Library, is loaned to the University for at least one year, for the purpose of helping with the collection and indexing of the agricultural and botanical works, which are so essential to scientific agricultural work in China. As far as possible, two sets of each book will be obtained, one for Mr. Swingle for the Congressional Library and the other for our own Library. Half of the expenses are to be borne by the University. Miss Wead comes especially qualified for this

work, as she has been aiding Mr. Swingle with the indexing of the Chinese works in the Congressional Library.

Governor of Shantung and Forest Service

The nature of this coöperation was carefully outlined in last year's report. During the year Mr. D. Y. Lin continued to give considerable of his time and thought to this important work. In fact, the Governor found that the work had gone forward so rapidly under Mr. Lin's able leadership, that it became necessary for him to ask for Mr. Lin's entire time. Owing to the importance of the reafforestation work in Shantung, we finally agreed to release Mr. Lin to the Shantung Government, although he is still working in close coöperation with the College.

Government Coöperation

Government Recognition. We are pleased to announce that the College of Agriculture has received government recognition from Peking. This means that the students who graduate from the College of Agriculture will receive at least the same recognition in government circles as students graduating from government schools. Only those students from schools recognized by the Government are allowed to take its examination for official positions. We, however, aspire to a recognition which will be manifested by the quality of work which our graduates are able to do. The suggestions of the Committee on Government Recognition in regard to the desired increase of the College of Agriculture faculty are well taken and are also in accordance with our plans. We appreciate very much the work of the committee and their suggestions.

Scholarships. Although official government recognition has only just come, the College has been recognized for some time through the fact that various of the provincial governments have sent scholarship students to us. At the present time the scholarships students are as follows: Anhwei eight

(forestry), Shansi twelve (ten in agriculture and two in forestry), Shantung three (forestry), Kiangsi one (agriculture).

Forestry Fund

In addition to the grant of $5,000 a year for the support of teachers for three years, the Forestry Fund Committee maintains two full scholarships and a scholarship loan fund of $5,000 established in 1919, $1,000 becoming available each year for five years.

Contributions*

Grateful acknowledgment is made of the following contributions to our work:—

Through Mr. Tillson of Montgomery Ward & Company, Shanghai office, agricultural implements to the value of $225.64 have been loaned for demonstration purposes.

The Oliver Plow Company, through their representative, Mr. C. Sellers, presented the College with an Oliver plow for demonstration and use. Mr. Sellers also promised to send a small shipment of various sized plows for demonstration work and for sale at cost price.

The Commissioner of Public Works of Shanghai, Mr. Charles H. Godfrey, has donated two barrels of activated sludge for fertilizing purposes.

The Northern Manufacturing & Trading Company of Shanghai has donated one barrel of nitrate of lime for fertilizing purposes.

Two hundred pounds of nitrate of soda and 175 bulletins on the use of fertilizers were given by Mr. C. G. Atwater of the Barrett Company, 17 Battery Place, New York.

A thresher pump and a diaphragm pump for irrigating purposes have been given by Andersen, Meyer & Company of New York City, through Mr. Adams.

*Only those contributions not noted elsewhere in this report are mentioned here.

As mentioned in last year's report, Mr. E. E. Luther of the California Spray Chemical Company has given scholarships not to exceed a total of $200 a year from the sale of spray chemical materials consigned to the University.

Students

There was an increase of 90.2% in the enrolment of the agricultural and forestry students in the Junior College over last year, which is the highest since the opening of the College in 1914. The average enrolment for the Junior and Senior College for the year is given in the accompanying table:

	Junior College			Senior College		
	Enrolment	Christians	Graduates	Enrolment	Christians	Graduates
Agriculture	38	12	13	17	8	5
Forestry	28	6	5	4	1	2

We are pleased to announce that three out of four of our graduates who competed in the Tsing Hua examinations for further study in America successfully passed their examinations. The three students are Chang Nien-yuen, '21, Feng Rui, '20, and Li Tsi-tung, '21.

Faculty Notes

During the past year there have been nine foreign-trained men on the faculty, five Chinese and four American, devoting full time to the College of Agriculture and Forestry. There are four associates in agriculture and forestry, four assistants, and two extension men. Two new members (Americans) have been appointed and they will arrive in September 1921.

Mr. Chun Woon-young came in October. In addition to post-graduate work, Mr. Chun has had practical work in

nurseries in the United States. He has also made a valuable collection of tree species in Hainan, two thousand of which he has sold to the College Herbarium.

We very much regret that Mr. Ts'ien Sung-shu, after a year and a half of faithful service in teaching Botany and building up the Herbarium, is leaving to take a position with the Teachers' College, Nanking. Mr. Ts'u Liang-fu will leave with Mr. Ts'ien.

On 1 May 1921, Mr. Lin Dao-yang began his new work with the Forestry Service of the Shantung Government. He accepted this position because of his close connection with the work in Shantung and because of the big need for someone to take charge of this practical side of reafforestation. Mr. Lin will work in close coöperation with the College and will hold the position of Honorary Lecturer.

Miss E. M. Priest, English Secretary for the College, came in March 1921, thus relieving a great deal of the pressure in the administrative work of the College. Miss Priest formerly had a position as book-keeper at the Beaver Mills, a wholesale woodworking concern in Keene, New Hampshire, for a period of three years. Later she acted as teller of the Cheshire National Bank of Keene, New Hampshire, and spent nearly four years there, leaving the Bank to come to China.

Mr. N. K. Ip came on June first to take up teaching work in the Forestry Department. Mr. Ip has had practical nursery work in the United States. In 1915 he was made Assistant Magnetic Observer with the Terrestrial Department of the Carnegie Institution of Washington. He held this position for eighteen months, and travelled through most of the provinces of China. For fourteen months he was in the Y. M. C. A. service in France. Mr. Ip was then engaged in Y. M. C. A. work for a period of ten months at Hankow.

Dr. Charles S. Gibbs has been appointed as the Baptist representative in the College. Dr. Gibbs was principal of Old Lyme High School, Old Lyme, Connecticut, in 1916-17. During 1917-18 and 1919-21 he took his graduate work at Yale, his major subjects being bacteriology and bio-chemistry, and minor subjects, German and economics. His thesis subject was 'Modification of the Complement Fixation Test in Infectious Abortion in Cattle.' During the summer of 1918 Dr. Gibbs worked on infectious abortion in cattle, white diarrhœa in chickens, and Keel in ducks, at the Connecticut Agricultural College. At this time he discovered B. Anatum, the curative agent in Keel. In 1918-19 he was Bacteriologist for the United States Army, Base Hospital, Camp Upton, New York. Dr. Gibbs will undertake investigations in silkworm diseases, rinderpest, and other animal diseases. He will arrive in September.

Mr. A. N. Steward, Botanist, has been appointed as the Methodist representative in the College of Agriculture and Forestry. He will probably arrive early in September in time for the opening of the autumn term.

Commencing with June 1921, Mr. Shao Teh-hsing began devoting part time to the over-sight of the University Farm. The rest of his time will be given to cotton improvement or teaching in extension courses.

Mr. Li Tai-fang, after nearly two years of faithful service in forestry extension, accepted a position with the Weihsien-Chefoo Railroad, which is undertaking forestry work.

Mr. Chang Chw'an-ching came in April to carry on the extension work in forestry. Since graduating from the College of Agriculture and Forestry, he had been engaged in the forest service of the Peking Government.

Mr. Wang Kwoh-ting began his work as associate in sericulture after graduation in June 1920.

Mr. Feng Rui has passed the Tsing Hwa examinations and will undertake further study in the United States. He hopes to engage in our sericulture work upon his return.

Messrs. Ma Chen and Liu Ch'en, graduates of our 1920 short course in sericulture, began their duties as assistants in July 1920.

Mr. Li Tsih-hsing, after one and a half years of faithful service, has taken a position as principal of the Wuhu Agriculture School.

While we very much regret to have members of the faculty who are doing satisfactory work leave the College, still we realize that other institutions are in need of good men and in the case of those we have trained, such as our own graduates, we feel that this is a part of the service we must render.

Publications and Reprints

The publications in the accompanying table were all published during the year 1920-21. Most of them are mailed free upon request. The Chinese bulletins are usually mailed as soon as issued to the experiment stations, magistrates, forest nurseries, and agricultural societies in the ten provinces nearest to Nanking. The 'Nursery Stock and Seed List' was mailed to 4,000 missionary and business people. Reprints of 'Methodism and Agriculture' and 'Foreign Missions and Agriculture,' both by Dean Reisner, were enclosed with the 'Nursery Stock and Seed List.'

General Publications.

	In English.			*In Chinese.*		
Title and Author	*Pages.*	*Copies.*	*Distributed.*	*Pages.*	*Copies.*	*Distributed.*
Nursery Stock and Seed List, 1921 ...	22	4,200	4,100	18	3,500	3,000
Control of Plant Diseases and Insects, by G. E. Ritchey*	20	1,200	200			
Farmer's Bulletin on Deeper Plowing, by Shao Teh-hsing†				8	30,000	11,500

Publications on Cotton.

Roguing of Cotton, by J. B. Griffing	8	2,000	800	10	2,000	1,000
Cotton Culture, by J. B. Griffing ...	13	500	300	10	1,000	400
Dangers and Control of Cotton Seed Importation and Distribution in China, by J. H. Reisner; translated from 'Millard's Review,' 29 January 1921 by Shao Teh-hsing.				3	1,000	600

* These bulletins are distributed by request only.

† Mission stations may purchase these at cost price, for distribution in connection with their evangelistic work. See 'Farmer's Bulletin' under 'Extension Work,' page 23.

A Disorder of Cotton Plants in China, by O. F. Cook; translated from the 'Journal of Heredity' by Shao Teh-hsing	7	1,000	200
Selection of Cotton by Character of Leaves, Stalks, and Bolls, by O. F. Cook; a bulletin translated by Shao Teh-hsing	22	2,000	1,600
Cotton a Community Crop, by O. F. Cook; translated from the 'Journal of Heredity' by Shao Teh-hsing	8	1,000	200
Possibilities of the Introduction of American Cotton into China, by J. B. Griffing; translated by Shao Teh-hsing	6	1,000	1,000

Publications on Sericulture.

Report of Sericulture Work for 1919-20, and Announcement of Special Course in Sericulture, by C. L. Chien (Ts'ien T'ien-ho) ...	18	2,000	1,000
Development of Silk Industry, by C. L. Chien and Wang Kwoh-ting	26	3,000	2,000
Silk Repellants, by C. L. Chien ...	10	3,000	2,500
Silkworm Egg-laying Box, by C. L. Chien	3	3,000	1,000

The Faculty in Print.

In addition to the publications already mentioned, the following articles or books have been written by members of the faculty during the past year:—

By John H. Reisner.

Progress of Forestry in China in 1918-1919. In American Forestry Magazine (illustrated), Washington, D.C., November 1920; also in Commercial Handbook of China, by Julean Arnold, Government Printing Office, Washington, D.C., volume two.

Progress of Forestry in China in 1919-1920. In Journal of Forestry, Washington, D.C., April 1921; also in Millard's Review, Shanghai, 2 April 1921; also in World Agriculture, Amherst, Massachusetts, spring and summer number, 1921.

Nut Culture in China. In American Nut Journal, Rochester, New York, 21 February 1921.

Control of Cotton Seed Importation in China. In Millard's Review, Shanghai, 29 January 1921.

Modern Commercial Fertilizers in China. In American Fertilizer, Philadelphia, 7 May 1921.

Farm Implement Market in China, in International Trade and Shipping Digest (illustrated), San Francisco, 1921; also in Weekly Review of the Far East, Shanghai, 6 August 1921.

New Discoveries in China Silk Culture. In American Silk Journal (illustrated), New York, September 1920.
Practical Work to Improve China Raw Silk. In Silk (illustrated), New York, October 1920.
Improve China Raw Silk. In International Trade and Shipping Digest (illustrated), San Francisco, March 1921.
Important Developments in Missionary Interest in Agricultural Education. In Educational Review, Shanghai, October 1920.
Foreign Missions and Agriculture. In Chinese Recorder, Shanghai, October 1920.
Relation of Agriculture to Missionary Activities. In Report of the Twenty-eighth Annual Session of the Foreign Missions Conference of North America, Garden City, Long Island, 18-20 January 1921; also (abridged) in All the World (illustrated), New York, April 1921.
Poultry Industry of China. In Pennsylvania Farmer (illustrated), Philadelphia, 1921.
America Helps China Reforest her Barren Hills. In New York Evening Post (illustrated), New York, May 1921; also in Weekly Review of the Far East, Shanghai, 18 August 1921.
Agricultural Education in China. In World Agriculture, Amherst, Massachusetts, spring and summer number, 1921.

By C. L. Chien (Ts'ien T'ien-ho).

The Abolishment of Existing Laws Regulating Cocoon Shops in Kiangsu Province (widely published in Chinese newspapers).
Silkworm Egg-laying Box. In Science (Chinese), Shanghai, March 1921.

By W. Y. Chun.

Chinese Economic Trees (in press).

By J. B. Griffing.

Possibilities of the Introduction of American Cotton into China. In Millard's Review, Shanghai, 12 June 1920.
Will the Cotton Boll Weevil Come to China? In British Chamber of Commerce Journal, Shanghai, January 1921.
Cotton Insect Problems of China. In Weekly Review of the Far East, Shanghai, 30 July 1921.

By D. Y. Lin.

The Relation of Forests to Drought (in Chinese).

By Wang Kwoh-ting.

History of Chinese Sericulture, Journal of Agriculture and Forestry (Chinese), Nanking, Silk number, March 1921.
Study of Wild and Domestic Strains of Silkworms, Journal of Agriculture and Forestry (Chinese), Nanking, Silk number, March 1921.

By J. Lossing Buck.

The Development of Agricultural Missions in China. In Mission Survey Book of the China Continuation Committee, Shanghai (in press).
International Association of Agricultural Missions. In Millard's Review, Shanghai, 7 May 1921.

Administration.

From June until November 1920 the administration work was admirably carried on by the Associate Dean, Mr. Sie Kia-shen, in the absence of both the Dean and the Acting Dean. Then, after the return of the writer, it was only through Mr. Sie's valuable help and assistance and that of the other members of the faculty that it was possible to take up the routine of duties without great difficulty. I wish especially to express my appreciation to Mr. Sie for his advice and help and, indeed, to the entire faculty for their hearty coöperation and friendly spirit throughout the year. We have all felt a deep sense of loss since Mr. Sie's request, chiefly for health reasons, for release from his administration duties as Associate Dean, in preference for teaching work.

The urgent need for secretarial help was greatly relieved with the arrival of Miss Priest in March. The use of student help in the office and in the seed room has also greatly reduced the amount of detail work.

During the year approximately 2,500 orders for seeds, nursery stock, and spray materials have been filled. A conservative estimate of the mail matter sent out from the College is 11,500 pieces second class matter (bulletins and pamphlets); 2,000 parcels; 7,000 post cards and bills; and 5,500 letters. Miss Purcell's willing assistance with important letters and her attention to all the copying work of the College until Miss Priest came were greatly appreciated.

Another step in reducing the duties that have necessarily grown up with this office is the appointment of Mr. Shao Teh-hsing to help look after the administration of

the college farm. It has been impossible to attend properly to both the duties of the office and those of the farm. The taking over of experiment work of cotton, sericulture, wheat, rice, and corn by the members of the faculty concerned has also helped to relieve the number of details to be supervised by this office.

Needs

Our needs are always with us as in any other institution. Owing to the fact of Dean Reisner's return in the autumn, the writer will enumerate only some of the important and outstanding needs, many of which were mentioned in last year's report, but which have not yet been met.

1. A permanent building for the College of Agriculture and Forestry for administrative, laboratory, and teaching work is a pressing necessity. Our present quarters are still inadequate, even with the botany department moved to Severance Hall. For a building corresponding to Swasey Hall, equipped, $90,000 Mexican is required, at the present rates of construction and prices of equipment.

2. A sericultural building to house our sericultural work is needed at once. Mr. Ts'ien is much hampered without it in his important experiment work. Such a building, 43 feet by 126 feet, two and half storeys, will cost about $30,000 Mexican.

3. The need for houses is ever present with the increasing faculty. Four houses are needed for the American families which are on the field, or due on the field within a few months. Houses for the Chinese faculty are also badly needed, owing to the crowded and unsatisfactory housing conditions in Nanking.

4. More land is still needed for the rapidly developing experimental and nursery work. Additional property in the city will greatly facilitate the growing needs of the nursery and the more important experiments. Some $60,000 for land

and $25,000 to $30,000 for improvements and permanent buildings is needed. Some of these permanent buildings should be houses for workmen. It is very difficult at the present time to secure good workmen and to give them the kind of living conditions they are entitled to, without provision for housing them.

5. While the need for faculty members has been slightly relieved by the new appointments, still the demands that are coming to us for extension work among the missions, the demand for more courses for the students, the need for research work in most subjects in order to make our teaching effective and adapted to Chinese conditions, and the need for effective work in crop, animal, and farm practice improvement in order to make extension work possible, make it imperative that we have an ever increasing faculty if we are even to begin to meet the large opportunities that are before us and *demanding* our attention.

6. A publication fund, whether as an endowment or pledged annual grant, is another immediate need.

7. An emergency grant of $5,000 for equipment in botany, agronomy, forestry, farm engineering, reference library, and other departments is needed until we can get into our permanent building.

Acknowledgments

The writer gratefuliy acknowledges the hearty coöperation given by the various members of the faculty. I wish also to commend the members of the faculty for the spirit in their work which has often kept them at their duties after regular office hours and during holidays. With such devoted workers, the College of Agriculture and Forestry is bound to succeed and to forge ahead.

It is also a pleasure to acknowledge the increasing help and support which is constantly given us by our many friends outside the University. It is encouraging to be carrying on a form of work for which there is so much hearty coöperation and support.

UNIVERSITY OF NANKING BULLETIN

ANNUAL REPORT

OF THE

COLLEGE OF AGRICULTURE

AND FORESTRY

AND

EXPERIMENT STATION

1922-1923

VOLUME SIX, NUMBER TWELVE

This report is issued in Chinese also. Additional copies of either the Chinese or the English edition will be sent on request. Address all communications to the College of Agriculture and Forestry, University of Nanking, Nanking, China.

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COLLEGE OF AGRICULTURE AND FORESTRY

Faculty and Officers *

BOWEN, ARTHUR JOHN, B.A., LL.D. (Northwestern). President of the University.

WILLIAMS, JOHN ELIAS, B.A., D.D. (Marietta). Vice-President of the University. (In the U.S.A.).

OWEN, LEWIS JAMES, Treasurer of the University.

§REISNER, JOHN HENRY, B.A. (Yale), M.S.A. (Cornell). Dean of the College of Agriculture and Forestry and Director of the Experiment station; Collaborator of the United States Department of Agriculture.

†BREDE, MRS. ALEXANDER, B.A. (California), M.A. (Radcliffe). Scientific illustrating.

§BUCK, JOHN LOSSING, B.S. (Cornell). Department of Agricultural Economics and Farm Management.

†CALDWELL, LEONARD HATHAWAY, Ph.B. (Yale). Department of Physics. Surveying. Meteorology.

§CHANG CHI-WEN, B.S. (Nanking). Associate in Department of Cotton Improvement.

§CH'EN CHIA-CHI, B.S. (Nanking). Associate in Department of Cotton Improvement. Cotton Extension.

§CHEO MING-I, B.S. (Nanking). Associate Director of the One Year Short Course in Agriculture; Associate in Department of Cotton Improvement.

§CHOW LI TS'ING, Office Assistant.

CLEMONS, HARRY, B.A., M.A. (Wesleyan), M.A. (Princeton). Librarian, University Library; English Secretary of the University Faculty; Collaborator of the United States Department of Agriculture.

§GIBBS, CHARLES SHELBY, B.S. (Bates), M.S., Ph.D. (Yale). Department of Bacteriology.

†GIBBS, MRS. CHARLES SHELBY, B.S. (Colby). Bacteriology.

§GRIFFING, JOHN B., B.S. (Kansas Agriculture College), B.A. (Drake), M.A. (Columbia). Department of Cotton Improvement. Director of One Year Short Course in Agriculture.

†HANCOCK, MARCUS LESLIE, B.S. (Ontario Agricultural College). Department of Agricultural Gardens. Horticulture and Plant Propagation. (Language Study).

*As of September 1, 1923. §Devoting full time. †Devoting part time.

§HSU CHEN, B.S., (Nanking), Associate in the Department of Agricultural Economics and Farm Management. Rural organization.

§HSU CHEN-KEN, B.S. (Nanking), M.S.A. (Cornell). Genetics. Secretary of the College of Agriculture and Forestry.

§HWA PEH-HSIUNG, B.S. (Nanking). Associate in Department of Agricultural Economics and Farm Management. Farm Survey.

§HWANG TSUNG, Associate in Forestry. Seed Collection and Forest Nursery.

§KAN HAN, B.S. (Nanking). Associate in Department of Forestry. Forestry Extension.

§LING KAN, B.S. (Nanking). Associate in Department of Forestry, Dendrology.

§IP NGA-KOK, B.S. (Penn. State), M. F. (Yale). Department of Forestry..

†JONES, ERNEST VICTOR, B.A. (Scarritt-Morrisville), M.A., Ph.D. (Vanderbilt), Department of Chemistry.

§KU YING, (Tokio Agricultural University). Department of Sericulture.

§LI TEH-I, B.S. (Nanking). Associate in Department of Forestry.

§LIU CH'EN. Assistant in Department of Sericulture.

§LOH I-KAO. Assistant in Department of Sericulture.

§LOWDERMILK, WALTER CLAY, B.S. (Oxford). Department of Forestry. Forest Research.

§MA CHEN. Assistant in Department of Sericulture.

†PORTOR, RUPERT HOWARD, B.S., M.S. (Iowa Agricultural College). Department of Plant Pathology; Collaborator of the United States Department of Agriculture. (Language Study.)

§PRIEST, Miss ELSIE MAY. English Secretary.

§RITCHEY, GEORGE EDGAR, B.S. (Iowa Agricultural College). Department of Agronomy.

§SHAO TEH-HSING, B.S. (Nanking). Farm Superintendent; Translator and Interpreter for the University Faculty.

§SHEN PEN-TSENG, Typist.

§STEWARD, ALBERT NEWTON, B.S. (Oregon Agricultural College). Department of Botany.

†THOMSON, JAMES CLAUDE, S.B., M.S., B.D. (Rutgers), M.A. (Columbia). (Department of Chemistry), Agricultural Chemistry. (On furlough.)

§WU TING-TAN, Office assistant.

Letter of Transmissal

President A. J. Bowen,
University of Nanking,
Nanking.

My Dear President Bowen:

I have pleasure in submitting herewith the annual report of the College of Agriculture and Forestry and Experiment Station for the year ending June 30, 1923, and in recommending its publication as University of Nanking Bulletin, Volume six, Number twelve.

Respectfully yours,
John H. Reisner.

September 1, 1923.

ANNUAL REPORT OF THE COLLEGE OF AGRICULTURE AND FORESTRY AND EXPERIMENT STATION

Introduction

A review of the year indicated shows steady improvement and accomplishment in practically all parts of our work. The One Year Short Course in Agriculture instituted in the fall of 1922 has been a success and is being continued. By means of institutes, exhibits, plays and demonstrations we have gotten out into and next to the rural communities much more than ever before. We are more surely and in more ways becoming linked up with general missionary interests in rural affairs. The gift of $21,000 gold from the Silk Association of America, including equipment, gives us the best equipped sericultural establishment in China. Inability to renew the agreement which we have had for three years with the Cotton Mill Owners' Association of China and the Shanghai Cotton Anti-adulteration Association, has caused a curtailment of a part of our cotton improvement work, but we hope the curtailment is only temporary, and we can again expand this phase of our work. Negotiations for the allocation of approximately $700,000, gold, to the University for famine prevention work by the American Committee for China Famine Fund have been brought to a successful conclusion. Co-operative relations with Cornell University through the Cornell in China Club under which they will undertake University extension work in agriculture and engineering, and we hope also home economics, in the College of Agriculture and Forestry, have been established. Much more research work than ever before has been accomplished by the faculty, and we have been able to offer practically all courses regularly scheduled for our students. More detailed statements concerning the above developments, along with many other items, particularly fairly detailed reports from each of the Departments, will be found below.

Famine Prevention Funds and Plans

When the American Committee for China Famine Fund (New York City), appointed by President Wilson in 1920, to raise funds for relief on account of the 1920 to 1921 China famine, closed their activities, there remained in their hands a considerable undesignated balance. It was early recognized, and publicly acknowledged on the part of the American Committee through the printed report of the Chairman, Mr. Thomas W. Lamont, that the co-operation of the churches, chiefly through their Foreign Mission Boards, had made possible the success of the committee's activities, and that the preponderant part of the famine relief fund had come from church sources. Reports of the various Relief Committees operating in China during the famine indicate the preponderant part Christian Mission forces played in carrying forward various relief projects and in the distribution in various ways of the many millions devoted to this end.

When it was recognized that there would be a rather large surplus after all relief commitments had been paid, various suggestions were offered as to how this balance could be most wisely used. There was practical unanimity of opinion that it should be devoted to permanent famine prevention measures. Needless to say there was considerable divergence of opinion as to how such measures should be administered. Improvement of Agriculture and the conditions under which the rural population lives, and the development of Forestry were generally recognized as absolutely fundamental measures. In July 1921, through Mr. Robert E. Speer, President of the Board of Trustees of the University, the writer submitted to Mr. Lamont, the Chairman of the American Committee for China Famine Fund, a memorandum on factors of famine prevention in China, and a list of projects in Agriculture and Forestry which would contribute to this end. In the recommendations submitted by the American Famine Relief Committee in Peking both Agriculture and Forestry received emphasis. In January, 1922, the Trustees of both the University of Nanking and Peking University

acting jointly laid before the American Committee for China Famine Fund a proposal to use these two Universities in carrying out famine prevention projects in Agriculture and Forestry, and the allocation to them for such purposes of the sum of one million dollars, in the ratio of three and one, respectively. After due consideration this proposal received the support of the North American Conference of Foreign Missions through its Committee of Reference and Counsel. In fact there was practically unanimity of opinion and approval of the proposal on the part of all who were interested or responsible in the matter. It is impossible to mention all those who have been concerned though I should like to acknowledge the help and interest of Mr. Robert E. Speer, Secretary of the Board of Foreign Missions of the Presbyterian Church, Mr. Rae C. Henckle, Managing Editor of the Christian Herald, and Executive Secretary of the American Committee, Mr. Roger S. Greene, Director of the China Medical Board, Mr. W. R. Wheeler, at the time Secretary of Peking University, and to express appreciation of the large amount of thought and time given by Mr. Lamont, the Chairman, and Mr. Vernon Munroe, Treasurer of the fund, in fulfilling their responsibility to the hundreds of thousand donors of the fund. The disposition of the fund as indicated below, carried with it, I understand, the unanimous approval of the members of the Executive Committee of the President's Committee of one hundred of the China Famine Fund.

The purpose of and plan for, the distribution of the surplus of approximately $900,000 gold (as of March 31, 1923) as outlined and given out to the public by the American Committee, the details of which have been placed in legal form, and the legal document* approved by the Chief Justice of the Supreme Court of the District of Columbia, is as follows:—

1 There shall be given to a Trustee in trust for Nanking University $675,000—and in trust for Peking University $225,000—to be used for the study and investigation of famine causes, prevention and/or relief, and as a means thereto for the education of the Chinese

* Approved, July 25, 1923.

in agriculture, forestry and such other activities as may relate to famine.

2. The Universities shall have the use of the principal and the income for the purposes above described only upon the conditions hereinafter set forth.

As to expenditures out of the principal the approval of the China Famine Fund Committee as hereinafter described shall be necessary. As to expenditures out of income, said Committee shall be furnished by each university with a copy of its annual budget of proposed expenditures from these funds and shall approve or revise said budget within a period of thirty days after said budget has been received. The Trustee shall be fully protected in making any payments approved by said Committee.

3. There shall also be set aside in trust as an emergency fund a principal amount of $75,000—and $25,000,—respectively, which for five years shall be subject to call by the Committee of Reference and Counsel, Foreign Missions' Conference of North America for use only as a nucleus to start a campaign for the relief of famine in China should such a campaign be, in the opinion of said last named Committee, desirable.

4. All funds shall be invested in securities similar to those permitted said universities in their charters.

No charge against the fund shall be made by either university or by officers or attachés thereof for services of a general nature relating to this fund. The compensation of those only who are assigned to specific work in carrying out this trust shall be charged against this fund.

5. At the end of ten years the China Famine Fund Committee shall either direct the Trustee to surrender control of all funds to said universities for the purposes named herein apportioning them between two said universities as in the judgment of said committee may seem wise or, if in their judgment said funds are not being satisfactorily employed, said Committee may direct the Trustee to apply the principal in whole or in part to other uses within the purposes of said plan.

6. The China Famine Fund Committee shall be composed of five members (and five alternate members) to serve without pay. They shall be American citizens, resident in China and shall none of them be connected with either university. They shall originally be appointed as follows:—

"By the American Minister to China, from among Americans in business or in other work in China not under missionary or church auspices, two.

"By the Committee of Reference and Counsel, two.

"The above four members to select the fifth. Vacancies are to be filled by the power making the original appointment.

7. The life of the Committee shall be for ten years after which the Committee shall dispose of the funds (see paragraph 5) and disband.

The total amount accruing to the University of Nanking, including interest as from March 31st will, it is estimated, be approximately $700,000 gold. Of the China Committee of five, those already appointed are as follows: by the Hon. Jacob Gould Schurman, American Minister to China, Mr. C. R. Bennett, General Manager of the International Banking Corporation, Peking, and Mr. J. Harold Dollar, of the Robert Dollar Company, Shanghai, and Chairman of Shanghai American Chamber of Commerce; by the North American Conference of Foreign Missions through the Committee of Reference and Counsel, Bishop Thomas Frederick Keeney, a Bishop of the Board of Foreign Missions of the Methodist Episcopal Church, with Rev. Frank W. Rawlinson, missionary of the American Board of Commissioners for Foreign Missions and Editor-in-Chief of "The Chinese Recorder," as his alternate and Rev. Charles E. Patton, a Missionary of the Board of Foreign Missions of the Presbyterian Church (North) and secretary of the (Presbyterian Mission) China Council, with Rev. J. E. Shoemaker, Ningpo, of the same Mission as his alternate. Accordingly there remain two alternates to be appointed by the American Minister and the fifth member and his alternate to be elected by the four regular members of the Committee. These final appointments have been held up pending the signing of the papers in Washington and New York.

It is premature to discuss in any detail the tentative plans and projects in agricultural and forestry instruction, research and extension which have been approved by the Executive Committee of the Board of Managers of the University, with budget, and which will be submitted to the China Committee of five for their action as soon as this Committee is organized. Attention might perhaps be called to the fact that the College of Agriculture and Forestry was a direct outgrowth of famine relief work, directed by Mr. Joseph Bailie in an attempt to provide permanent prevention

checks against famine by training leaders in improved Agriculture and Forestry. The Department of Forestry of the College of Agriculture and Forestry has been almost wholly maintained by annual grants (see page 39) from the Forestry Fund Committee of Shanghai administering surplus funds from the Hwai River Famine relief of 1912-1913, an expenditure which has fully justified itself by the results attained. We should keep clearly in mind that the permanent prevention of famines in China will be accomplished by no magic formula. Chinese history records thousands of famines the total effects of which in loss of lives, in loss of production, and in the general debilitating effects on the population, if it were possible to accumulate the data, would be quite unbelievable. The sum of money allocated to the University for famine prevention work though seemingly large in itself, represents but a very small fraction of what will be required if famine prevention is to become an accomplished fact in the next generation or two. The Christian Church in China always the first in work of relief, must recognize more clearly its responsibility for this constant problem of poverty—acute in times of famine, and general through much of the time for an altogether too great a share of the population. It is hoped that the missionary interests already enlisted by their approval of famine prevention work by the University of Nanking will give more constant heed and support to the elimination of famines in China.

Co-operation with "Cornell in China Club"

The resolutions which follow below, indicate the successful consummation of negotiations to secure the co-operation of Cornell University in the work of the College of Agriculture and Forestry through the "Cornell in China Club." This matter was first presented at Cornell by Mr. J. L. Buck, during his short furlough in 1920; and early in 1921, after a visit to Cornell during which time the matter of Cornell co-operation was discussed with a number of people there, the writer submitted four definite proposals to them, two of

them being for Cornell to undertake an extension program in agriculture, and famine prevention work through engineering. Mr. J. E. Williams made several trips to Cornell in the interests of the undertaking and has helped greatly in successfully launching the enterprise. This action of Cornell is particularly gratifying from the fact that five other American institutions in China were actively seeking Cornell co-operation. As stated in the resolutions, they will first take up extension work in Agriculture, and later extension work in Engineering. It is also hoped that the Cornell women will undertake a program of extension in Home Economics.

Official word has not been received from Cornell regarding the details of carrying out their plan, but a letter from Mr. R. H. Edwards, secretary of the Cornell University Christian Association, indicates that they will have a permanent organization with a full time secretary devoting all his time in developing interest and securing funds to make their undertaking the success it has every opportunity to become.

It should be noted that the organization and purpose of the Cornell in China Club has been approved by the Board of Trustees of Cornell University. The resolution passed by the latter body is also given below. The following paragraphs were taken from the "Cornell Daily Sun" of March 9th, 1923, indicating the official actions taken.

"To the Cornell in China Club:—

"The Committee favors accepting the invitation of Nanking Union University, and establishing in China a work of University extension of ultimately nation-wide scope, located at Nanking and affiliated with Nanking University. Our ultimate aim would be the creation of a comprehensive system of University extension for the promotion of popular education.

"We recommend that it begin with agricultural extension and that, as soon as possible thereafter, it add engineering extension, in order through both of these departments to contribute to the solution of the problems of food production and famine prevention.

"We recommend that the president of the Club take the necessary steps for presenting the Club's proposals to the authorities of the University and inviting their approval and co-operation.

"This seems an opportune time for the inception of the work. The interest in China is great, the memory of the recent famine fresh in the minds of all, and a constructive program of famine prevention is just beginning at the universities of Peking and Nanking. We therefore hope that the Cornell constituency will within a year select and send at least one man to China."

Following the adoption of the resolutions the matter was presented to representative women of the University, looking towards the possible formation of a co-ordinate work by Cornell women for the extension of Home Economics, parallel to the agricultural and engineering work contemplated by the men. The proposal has been received favorably and is now under consideration.

The above points were explained in a letter to President Farrand, January 16, and January 20, the Board of Trustees took the following action:—

"Resolved:—That the Board of Trustees of Cornell University approves the plan and purposes of the Cornell in China Club as presented in the report of the Committee of those interested, in relation to a Cornell project in China."

The following minute by the Board of Managers was sent to Dr. Livingston Farrand, President of Cornell University, and to Mr. Hugh A. Moran, Secretary of the Cornell in China Club.

"The Board of Managers of the University of Nanking desire to express their appreciation of the resolutions adopted by the Cornell in China Club and approved by the Board of Trustees of Cornell University, looking towards affiliation with the University of Nanking in the development of a program "of University Extension of ultimately nation-wide scope," beginning "with agricultural extension and,—as soon as possible thereafter, adding engineering extension." We note with pleasure that your objective is "to contribute to the solution of the problems of food production and famine prevention" in China, and that this objective is directly in line with a program for famine prevention to be undertaken by the University of Nanking with the approval and support of the recent American Committee for China Famine Fund.

"Between 1644 and 1911, a period of 267 years, preliminary investigation discloses that China has been visited with 1,068 famines, of varying degrees of intensity, and of varying extent throughout her area. Famines have been an age-long scourge upon these people against which all past efforts have made little or no headway. The same causes which brought on famines a thousand years ago still operate uncontrolled. Prevention of famines is a complicated and tremendous task calling into operation numerous lines of work, in which extension in agriculture and engineering figure largely. We appreciate profoundly the enthusiasm and judgment which Cornell will bring to these problems and assure you of our hearty co-operation and every opportunity to Cornell to make distinctive contributions towards their solution.

"We further note with appreciation the adoption "of a resolution looking towards the development of a co-ordinated work by Cornell women for the extension of Home Economics," and that the proposal is under favourable consideration by them. Along with the solution of the food problem goes the important application to the Chinese home, of the principles of Home Economics, which can be made effective through an extension program. We believe that much would be gained in efficiency of administration and effectiveness of effort by co-ordinating this work as closely as possible with the work for men and trust that it may become an integral part of Cornell's program in China at the University of Nanking."

Department of Agricultural Economics and Farm Management

Mr. Buck has been responsible not only for considerable administration work, particularly during the autumn semester, but in addition to his instruction work he has put in

much time on gathering and analysing some extremely interesting and informing rural and farm surveys. He has taught college classes in Agricultural Engineering, Agricultural Extension, and Farm Management, in the last two of which he was assisted by Mr. Hwa Peh-hsiung. An hour's course in Rural Sociology was given to the 1922 Summer School, and, assisted by Mr. Hwa, Mr. Hsü Chen and Mr. Chang Chi-wen he has offered a course each semester in the one year short course in Agriculture, during the autumn semester in Rural Sociology and during the spring semester in Farm Management. Mr. Hwa Peh-hsiung taught a course in General Agriculture to the students in the Nanking Union Theological Seminary.

Although detailed results of the village and farm surveys will be published shortly in a separate pamphlet, it will be very much worth while to make a short preliminary report on some of the data secured. All those interested in agriculture and village conditions have long felt the need for "real facts" regarding almost all phases of agriculture and rural life in China; facts that are reliable, and which for this reason, are extremely difficult to get, but which are absolutely necessary for a correct understanding of the real situation and on the basis of which recommendations for changes or improvements can be made. The problem has been approached from the scientific farm management standpoint and all data collected has been checked and rechecked with great care. In the working out of a survey blank, and in the gathering of the material, Mr. Buck's experience as agricultural missionary of the Presbyterian station in the typical region of Nanhsuchow, in Northern Anhwei, was of great value. The Survey data have been secured entirely by his own students under his immediate direction, and in the analysing of the data he has been assisted by Mr. Hwa Peh-hsiung, one of our graduates, with much village experience, having been born and brought up in a small village in Chekiang Province. Of the three hundred and fifty farm surveys made, one hundred and two came from one-half the farms from each of three villages near Wuhu, Anhwei, care being taken to select both large

and small farms. The following statements prepared by Mr. Buck are based on data secured from the Wuhu area.

Land Tenure

Fifty-five per cent. of the operators[1] were owners, thirty-two per cent. were part owners[2] and thirteen per cent. were tenants.

Labor Income[3]

The labor income of the owners was minus $15; of the part owners $156 and of the tenants $105. As a matter of fact each of the groups actually had more money than this to use because the interest on the capital invested was available.

Net Family Income[4]

The Net Family Income of the owners was $120.05, of the part owners, $267.15 and of the tenants, $63.43. The average size of the family (including all persons living in the operator's household) was 5.4 persons.

Size of Farms

The owners farmed an average of 20 mow, the part owners an average of 37 mow and the tenants an average of 15 mow. The average for all three groups was 24 mow.

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1. The term operator refers to the man who manages the farm and also works himself.

2. The term part owner refers to the operator who owns part of his land and rents the rest from some one else.

3. Labor Income is what the operator has left after subtracting all expenses from all receipts. Interest on capital invested and the value of unpaid labor (except operator's) are counted as expense. The value of produce from the farms used by the family is counted as a receipt.

4. The Net Family Income represents the actual amount of money the family had available at the end of the year in addition to any produce used from the farm and also house rent.

Dividing the farms into groups we find 13% in the group of 10 mow or less, 52% in the group of 11-20 mow, 15% in the group of 21-30 mow and 20% in the group of 31 mow and over.

We find that the *size of the farm has a definite correlation with profits.* In the group of 10 mow or less only 7% of the operators are making a labor income of over $50. The percentage increases proportionately until in the group of 31 mow and over 50% are making a labor income of over $50.

Man Labor

Man labor was much more efficient on the large farms than on the small ones. In the group of 10 mow or less $40 worth of labor farmed 2.5 mow while in the group of 31 mow and over it farmed 5.7 mow.

Animal Labor

Animal labor was almost three times as efficient on the large farms as on the small ones. In the group of 10 mow or less one animal farmed 10.6 mow while in the group of 31 mow and over one animal worked 28.8 mow.

Equipment

Equipment was nearly twice as efficient on the large farms. In the group of 10 mow or less, $20 worth of tools and equipment farmed 4.0 mow while in the group of 31 mow and over the same amount of equipment farmed 7.1 mow.

With 75% of the farm expenses expended on man labor it is not to be wondered at that the large farms are making the larger labor incomes. Not only is the business larger but the man labor as well as animal labor and equipment are used much more economically on the larger farms. This is due to the fact that men, animals and equipment are not idle as much of the time on the large farms as on the small ones and also to the fact that larger units can be worked to better advantage and with less loss of time going from one job to another.

Scene in one of the counties in Shantung after the severe famine of 1921-1922. The cattle are among the first of the farmer's realizable assets to be exchanged for grain, and until they can be replaced, the farmer himself must supply the animal labor.

At Lin I, Shantung, Agricultural Institute (see page 42.) Farmers in attendance watching a plowing demonstration with an American plow. The field used was a hard, stone rolled, sunbaked threshing floor and the ease with which it was plowed was quite startling if not altogether believable.

The doctrine of Improved Cotton being imparted to the farmers and gentrymen at Lin-I, Shantung, by means of the theatre. The play being given by University of Nanking students was specially written by the Department of Cotton Improvement and sets forth in a dramatic way the benefits to be derived from growing improved cotton. A most effective way to arouse the interest of the conservative farmers. These plays are usually followed up with distribution of improved cotton seed.

At Lin I, Shantung, Agricultural Institute (see page 42.) Farmers from many villages watching the play given by our students as shown in the above picture.

It is significant that the part owners were the ones who had large sized farms (average of 37 mow) and also the largest labor incomes, i.e., $156.

Capital

Capital. In the case of the 32% part owners we have a *definite correlation of capital to labor income.* In the capital group of $1,500 or less the part owner operators were making $18 while in the capital group of $5,001 and over they were making $112.

In the case of the owners, the labor income in the capital groups of $1,500 or less is $9, and in the group of $1,501-2,500 is $16. In the other three groups there is a minus labor income which may be accounted for in two ways, first, because of the small number of farmers in each group thus making the possibility very great of these farmers happening to be inefficient farmers, and second, and the more probable reason, as the owner gets richer he works less. This latter reason is the one given by the man securing the data.

Character

Character. It is interesting to note the relation of character to labor income. The 66% of farmers reported as having good character were making a labor income of $34.12 while the 34% reported as having bad character (mostly gambling but some drinking) were making a labor income of minus $20.32. Seventy-two per cent. of those reported with bad character were in the owner class. This may help to explain the low labor income of the owners.

The men with good character were working larger farms —28 mow, while the others had farms of 20 mow. One might say that the larger income is due to a larger farm rather than to good character. But in looking over the records it is the man with bad character who is selling his land and consequently he has a small farm.

Under this heading of character it may be well to mention that 40% of the families were reported as having feuds with other families.

General

General. The average number of *separate pieces of land* per farm were seven and the average number of mow per piece was 3.5. The average distance of these pieces of land was one-tenth of a mile, the furthest piece being 2 2/3 miles away.

Of those owning their property 73% reported that it was inherited, 22% that it was both inherited and purchased, and 5% that it was purchased.

The *average age of marriage* for men was 22 years, the lowest 17 and the highest 26. The average age of marriage for women was 19.5 years, the lowest 14 and the highest 25 years.

Forty-eight farms *exchanged labor* on an average of 10 days per farm. Forty-nine farms exchanged animals and implements for a total average period of 11 days.

All the *operators were born* in the same village they are now living in. This is also true of all the operator's fathers.

Of the *operators' wives* 38% of them came from the same village as that of the operator. Thirty-eight per cent. of the *operator's wife's fathers* were also born in the same village.

Department of Agronomy

Mr. Ritchey has been responsible for eleven hours of instruction in the College, Mr. Shen Sheo-tsuen for the courses given in the One Year Short Course in Agriculture and together they have been responsible for the large amount of work in crop improvement dealing principally with wheat, corn, barley and rice.

Eighty-five varieties of wheat were grown in rod-row tests, both foreign and Chinese. For a considerable number of these, the sources of origin are unknown, but of forty varieties whose origins are clearly indicated we have the following comparision for the season 1923.

Varieties.	Average yield.	Highest yielding variety.*	Lowest yielding variety.*
17 Chinese	17.89	24.42	8.83
23 Foreign	16.62	23.76	7.07

* Bushels per acre.

Thirty-one varieties and strains of wheat were grown in propagation plots and will produce seed for next year's rod-row tests, fifty-six plant selections were grown in head-to-row plots, and will be grown in propagation plots next year. This year over one hundred individual selections have been made and will be grown in head to row plots next season. The following table indicates some of the results of this year's comparison of the yield of selections with the original stock. It also indicates the possibility of very greatly increasing grain yield in China through scientific seed selection.

Variety number of original seed	Yield bushels per acre	Number of selection from original	Yield bushels Per acre	Percent increase over original
10	21.12	502	21.45	1.56
11	19.14	503	19.14	0
14	13.86	506	22.44	61.9
47	16.50	514	19.80	20.0
45	22.27	515	24.42	8.07
14b	13.86	556	20.90	50.80
21b	16.17	538	16.17	0
13b	20.13	539	22.00	9.29

The two varieties showing highest gains were of foreign origin, indicating possibilities of adaptation. The Chinese varieties have the advantage generally of earlier maturity, and suffering less from rust. The Department has about twenty-five hundred pounds of seed wheat of the higher yielding varieties for distribution in the fall of 1923.

In the corn breeding work, increased yield has been the objective and to this end three lines of work are being carried on as follows: ear-to-row tests in which we are trying to develop a large well filled ear, plant-to-row tests for plants bearing two or more good ears, and by crossing foreign and Chinese varieties. About four hundred pounds of improved Chinese corn seed was distributed (sold at cost) this last spring. During the past few years, seed of our improved Chinese corn has gone into practically every province, and many reports have been received indicating its superiority over the local product. It is difficult to secure quantitative data, that would indicate the degree of superiority.

but from the nature of many of the letters pertaining to it there can be no question of its much higher yielding value. The proceeds from the sale of the seed corn a little more than offset its cost of production.

Eighteen varieties of barley have been grown in rod-row tests and this year for the first time we have grown in variety test sixty-one varieties of soy beans. Seventy varieties of rice have also been grown in test plots, this being their second year under observation.

During the wheat and barley harvest, the Agronomy Department made a most satisfactory test of a small power threshing machine manufactured by the Messinger Manufacturing Company, Tatamy, Penna. After certain adaptations, there would seem to be a place for it in Chinese agriculture.

Department of Bacteriology

In addition to much teaching work, Dr. Gibbs co-operated with the Department of Sericulture in charge of sanitary measures during the silkworm rearing season. In co-operation with Dr. Macklin he also made some investigations of intestinal parasites of goats and directed individual bacteriological studies by several of his advanced students. One of these investigations, that in water sanitation, dealt with the water microflora of Nanking. The object of the study was to determine:—

1. the time element required to kill living micro-organisms in water by boiling; 2. the temperature at which vegetative forms but not spores would be killed; and 3. whether or not micro-organisms are killed at the same temperature in water containing suspended matter as in clear water. The results of the experiment which are significant in water sanitation may be summarized as follows:—

1. Clear water boiling hard with bubbles coming up from the bottom of the vessel and steam rising from the surface of the water will contain no living bacteria at the end of six minutes.

2. Water brought to the point of boiling 100°C. kills all vegetative forms but does not affect the spores. If this water is set aside the spores germinate as the water cools. If the water is brought to a boil again the next day some of the spores will be killed. The few spores escaping destruction at the second heating will have germinated by the time the third heating is due. After the third heating sterilization is accomplished in most cases.

Vegetative forms may be killed by exposing water to a constant temperature of 65°C. for one hour. Spores are not affected.

3. Water containing suspended matter must be heated longer to destroy all forms of micro-organisms. In the case of silt the water must be heated from 8-10 minutes, but when agar, gelatin, mucin, etc., is added, the time is prolonged to 10-12 minutes.

Since nearly all wells in Nanking are badly contaminated with the secretions of man and animals an attempt was made to apply the general rules learned from inoculating solutions of distilled water and boiling, to the raw water as it was taken from the wells. It was found that it took longer than six minutes to kill all bacteria in the samples of raw water and that raw water just brought to the point of boiling was not entirely freed of pathogenic nonspore forming bacteria. One of the students observed that the lethal exposure to heat in time of boiling varied as the concentration of the colloidal substances in suspension increased, especially when these substances were of animal origin and were non-conductors of heat. Solutions containing known amounts of mucin and proteins were tested out to see if this generalization was true or not. It was found that in general when bacteria were mixed in substances of colloidal nature that the temperature had to be maintained longer to kill the bacteria. Hence the general rule advocated by sanitarians that all water used for drinking purposes in countries where it is necessary to boil water should be boiled for twenty minutes, is a good and safe old rule to follow in China.

Department of Botany

On account of Mr. Steward's taking full-time language study throughout the year no courses in Botany were offered. However after language school hours he spent considerable time in the Herbarium, which shows steady development.

Prof. E. D. Merill, Director of the Bureau of Science of the Philippine Islands greatly aided the Herbarium work during his visit in the Summer of 1922 as guest of the University and has either checked or identified most of the species which it contains. A list of available duplicates of identified species has been prepared and submitted to a number of important Herbariums throughout the world. A number of these institutions have subscribed for the list, in whole or in part at the rate of twelve and a half cent, gold, per specimen. The response to this list indicates that we have every reason to believe the herbarium will largely maintain itself.

The Director of the Royal Botanic Gardens at Kew has agreed to exchange "Index Kewensis" for a set of plants thus making available one of the most essential reference books for our systematic botany work. Mr. Orvar Karlbeck, Assistant Engineer, Tientsin-Pukow Railway, Puchen, most generously contributed to the Library an almost complete set of Engler and Prantl "Pflanzen-Famielian," a reference work of very great value, and which we have been unable to buy on account of the cost.

There have been added to the Herbarium during the year, last season's (1922) collections, fully determined, including three new species from Kuling and one from Nanking. A valuable collection of identified woody plants from northern Honan was presented by Mr. J. Hers, secretary of the Lung-hai railway, and head of the Lung-hai railway nursery, probably the best forest nursery in China, located at Chengchow, Honan. About one hundred and fifty named specimens from South China have been received in exchange from the Canton Christian College. A very excellent collection of North American grasses has been received from Prof. A. S. Hitchcock, agrostologist of the U. S. Department of Agriculture, who spent several months in Nanking as the guest of the University in 1921. The Herbarium now contains 1,400 named species of Chinese plants, 200 unnamed species, 3,500 specimens mounted and filed, and about 10,000 specimens of unmounted duplicates.

An exhaustive collection has been made from about 2,000 mulberry trees, comprising the collection of the mulberry varieties which have been gathered together by the Sericulture Department during the years since 1917, representing the most complete collection of varieties in China, and varieties from Japan and United States. Each specimen includes leaves, flowers and fruit (if any) from each tree. The collection will be used as a basis for a scientific study of Chinese mulberry species and varieties, from which it is hoped to work out descriptions and a classification. So far as we can learn, no such careful study has been made in China, and it should have great economic significance inasmuch as the mulberry is the principal and almost only food of the domesticated silkworm used in silk production.

Department of Cotton Improvement

March 1st of this year ended the three year agreement entered into with the Cotton Mill Owners' Association of China and the Shanghai Cotton Anti-adulteration Association who agreed to finance the cotton improvement program proposed by the University, for which Mr. J. B. Griffing was especially secured. A full report of these three years' work in addition to a report on certain scientific studies which have been made during the process of acclimatizing two American varieties of cotton, Trice and Acala, has been prepared by Mr. Griffing and is being issued as a separate bulletin of the College of Agriculture and Forestry. It will only be possible here to mention a few details of this very excellent piece of cotton improvement work accomplished by Mr. Griffing and his associates.

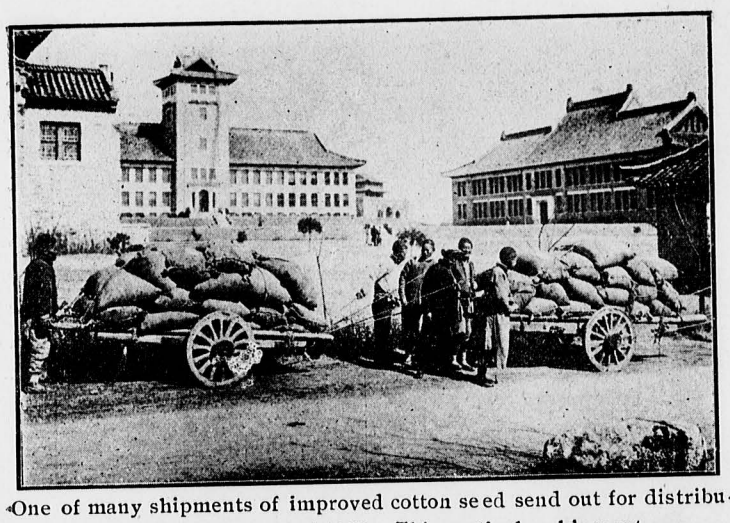
It is a pleasure to note the fine co-operation and the many evidences of interest in the progress of the work by the two associations, largely British in membership and interests. It is hoped that their support to this work will be renewed and that the cotton improvement work may again be prosecuted more vigorously. With the help of a friend in the United States and the returns from sale of cotton products

we have been able this year to maintain our seed production, but our instructional, propaganda and extension work has had to be curtailed. It is not clear just what adjustments will have to be made next year, if outside support is not forth-coming.

In the three years two varieties, Trice and Acala, of American cotton have been acclimatized, and three excellent strains of Chinese cotton have been developed, involving among other things the selection and careful laboratory study of 12,500 individual foreign cotton plants, and over 40,000 Chinese cotton plants. The best of these selections were also grown in the field and their performance carefully determined. It is not easy to appreciate the tremendous amount of work involved which would have been impossible without the efficient and large amount of help of many students and assistants. The improved strains were multiplied into a seed supply which in 1923 furnished seed for 125 (English) acres of pure seed producing farms, seed for distribution in lots of from two to five pounds to 1,820 farmers and further distribution (by sale mostly) to cotton stations, to the amount of three and a half tons. Our present crop should give between twenty-five and thirty tons of pure seed of improved strains for distribution next year.

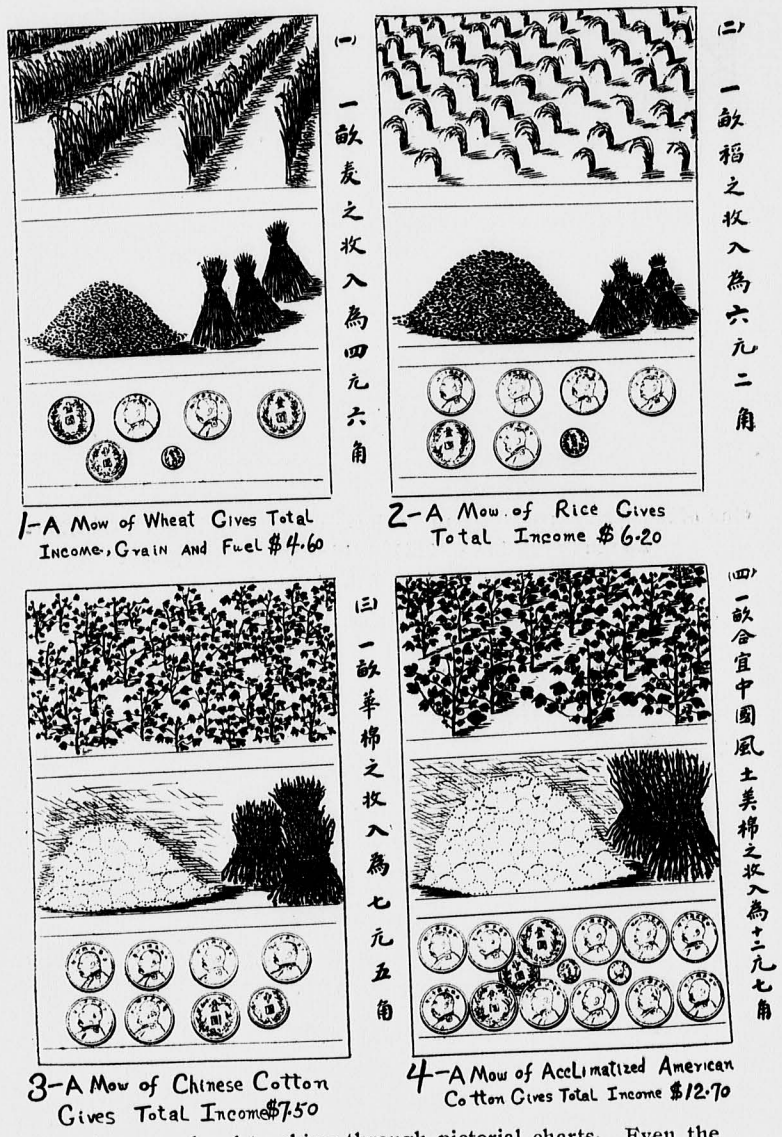
During the three years special instruction in Cotton has been given to one hundred and seventy-one students, assistants and foremen. Extension campaigns with fairs, exhibits, plays, etc., with seed distribution have been promoted in eleven different centers. A large number of small experiment stations and demonstration areas have been maintained. Besides magazine and press articles, four bulletins have been published in English with a total of forty-nine pages and 3,800 copies. In Chinese there have been eleven publications with a total of 106 pages and 25,600 copies.

Labor saving machinery, very essential even in China, for the cultivation of cotton has been designed and manufactured, including five and seven tooth adjustable cultivators and a shovel plow adapted to Chinese use and within their ability to pay. A saw gin adjusted to small seeded Chinese



One of many shipments of improved cotton seed send out for distribution in the spring of 1923. This particular shipment was consigned to Shansi Province.

The first shipment of cotton baled by the modern press at the University of Nanking custom gin.



An example of teaching through pictorial charts. Even the illiterate farmer can catch the idea of a greater income from improved cotton.

cotton has been made and successfully used, as has also, a hand baling press. Considerable progress has been made on an irrigation pump for use in North China, where with favorable soil and climate successful cotton cultivation is uncertain on account of lack of water though it can be secured from small wells sunk from ten to fifteen feet.

During the course of the work much scientific data on the behavior of cotton plants undergoing acclimatization was secured and is being published as part two of the full report of the Cotton Improvement Department.

Department of Forestry

Mr. N. K. Ip has carried during the year a heavy schedule of classes, being responsible, with the assistance of Mr. C. C. Chang, for twenty-four credit hours during the autumn, and twelve hours during the spring semester. Mr. W. C. Lowdermilk in addition to full language study taught three hours during the autumn, and five hours in the spring semester.

In addition to his teaching, Mr. Ip has overseen the collection and making up into standard sized wood specimens of thirty-one species of Chinese economic woods to which other species will be added as they can be secured until a complete list is obtained. These species have all been described as fully as present sources of information makes possible. Research work into old Chinese forest laws was carried on, covering a period of twenty-four dynasties through four thousand years. About two hundred references were made, and the work is to be continued. A translation of Prof. H. H. Chapman's standard work on Forest Mensuration was undertaken with the aid of the advanced forestry students and about three-fifths completed. Twenty-five charts illustrating various silvicultural systems were made.

An important piece of research work was instituted in the Chemistry department under Mr. J. C. Thomson with the co-operation of Mr. Lowdermilk. A wood distillation plant was erected and distillates made of fourteen important species

of Chinese woods. The work was done by Mr. Li Teh-I one of this year's graduates, to whom a very great deal of credit is due. The research is to be continued during the coming year.

Mr. Lowdermilk instituted through his Seminar course, a rather comprehensive project under which the economic trees of China will be studied intensively to ascertain their several silvical characteristics and habits, approved methods of treatment in forest stands and the qualities and uses of their respective woods. Seed germination tests of a large number of tree species was also undertaken and will be continued next year.

During the spring semester the forestry students were given considerable field practice in nursery work and reforestation plantings. In this work we had the cordial and helpful co-operation of Mr. Soong Ding-moo, Director of the First Provincial Forestry Station of Kiangsu Province located near Nanking. A three weeks trip to study the German forests at Tsingtao was also taken. Here we had the full and valuable help and co-operation of Mr. D. Y. Lin for three years a teacher in our Forestry Department and now in charge of the Bureau of Forestry, Tsingtao and of four of our graduates who are assisting Mr. Lin in important positions in the administration of the Bureau.

Department of Sericulture

The work of the year has chiefly centered around the production of disease free eggs; grafting last year's transplanted mulberries; transplanting seedlings for grafting next spring; the extension of the mulberry orchard; adding to our already large collection of mulberry varieties, both foreign and Chinese; carrying on a large amount of educational work including the special short course in sericulture; doing extension work with a selected group of farmers near Nanking, and silkworm breeding for purification of varieties and increasing silk yields. The new sericultural building donated by members of the Silk Association of America has been

completed and equipped and its value admirably demonstrated for the prosecution of our work. Mr. C. L. Chien has been assisted in the work of the Department by Messrs. Kuh Ying, Ma Chen, Liu Chen and Loh I-kao. The following more detailed statement has been prepared by Mr. Chien on the work of the year.

Egg Production

The Spring Crop.—This spring we moved into the new Sericulture building, which was then only partially finished and not in a very good condition for silkworm rearing. The wall was damp; the humidity in the room ranged from 74% to 98% averaging 82.16% which was 7% higher than the silkworm can stand and water could be seen accumulated at night like dew on the window glass. This moist condition naturally weakened the health of the silkworms, decreased their resistance against disease, and finally brought forth an epidemic just after the fourth moult. The epidemic was caused, we believe, by a disease called flacherie which is not hereditary but very contagious. Sometimes the whole crop may be entirely lost in a few days. We took, however, great pains in eliminating diseased worms and separating them from the healthy ones. By so doing we were able to get the disease under control, save a small portion of the worms and succeeded in producing from them 4.25 piculs of cocoons, which in addition to 4.71 piculs bought from farmers using our seed under special contract, made about 1,200 pounds of cocoons from which 85,400 layings of silkworms' eggs were produced.

The Summer Crop.—After the spring crop was over, the whole interior of the building and the equipment in the rearing rooms, bamboo poles and leaf baskets were thoroughly cleaned and disinfected so that we could be sure that no germs of flacherie or of other diseases might be left alive to infect the summer worms. The same amount of careful and painstaking work was done with the summer crop as with the spring crop by all the teachers, assistants and students. Although we were confronted by a difficult problem of leaves,

by using all kinds of mulberry that we could buy from the farmers we got the crop through very successfully with practically no disease appearing. The walls of the building were now practically dry and with its excellent arrangement of rooms we had no difficulty in regulating the ventilation, humidity, and to a certain extent, temperature. Four large rooms 17′×52′ 6″, occupying the whole second floor of the building were devoted to rearing the crop, 1,785 trays were used, two thousand three hundred pounds of cocoons (17.23 piculs) were produced, and from these cocoons, 254,900 layings of eggs were made.

The total of cocoons therefore for this year's egg production was three thousand and five hundred pounds (26.19 piculs), about 1,164 pounds (8.74 piculs) of cocoons more than the production of last year. From this number a total of 340,300 layings of eggs were produced which are now being examined for pebrine.

Mulberry Production

This spring we sold 49,780 mulberry plants of the Ho San variety, which had been grafted last year, not including those used in our new mulberry orchard and those given away free to farmers. As usual, the plants were sold at cost, which was about one-half to one-third the price of those offered by commercial dealers.

In addition, this spring, we crown grafted 94,060 mulberry plants of Ho San variety on native wild stock. In order to grow stockier and larger plants we tried an experiment of digging up a portion of the wild stock soon after the winter was over. The ground was thoroughly plowed and the soil well smoothed. Long ditches of about six inches deep were dug and run in pairs. The distance between the rows of each pair was one foot and between every two pair there was a space two feet wide. In the ditches we placed a layer of well decomposed horse manure and covered this with another layer of fine soil. The wild plants were then planted in the ditches, about six inches apart, well firmed with soil and thoroughly watered. After a few weeks these

plants began to open their buds and selected scions from Ho San mulberries were then grafted by the crown graft method. The purpose of this experiment was to furnish plenty of food for the plants to grow and at the same time provide facilities for the removal of weeds both in spring, summer and fall. The space between the double rows was wide enough so that it was possible to use successfully a small labor saving cultivator designed at the University for such purposes.

As the distance between the plants in the row was only six inches it was also economical in the use of space. The same system was used in transplanting 176,700 mulberry seedlings which are to be grafted next spring. Both experiments were fairly successful, and hereafter we shall save a great deal of expense as well as time and labor in removing the weeds by using the cultivator. It is very simple in construction and can be manufactured by native blacksmiths for a few dollars each. It can perform a number of services and should have a wide use by the farmers. In addition to the transplanting of 176,700 mulberry seedlings, this spring, we sowed 22.7 pound of mulberry seed which will give us about 200,000 seedlings next spring after allowances for non-germination and losses in thinning and transplanting.

Mulberry Orchard

At the end of 1922, we had 967 five-year old trees, 5,131 four-year old trees, 297 three-year old trees, 495 two-year old trees, and 3,064 one-year old trees, making a total of 9,954 trees. They occupy about 90 mow of land. This spring 11,580 young trees were planted. On account of shortage of land and for the purpose of producting bushy plants like those prevalent in certain sections and of yielding quicker results than in the regular tree system, a portion of the trees were planted close together in a well fertilized soil, being one foot each way between the plants and rows. The soil was fertilized twice in the spring and once again in the summer with a quickly available fertilizer like night soil solution and again fertilized with a mixture of well decom-

posed horse manure and pond mud. In this way it will be possible to use the leaves of these plants next spring, while it would take several years longer by the regular tree system. The advantages of this system are economy of space and early production of usuable leaves, but the disadvantages are the high cost of maintaining the soil fertility and shortening the life of the mulberry plants. Another portion of the plants, however, were planted in the regular tree system, the distance between the plants being about five feet. The soil was heavily manured with well rotted horse manure previously mixed with ashes and decayed vegetable matter. In summer a night soil fertilizer was applied to the soil around the roots of the plants.

Silkworm Breeding Work

Careful experimenting to purify the breeds of silkworm gathered from various places and which were impure, was continued this spring along the line followed during the past three years. This year's work gave us ten pure breeds, but eliminated eight of the twenty-six old pure breeds, due to poor quality or susceptibility to disease, making a total to date of twenty-eight breeds that have been completely purified. Out of this number, six are of the bivoltine type.

At the same time, some selection work has been carried on to increase the percentage of silk in the cocoon. We have found that it is possible to select out cocoons bearing from 15% upward to 25% of pure silk from cocoons that normally contain from 10.50 to 14.50%, but whether they will remain so highly productive is a problem of continuous selection and separation which will require a number of years to determine. We have two varieties of silkworms, one monovoltine and the other bivoltine, which show continuous improvement in the percentage of pure silk in the cocoon. The monovoltine type called Big Round has an average of 18.41% of pure silk and the bivoltine type by the name of Hochow White has 14.67%, while the average per cent. of pure silk in a bivoltine type is somewhere around 10%.

In addition there has appeared what is apparently a new white breed from a green variety called "Pieh Lien." "Pieh Lien" usually produces small green cocoons, but last year we noticed a laying of green coloured eggs, which was quite unusual. These eggs were saved, hatched out and the worms reared separately this spring. These worms spun white cocoons and their eggs, like those of their parents, were also green in color. Their average percentage of pure silk in the cocoon was 13.56%. But whether or not they will continue to breed true will required further testing which we are planning to do.

Mulberry Collection Work and Study of Mulberry Varieties

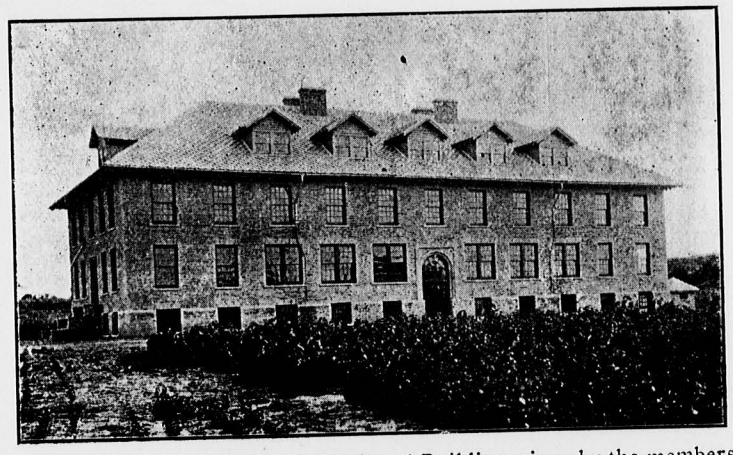
The University has a collection of 208 different lots of Chinese mulberries collected from Chekiang, Anhwei, Kiangsi, Hupeh and Kiangsu Provinces, including 13 varieties of wild mulberries which the writer selected out of our nursery on the basis of color and differences in the spots on the bark. In addition we have 13 American varieties and 109 Japanese varieties including six bought this year. The total number is therefore 330 different varieties (or lots) of mulberries both Chinese and Foreign. The above 13 varieties of wild mulberries, six Japanese varieties and 13 American varieties were planted in rows in a piece of level land about .23 acre in extent. They were planted in rows six feet apart and five feet apart between the plants in the row. The location of the various plants have been indicated on a map.

This collection is undoubtedly the largest and best in China, and will serve as a basis for scientific study and classification. We have been trying for several years to get a good botanist to undertake this difficult but extremely interesting task. This year we persuaded Professor A. N. Steward, Head of the Department of Botany at the University, to undertake the work. He has already secured dry specimens of each variety and will study their botanical characters very carefully this fall. Later on he will study the trees and classify them according to scientific principles.

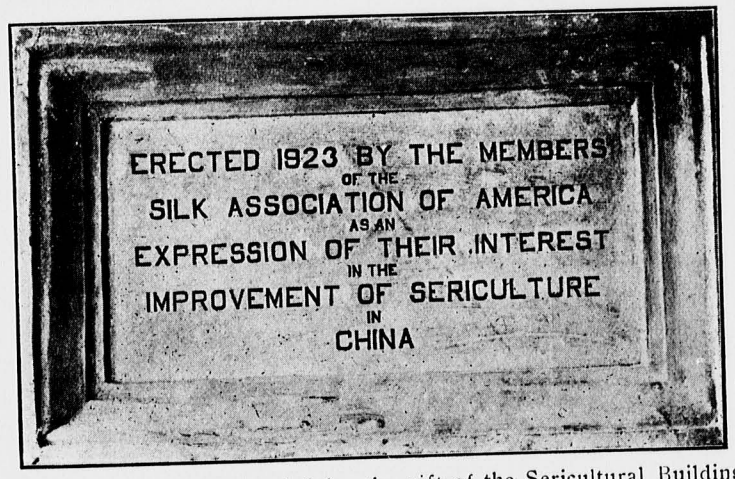
Instruction in Sericulture

One of the problems in giving instruction in sericulture is to find students who are not merely students. Unless students are thoroughly trained in practical work while they are in school they are liable to meet almost unsurmountable difficulties in occupations like silk culture when they go out to do independent work. But the student class in this country generally looks down upon manual work. Therefore we have this spring made a change in our policy of selection. We have tried to eliminate applicants of the merely student type by demanding that each applicant bring from some person living in a silk producing section and known to us a recommendation stating that the applicant has had some previous experience in sericulture. Furthermore out of many applications we finally accepted but twenty-six boys who came from five provinces and were distributed as follows; Kiangsu, 13; Anhwei, 10; Chekiang, 2; Hunan, 2; and Honan, 1. Their average age was 23, the oldest being 35 and the youngest 18. Their previous training was as follows: Two students were graduates of provincial agricultural schools (middle school grade); 7 graduates of mission schools, also of middle school grade; 6 graduates of higher primary schools; 4 graduates of lower primary schools, 1 graduate of People's school, and 8 without any school training but being able to read and write in simple language.

These students were taught how to rear silkworms from the hatching of eggs to the spinning of cocoons, to grow mulberries from the sowing of mulberry seed to the grafting of mulberries, to care for mulberry orchards by actually doing the work just like regular workmen. After the cocoons had been spun, they were taught how to produce silkworm eggs and later were trained in the microscopic examination of moths for pebrine. This year our total of 340,300 layings of eggs are being examined by the best of these students. During the Autumn there will be further class room and laboratory work, ending about December first. Board, room, etc., are provided and in addition two dollars in cash every month.



The University of Nanking Sericultural Building given by the members of the Silk Association of America. (See page 31.)



Tablet in English acknowledging the gift of the Sericultural Building in the above picture. Another tablet in Chinese corresponding to it has been placed opposite it in the entrance hall to the building.

In addition to the special course in Sericulture described above a course on General Sericulture was given to the students of the College of Agriculture and Forestry during the spring term. The course included mulberry culture, silkworm rearing, egg production and study of silkworm diseases. Thirty-four students were in attendence.

A similar course on General Sericulture was also given to the students in the One Year Short Course in Agriculture which is now being conducted by the University. In this, there were forty-one students. Later, in the University of Nanking Summer School, held from July 14 to August 20, two courses, one on Mulberry Culture and the other Silkworm Rearing, were also taught by Mr. Y. Kuh. There were sixteen students in each class, most of whom were rural school teachers. The purpose of the courses was to give the students some general knowledge of sericulture so that they might not only go out and talk intelligently about the important problem of improvement of Chinese sericulture but be able to assist actively in it. Instruction therefore, in sericulture and mulberry culture was given to a total of 117 different students during the year.

New Sericuture Building

Through the generosity of members of the Silk Association of America who contributed Gold $21,000, the University has built and equipped a substantial modern sericultural building, 47′×118′, walls made of brick, with concrete floors. It is therefore, practically fireproof and consists of two stories with four 17′×52′ rooms on each floor, with basement, and an attic fitted for dormitory use. The worms are reared in the rooms on the first and second floors except one room on the first floor which is used for offices and laboratory. The basement is used for storing and preparing leaves and also for general washing purposes. The attic can accommodate about fifty students. The rearing rooms on the first and second floors have a maximum holding capacity of 4,000 trays or seventy-five piculs of cocoons, and if

necessary, the basement can also be devoted to rearing purposes. After the silkworm season is over, these rooms are used for class work, microscopic examinations and storage. The building is equipped with electric light, running water, microscopes and apparatus necessary for both commercial and experimental work and represents the best facilities to be found anywhere in China for sericultural work.

Participation in Silk and Commercial Exhibits

(1) An extensive exhibit similar to but more carefully planned than the one for a like occasion two years ago was prepared and sent to America and displayed at the Second International Silk Exposition held in New York last February. This was made possible through the courtesy of the Chinese Chamber of Commerce, Shanghai. The exhibit consisted of nine photographs showing various activities of the Sericultural Department, twenty prepared specimens showing different methods of grafting mulberry, the new method of egg production, samples of cocoons, etc., sixty-one charts, among which were hand-drawings of silkworm, and mulberry leaves representing those under special study at the University of Nanking, a sericultural map of China, and a number of charts showing China's production and export of raw silk from 1912 to 1922, making a total of 60 different articles.

(2) After the close of the Second International Silk Exposition the exhibit was turned over to the United States Testing House in New York City. Later a request came from the Newark Museum Association to use it in their traveling Chinese exhibit and after consultation, the entire exhibit was turned over to them. It will be shown in many cities in the United States and receive wide publicity.

(3) Previous to sending the exhibit to the United States, a domestic Silk Exhibition was held in Shanghai under the auspices of the Chinese Chamber of Commerce in which the exhibit prepared for the Second International Silk Exposition, was placed. The result was very gratifying as

soon after the exhibition was over, the Shanghai Chamber of Commerce awarded our exhibit a certificate of "First Class Honor."

Extension Work among Farmers

Along the lines recommended in last year's annual report, we tried to co-operate this spring with the farmers on Lotus Island. These farmers agreed to raise for the University, under supervision, silkworms from eggs furnished by the University and sell the cocoons to the University at the rate of $75.00 per picul which is from 10 to 20 dollars higher than they would get on the market for green cocoons.

Considerable difficulty was met with. It was difficult to convince the farmers of the sincerity and fairness of our plan and they looked upon the matter with doubt and suspicion. However we succeeded in getting hold of five farmers who carried through with the plan, while many other farmers accepted a few cards of eggs for trial free of charge. Although it happened to be a bad season this spring for silkworms throughout the vicinity of Nanking, we were able to buy 4.71 piculs of cocoons from the co-operators. It is hoped that next year the work will meet with more success.

Publications

The following is a list of articles or publications contributed by the members of the Department of Sericulture during the year.

By C. L. Chien:

The latest condition of Silk Industry in France and Italy. Translated from Japanese from the Journal of Silk Industry, Tokio, Japan; published in "Science" Shanghai, 1923; and in the Nanking University Magazine Vol. 11 and Vol. 111. 1922-1923.

Prequisites in Sericultural Extension. Published in the Magazine issued by the students of the one year Course in Agriculture.

The General Status of Artificial Silk. To be published in the Nanking University Magazine.

Aiding the Chinese Silk Industry. Silk Journal. April, 1923.

Methods of Silkworm breeding. Bulletin. 4,000 copies.

By Y. Kuh:

Methods of Silkworm Rearing for Farmers. Bulletin, printed in "Beh Hwa," 3,000 copies. Distributed free of charge to farmers.

Needs

Although we have at present excellent equipment both in building and apparatus for our egg production and experimental work, yet we are very short of land to grow enough mulberry leaves to feed our silkworms. This summer we were compelled to buy from outside sources, 362.84 piculs of leaves while our own production was only 105.00 piculs. The condition is, therefore, very serious. If we continue to rely on the farmers for the supply of leaves, we shall always meet with the following difficulties: (1) uncertainty; (2) expensiveness; (3) inferior quality, due to over-evaporation of moisture from the leaves or to dampness; and (4) danger of disease infection. This problem cannot be solved unless we immediately buy or rent at least 200 mow of land for growing mulberries. After four or five years, the land will be self-supporting as is our present mulberry orchard. The present value of land is only from twenty to sixty dollars per mow.

Special One Year Short Course in Agriculture

Mr. J. B. Griffing has been directly in charge of this course, assisted both in administration and teaching by Mr. Chow Ming-I. Practically the whole of the faculty participated in it at some time during the year. The object of the course was "primarily so to train rural teachers and extension workers that they will be able to meet the particular problems in their own localities and become active community

leaders. Secondarily, it is intended to develop farm foremen, experiment station managers, operators of pure seed farms, nursery managers, etc." Special emphasis was placed on gaining skill in practice by arranging all classroom work in the forenoon and requiring, during each afternoon, field, garden or nursery operations corresponding to the lessons studied. The old sericultural buildings were fitted up for dormitory use and one of the rooms in the Agricultural gardens was fitted up as a class-room. All the courses covering a rather wide range were given in Chinese. Besides the regular work, men interested in sericulture, cotton growing, and teaching were given special work in these lines. A series of special lectures was also arranged. The course lasted from September 21st till August 20th, becoming part of the Summer School beginning July 4th. The course was quite successful and is being offered again.

There were more than two hundred inquiries and applicants, of whom only forty-five were accepted. It speaks well both for the teachers and students in view of the large amount of hard practical field work required, that only four men dropped or were dropped during the Autumn Semester, three of whose places were filled during the Spring semester, making a total enrollment of forty-seven. Ten provinces were represented including far away Szechuen with six students. Fourteen students came from Kiangsu. Seven students were sent by Missionaries to prepare to take up Agricultural work upon their return.

Agricultural Gardens

While the gross receipts (approx. $15,000) are a little less than for the preceding year the number of orders filled is more than a third greater, some four thousand orders being filled during the year. Financially, however, the year has been a good one, showing a fair credit balance after having paid all overhead charges.

An inventory of the agricultural gardens as of December 31st, 1923 showed the value of our equipment, stock, seeds

and trees (these last two items being taken at one-half their market value) to be $6,007.40.

Mr. Shao Teh-hsing, as Superintendent, has done excellent work in handling a large amount of labor and in providing both educational and recreational opportunities for the workmen. A successful night school was maintained during the school year, regular Sunday services were held and during China New Year he largely suppressed their gambling propensities by holding their interest in the revival of an ancient Chinese horse lantern parade.

During the year we used 28,148 days of labor, an average of ninety laborers per work-day throughout the year. This includes all the labor used by the Department of Cotton Improvement and most of that used by the Department of Sericulture.

Mr. Hwang Tsung has continued in charge of the nursery and tree seed work. About $1,600 gold worth of tree seeds were shipped to the United States. The majority of these seeds are of great value to the American horticultural industry, particularly seeds of certain wild Chinese fruits used as grafting stock for varieties cultivated in America.

Area of Land Under Cultivation

In spite of the apparently large amount of land under cultivation, one of our greatest needs is more land, and in the same area in order that we may oversee it more effectively. In the city we have approximately seventy English acres under cultivation all of which is owned by the University, but rather scattered. Outside the city on our Tai Ping Men farm we own about thirty-five English acres, fairly well concentrated in one area, and in addition we rent three other tracts totaling about seventy English acres. Most of the land outside the city is devoted to cotton of which there are about seventy acres and the balance is devoted to rice, wheat and corn. Seed improvement and the production of fairly large amounts of improved seed for distribution are bound to be important projects and parts of our work, and plenty of suitable land, well located, is fundamental. As soon as possible we should secure permanently at least one hundred and fifty acres more land, including the land we are now renting on three-year contracts which are unsatisfactory, expensive and undesirable. We need one fairly large farm near our College buildings in the city and the present farm outside the city should be greatly expanded.

Inventory of the College of Agriculture and Forestry

Last year as of December 31st, 1922 we attempted an inventory of the equipment, tools, animals, products and land of the College of Agriculture and Forestry. None of the buildings though built from the various Department funds were included. The value of the equipment, tools, etc., is not based on first cost but depreciation has been taken into account in every case and its present marketable value thus estimated. The land has been put in at cost. The inventories of the principal departments or items are as follows.

Agricultural Gardens	$ 6,007.40
Agronomy Department	364.70
Cotton Department	3,867.10
Herbarium	1,560.00
Sericulture Department	8,255.41
Land (396 Mow)	18,453.00
Total	$38,507.61

Faculty

During the year Mr. W. C. Lowdermilk and Mr. Hsü Chen have joined the faculty. Mr. Lowdermilk is a graduate of Oxford University, in Forestry. He has had forestry experience in France and Germany and previous to his coming to Nanking, he was carrying on important research in reforestation problems in the Pacific Northwest, as a member of the United States Forest Service, District number one. Mr. Hsu Chen was one of the first graduates of the College of Agriculture and Forestry, B.S. 1918. He taught for four years in Saint Andrews' Middle School, Kaifeng, and acted as Chinese Secretary of the College of Agriculture and Forestry half time, during the Autumn Semester. He

has been devoting full time since the beginning of the spring semester in the College, continuing his secretarial work and assisting in the Department of Rural Economics and Farm Management and teaching in the short course in Agriculture. Mrs. Charles S. Gibbs, B.S., Colby, and assistant in the Yale Medical School in Physiological Chemistry, has been regularly and effectively helping Dr. Gibbs in the Bacteriological laboratory. Mrs. Alexander Brede, B.A., California, and M.A., Radcliffe, with much experience in scientific illustrating, though doing full language study, has spent much time in the preparation of entomological charts for educational purposes.

We lost by resignation, Mr. Chao Tsung-ting, who has gone to America for further study, after four years of exceptional service; Mr. Sie Kia-shen, who has gone to the Peking Agricultural College as Dean and Professor of plant pathology, and Mr. Chang Chuan-ching who has returned to his native home in Chekiang province.

Faculty Meetings

Faculty meetings have been held regularly each month, and after short business sessions, some member of the faculty has presented a paper or given a talk, generally, on the work of his department or on some research problem on which he has been working. These have been very helpful and interesting. General faculty business has been cared for through an executive committee which met separately and made its recommendations for general faculty action. This dispatched business more effectively and gave time in the regular faculty meetings for the cultivation and maintenance of more particularly professional interests.

Government Co-operation

Our official relationships remain unchanged. Shansi Province has fourteen students, on provincial scholarships; Anhwei province has eight; Shantung province has three. Ten of these scholarship students are studying agriculture and fifteen are studying forestry.

Shantung Provincial Summer School

During the spring, the Bureau of Education of Shantung Province sent an invitation to us to provide them with a teacher of Rural Education for the Summer School carried on by the Bureau, they to provide in turn an honorarium of $200 for the month. We were able to arrange for Mr. Griffing and Mr. Chow Ming-i to carry the work. The lectures were written in English by Mr. Griffing in Nanking with suggestions for field work, and given in Chinese by Mr. Chow who represented the University in Tsinan. The contact was helpful in every way and Mr. Chow did excellent work in arousing much interest in this important problem. In signing up for classes for the Summer School of 1924 eighty per cent elected Rural Education. The subject was brought so forcibly to the attention of the officials that plans are already under way to institute a Department of Rural Education in connection with the Provincial Normal School.

Forestry Fund Committee

The Forestry Fund Committee of Shanghai administering suplus famine funds from the Hwai River flood famine of 1913 continue their grant of $5,000 Mexican per year for instruction in forestry and $1,000 toward the $5,000 loan scholarship fund established three years ago. There can be no question that the committee has used their funds wisely when the work of the thirty odd forestry graduates are taken into consideration occupying as they do some of the most important forestry positions in China, and the large majority of them engaged directly in forestry teaching or practical forestry work. Forestry in China can not proceed faster than an adequately trained forestry personnel, and while such training work may not be in any sense spectacular, there is no work more fundamental at the present stage of forestry development in China.

In addition to their grants for instruction and personnel, in 1922 a special grant of $1,100 was made for some much

needed equipment for the forestry department and for the expenses of an investigation into the Cunninghamia lumber industry of China. Mr. Ip is carrying on this investigation this summer, assisted by three of our senior forestry students.

Missionary Interest in Agricultural Education and Rural Problems

There are three important evidences of the increasing interest among the missionary body in agricultural education and rural problems; namely, the recommendations of the China Christian Educational Commission, the appointment by the China Christian Educational Association of a standing Committee on Agricultural Education and the appointment by the National Christian Council of a standing committee on Rural Problems and the Country Church. One also sees unmistakable evidence of this interest in missionary literature. Our own definite contacts with China missionaries have been increasing, and we are increasingly being called upon for co-operation and help. Seven of the one-year short course in Agriculture students were sent by missions or stations for definite training for rural work when they go back. It is quite evident also that more would avail themselves of these trained men or of our facilities for training them were the cost not as considerable as it is. We must frankly recognize the fact that many missionaries are more willing to co-operate than we or they have found satisfactory ways to get definite agricultural or rural work started.

There is an increasing tendency on the part of the missions and missionaries to be thinking in the terms of general rural problems rather than on agricultural education. What is wanted is more than just a school teacher; one who can combine rural social interests with evangelistic interests or as suggested by President Butterfield in the Educational Commission's report, a farmer-preacher type of worker. It is not an easy product to develop but some way must be found to equip both the village teacher and preacher more specifically for their rural work. Perhaps with the help of

these new committees we may be able to develop a practical plan, and certainly we are ready to co-operate to the extent of our resources. Each year the College of Agriculture and Forestry is more and more convinced that its greatest contributions to China will be made directly through the channels of the Christian Church in China, emphasizing the human and Christian though not under-estimating the economic and commercial interests in agriculture and rural life.

Mission Co-operation

During the year Mr. Griffing has been co-operating with, and directing the agricultural work of the Presbyterian Nanhsuchow station. Improved Trice cotton seed has given excellent yields. Mammoth Red wheat introduced six years ago has yielded at the rate of 413 pounds per mow in 1922 and 533 pounds in 1923, out-yielding two to three times the native varieties. Ripening at the same time the local wheats ripen makes it a very hopeful introduction. Last year about 4,000 pounds of improved seed was distributed (sold) locally, and this year's larger crop will be distributed over a much wider area. A small tree nursery has been supplying trees to a wide area also. An interesting and promising experiment is being carried on with spring irrigation of wheat, the yield of which is invariably affected by the dry winters and springs. Mr. H. H. White, a graduate of the Massachusetts Agricultural College has recently arrived to take up agricultural missionary work in the station which should make possible even more helpful relationships at Nanhsuchow.

The Canadian Church Mission, Kaifeng, Honan, invited Mr. Ritchey and Mr. Hsu Chen to give a course in Agriculture, July 3-24, through the period of their Summer Conference of Church workers. Fifty-nine teachers, of whom thirty-nine were men and twenty were women, took the course consisting of much laboratory and field work, emphasizing such things as would be of value to the students on returning to their schools. The interest in the course steadily increased as its value became more apparent. It is hoped to continue some work in Agriculture next year at this same annual con-

ference. Similar Summer Conferences by other missions offer an excellent opportunity of enlisting interest and co-operation.

At the invitation of Rev. R. A. Torrey, of the Presbyterian Shantung Mission at Tsinan, we took part in a big agricultural institute in Ling I Hsien, Shantung. Mr. Buck, Mr. Ritchey, Mr. Chow Ming-i and four students spent four days, lecturing, exhibiting improved farm crops material, demonstrating a foreign plow, and giving plays in the local theatre on themes relating to agricultural improvement and social betterment. The magistrate co-operated heartily, and the institute reaching several thousand village leaders and villagers was an unqualified success.

Agricultural exhibits, plays, ploughing demonstrations were given in quite a number of localities during the year, and always in co-operation and with the help of the local Christian community.

Improved Agricultural Machinery

Important progress has been made in developing or adapting improved agricultural implements and machines for use in China. Special attention should be called to the series of cultivators made by Mr. Griffing primarily to aid in cotton cultivation but adapted to other uses on the Chinese farm particularly in North China; to his saw gin for ginning Chinese cotton, and to an irrigation well pump for use in the extensive well region north of the Yangtze River. The advantage of the pump is the greater rapidity with which irrigation can be accomplished, and consequently the greater the area that can be irrigated in a given time. Further improvements will have to be made on the pump, but there seems to be little question of its practicability from the standpoint of efficiency, use and cost. A small grain thresher presented to the College of Agriculture and Forestry by Elbrook, Inc. New York, Shanghai, and the Messinger Manufacturing Company, Tatamy, Pa., used for the first time during the 1923 wheat harvest did excellent work, and if the cost can be reduced by manufacturing certain parts and

constructing it in China, it should come into considerable use in North China. We have distributed (sold) over sixty of the Oliver Chilled Plow Company's series of chilled steel plows, with general satisfaction. The lack and cost of easy transportation is and will continue to be one of the chief obstacles in the way of general use of improved farm machinery even though it be fully practical to use.

Publications

1923 Nursery Stock and Seed List (in English)	40 pages,	4,500	copies
1923 Nursery Stock and Seed List (in Chinese)	„	3,000	„
Farm Implement Supplement (in English) ..	4 „	2,500	„
Farm Implement Supplement (in Chinese) ..	„	1,000	„
What the College of Agriculture and Forestry can do for you (in English)	4 „	4,000	„
Missionary Interest in Agricultural Education (in English)	4 „	2,500	„
1923 Chinese Tree Seed List (in English) ..	8 „	1,000	„
Rural Survey Blank (in Chinese) by J. Lossing Buck and Chang Chi-wen	„	1,000	„

(This was also printed in the "Journal of Agricultural Association of China," Nanking.)

For Publications of the Department of Sericulture, see page 33.

Faculty in Print

J. Lossing Buck. The Chinese Church and Country Life. The Chinese Recorder, June, 1923.

C. L. Ch'ien. (See page 33.)

C. S. Gibbs. The Rôle of Bacteria in Nature. The China Journal of Science and Arts. Vol. I. No. 4, July 1923.

Griffing, J. B., Gleaners in the Fields of China. The Christian Herald, August 2, 1923.

N K. Ip. Chinese Women's Position in Forestry—Published (1), Chinese Forestry Journal; (2), Nu Dou Bao—1922.

Y. Kuh. (See page 34.)

W. C. Lowdermilk. Famines and their Prevention. The Linguist, 1923.

A College of Agriculture and Forestry Building

While the need for a building corresponding to Swasey Hall for the College of Agriculture and Forestry has for a number of years been quite evident, the need has now become

acute. We are now occupying less than one-half the second floor of Swasey Hall, and in this space have most of our classroom and offices. The Department of Chemistry alone has almost twice the floor space that we have, with our many more teachers, classes and offices. Moreover, both Physics and Chemistry need the rooms we now use.

A new building, adapted to our class room and laboratory needs is accordingly an exceedingly urgent necessity, and should provide room not only for our own departments, but for the Department of Biology so that there could be the best and most efficient use of all laboratories and equipment for all the biological subjects including bacteriology, botany, plant pathology, etc. Were the building ready for occupancy this autumn, we could practically use it to capacity and within a year after we get to operating on the Famine Prevention funds we should be using it fully. It is to be hoped that the necessary $100,000 Mexican ($50,000 Gold) may be forthcoming soon so that we can proceed with construction and be occupying it as early as possible. Until then our work is bound to be hampered by lack of proper facilities under which to carry it on.

Acknowledgments

I want to acknowledge and to express my appreciation of the splendid way in which the College of Agriculture and Forestry was carried forward during my absence of twenty-seven months, by Mr. K. S. Sie as associate dean during the absence of both Mr. Buck and myself and later by Mr. Buck as acting dean, also by all the members of the faculty. Miss Priest has been especially helpful as English Secretary of the College in carrying in addition to much secretarial work a tremendous amount of detail, in helping with the accounts of the Departments specially financed, and in organizing and checking departmental budgets. Every member of the faculty has shown fine spirit in submitting to the cuts in budget, doing without much needed equipment, and in willingness to carry their share of the difficult financial burden of the University.

PUBLICATIONS

AGRICULTURE AND FORESTRY SERIES

VOLUME ONE.

Number one. School Nurseries. By John H. Reisner. (Translated into Chinese by Li Tai-fang.)

Number two. Roguing of Cotton. By J. B. Griffing. (Translated into Chinese by Shao Teh-hsing.)

Number three. Cotton Culture. By J. B. Griffing. (Translated into Chinese by Shao Teh-hsing.)

Number four. The Control of Plant Diseases and Insects. By G. E. Ritchey.

Number five. A study of Weeds. By G. E. Ritchey.

Number six. I. Report of Three Years' Cotton Improvement Work.

Number six. II. Observations on the Behavior of Cotton Plants especially during Acclimatization.

By J. B. GRIFFING.

UNIVERSITY OF NANKING BULLETIN

TENTH

ANNUAL REPORT

OF THE

COLLEGE OF AGRICULTURE AND FORESTRY

AND

EXPERIMENT STATION

1923-1924

VOLUME SIX, NUMBER SEVENTEEN

Letter of Transmittal

President A. J. Bowen, LL.D.,
The University of Nanking,
Nanking, China.

My Dear President Bowen:—

I have pleasure in submitting herewith the tenth annual report of the College of Agriculture and Forestry and Experiment Station for the year ending June 30, 1924, and in recommending its publication as University of Nanking Bulletin, Volume six, Number seventeen.

Respectfully yours,

John H. Reisner,

Dean and Director.

CONTENTS

COLLEGE OF AGRICULTURE AND FORESTRY

Faculty and Officers*

BOWEN, ARTHUR JOHN, B.A., LL.D. (Northwestern). President of the University.

WILLIAMS, JOHN ELIAS, B.A., D.D. (Marietta). Vice-President of the University. (In the United States).

REISNER, JOHN HENRY, B.A. (Yale), M.S.A. (Cornell). Dean of the College of Agriculture and Forestry and Director of the Experiment Station; Collaborator of the United States Department of Agriculture.

SARVIS, GUY WALTER, B.A. (Drake), M.A. (Chicago). Registrar of the Colleges; Dean of the College of Arts and Science.

OWEN, LEWIS JAMES, University Treasurer.

BUCK, JOHN LOSSING, B.S. (Cornell). Department of Agricultural Economics and Farm Management.

CALDWELL, LEONARD HATHAWAY, Ph.B. (Yale). Surveying; Meteorology.

CHANG CHI-WEN, B.S. (Nanking). Associate Director of One Year Short Course in Agriculture; Associate in Department of Cotton Improvement.

CHANG YUAN-WEI, B.S. (Nanking). Associate in Department of Rural Education. (July 1st, 1924).

CHEN KEN, B.S. (Nanking). Associate in Department of Bacteriology. (July 1st, 1924).

CH'EN YEN-SHAN, B.S. (Nanking). Associate in Department of Cotton Improvement; Extension.

CHIAO CHI-MING, B.S. (Nanking). Associate in Department of Agricultural Economics and Farm Management. (July 1st, 1924).

CHIAO CHI-YUAN, B.S. (Nanking). Associate in Department of Botany. (September 1, 1924).

CHOW MING-I, B.S. (Nanking). Associate in Department of Extension.

CLEMONS, HARRY, B.A., M.A. (Wesleyan), M.A. (Princeton). Librarian, University Library; Collaborator of the United States Department of Agriculture.

DEGROFF, Miss DOROTHY, Secretary to the Dean.

GIBBS, CHARLES SHELBY, B.S. (Bates), M.S., Ph.D. (Yale). Department of Bacteriology.

* As of June 30, 1924 with exceptions as noted.

GIBBS, Mrs. CHARLES SHELBY, B.S. (Colby). Department of Bacteriology.

GLESS, Miss BERTHA, Office Secretary. (September 1, 1924).

GRIFFING, JOHN B., B.S. (Kansas Agricultural College), B.A. (Drake), M.A. (Columbia). Departments of Cotton Improvement, Rural Education and Extension. Director of One Year Short Course in Agriculture.

HAN LIH-WU, B.A. (Nanking). Associate in Research Library.

HANCOCK, MARCUS LESLIE, B.S. (Ontario Agricultural College). Department of Agricultural Gardens; Horticulture and Plant Propogation.

HEH CHING-MING, B.S. (Nanking). Associate in Department of Agronomy.

HSU, PAUL C., B.S.. (Nanking). Associate in the Department of Agricultural Economics and Farm Management; Rural Organization.

HSU CHEN-KEN, B.S. (Nanking). M.S.A. (Cornell). Genetics. Secretary of the College of Agriculture and Forestry.

HWA PEH-HSIUNG, B.S. (Nanking). Associate in Department of Agricultural Economics and Farm Management.

HWANG TSUNG, Assistant in Department of Agricultural Gardens; Nursery.

ILLICK, J.T., B.A. (Taylor), M.A. (Syracuse). Department of Biology. (On furlough).

IP, N.K., B.S. (Penn. State), M.F. (Yale). Department of Forestry.

JONES, ERNEST VICTOR, B.A. (Scarritt-Morrisville), M.A., Ph.D. (Vanderbilt). Chemistry.

KAN HAN, B.S. (Nanking). Associate in Department of Forestry; Forestry Extension.

KUH YING, (Tokyo Agricultural University). Department of Sericulture.

LI TEH-I, B.S. (Nanking). Associate in Department of Forestry.

LI YING-HWEI, B.S. (Nanking). Associate in Department of Extension. (July 1st, 1924).

LING KAN, B.S. (Nanking). Associate in Department of Forestry; Dendrology.

LOWDERMILK, WALTER CLAY, B.S. (Oxford). Department of Forestry; Forestry Research.

PORTER, RUPERT HOWARD, B.S., M.S. (Iowa State College). Department of Plant Pathology; Collaborator of the United States Department of Agriculture.

PRIEST, Miss ELSIE MAY, English Secretary of the Faculty.

REN CHEN-TUNG, B.S. (Nanking). Associate in Department of Forestry.

RITCHEY, GEORGE EDGAR, B.S. (Iowa State College). Department of Agronomy.

SHAO TEH-HSING, B.S. (Nanking). Department of Agricultural Gardens; Farm Superintendent; Translator and Interpreter for the University Faculty.

SHEN SHEO-TSUEN, B.S. (Nanking). Associate in Department of Agronomy.

SHEN HSIOH-LI, B.S. (Nanking). Associate in Department of Forestry.

STEWARD, ALBERT NEWTON, B.S. (Oregon Agricultural College). Department of Botany.

SWEN FANG, B.S. (Nanking). Associate in Department of Rural Education. (July 1st, 1924).

SWEN WEN-YUH, B.S. (Nanking). Associate in Department of Agricultural Economics and Farm Management.

THOMSON, JAMES CLAUDE, B.S., M.S., B.D., (Rutgers), M.A. (Columbia). Department of Chemistry; Agricultural Chemistry. (On furlough).

WANG KWOH-TING, B.S. (Nanking). Associate in Research Library.

WANG SHEO, B.S. (Nanking). Associate in Department of Agronomy. (July 1, 1924).

TENTH ANNUAL REPORT OF THE COLLEGE OF AGRICULTURE AND FORESTRY AND EXPERIMENT STATION

Introduction

The year under review has witnessed a rapid expansion of our work due in large part to the new projects undertaken in connection with our Famine Prevention Program which has been approved by the American Famine Fund Committee. There has been a big increase in the number of teachers, associates, and assistants. Instruction has been better cared for, our extension work has been considerably enlarged, and all investigation and research work much more effectively organized. The annual grant of $5,000 from the Shanghai Forestry Fund Committee has been renewed for another period of three years. An agricultural and forestry newspaper has been effectively launched. Much needed equipment for class, laboratory and field use has been added. We have had more requests from missionary and Chinese interests for co-operation than we could take care of. The year's work in sericulture, cotton, and cereal improvement has been highly successful. Our direct contacts with the farmers have been greatly increased. We are four-fifths of the way towards the $100,000 required for the erection of the badly needed College of Agriculture and Forestry building. Fuller statements regarding these and other developments and fairly full reports of the departments will be found below.

Famine Prevention Program

The outstanding event of the year was the approval by the American Famine Fund Committee of the ten year famine prevention program and budget, made possible by the alloca-

tion to the University for famine prevention work of $675,000 gold by the American Committee for China Famine Fund of New York. The famine prevention program includes the following projects: forestry instruction, extension and research, agricultural extension, farm crops improvement and pure seed farms, economic and farm management studies in famine areas, co-operative extension projects in famine areas, plant disease control, animal disease control, rural engineering, rural education, and research library. The full program, with detailed statements concerning each project, was published in May as bulletin, volume one, number nine of the Agriculture and Forestry series.

Famine prevention is a complex problem. During the last winter and spring, prolonged droughts, in some cases extending into the summer, over large and small areas, seriously effected crop production. Plant lice in one known area destroyed thousands of acres of wheat. Over a wide area in North China, rinderpest caused the death of hundreds of thousands of cattle, decreasing the farmer's working capital and credit and consequently his ability to meet normally adverse conditions. During the present summer wide spread floods are destroying crops, property, and life. River beds are being further silted up with the unprotected soil of thousands of hills through which the rivers run. More forest resources are being destroyed than are being built up. It is difficult to portray the immensity and complexity of the famine problem. Permanent prevention can only be accomplished by attacking the problem in a comprehensive way. The projects undertaken as listed above appear meagre in view of the whole task but we believe they are all pertinent and will serve in methods and results as effective demonstrations. **The improvement and development of agriculture and forestry and the conditions under which the rural population lives is not only the cornerstone to any comprehensive and wise program of famine prevention but it is basic to national prosperity and greatness.**

Forestry Fund Committee Grant

We record with much pleasure the continuation for another three year period of the annual grant of $5,000 Mexican by the Forestry Fund Committee of Shanghai administering surplus famine funds from the Hwai River flood famine of 1913. These grants will apply as in the past to the work of the department of forestry.

Cornell in China Club

The organization and purposes of the Cornell in China Club were fully reviewed in the last annual report of the College of Agriculture and Forestry. It has not yet been possible for the Club to put into operation its plans for developing agricultural extension work in connection with our famine prevention program. Cornell women are contemplating parallel extension projects for the women of rural China. Real progress, however, is being made by the Club in getting the co-operation actively under way and we hope that the first Cornell representative will arrive on the field within the coming year.

Agriculture and Forestry Building

The agriculture and forestry building which has been mentioned in the annual reports for the last six years as constituting a pressing need seems about to be realized. We have been very much overcrowded and cramped in our present quarters for several years and the increase of the faculty in order to take care of our famine prevention projects has created an impossible and very undesirable situation. The fitting up for temporary use of an old temple for cotton improvement and the one year short course in agriculture, additions to the agricultural gardens' buildings for our horticultural and agronomy work, and the fitting up of several rooms in the basement of Severance Hall for forest research have made it possible for us to carry on. The new building will add greatly to the effectiveness of all our work.

It is to be located on the main campus immediately opposite Swasey Science Hall, and in exterior design will be similar to it. The building will cost, with equipment, $100,000 Mexican. The China Medical Board have made a provisional grant of one fourth and the American Famine Fund Committee a provisional grant of one half of this amount. It is hoped to raise the remaining one fourth from friends in the United States in time to begin work early in the autumn of 1924. We hope to be able to move into the building in September 1925.

Government Recognition

By an unfortunate oversight in the last annual report the recognition by the Peking Ministry of Education of the College of Agriculture was not recorded. This recognition was accorded in 1922 after an investigation made by a special committee appointed by the Ministry. The department of forestry was not registered, partly on a point of technicality and partly because it was understaffed. Since the College was registered by the Ministry it has practically doubled in number of faculty and size of budget with a commensurate increase in the work of instruction, research, and extension. The forestry department has been greatly strengthened and its program enlarged so that we hope to have it also recognized at an early date.

Government Scholarships

Anhwei province maintains eight scholarships for agricultural and forestry students from that province. Shantung province maintains three scholarships for forestry students. Shansi province still has three scholarship students; the other eleven of the original fourteen Shansi scholarship students have been graduated.

Agriculture and Forestry Newspaper

To fill the evident and very great need for a good farm paper in China corresponding to farm papers in the west,

an agriculture and forestry newspaper, "Nung Ling Sin Pao," was started on the first of January. The aim of the paper is to disseminate agricultural and forestry information and news that will be of help and interest to the literate rural population. The paper has an editor in chief, Mr. C. K. Hsu, an associate editor, Mr. C. W. Chang, and an editorial board. The articles published are for the most part contributed by the members of the faculty.

The newspaper is four pages in size, and is published biweekly. A subscription price of thirty cents per year is charged, less a twenty percent discount to all teachers and preachers and to clubs of ten. That there are 750 paid subscriptions after only six months indicates that the newspaper has been well received and has a real place in the rural affairs of China. Plans for enlargement are under consideration.

Faculty

The year has given us a big increase in faculty members. This increase has been most noticeable in the number of our own graduates who have joined the faculty as Associates and who add very greatly to the strength and effectiveness of all our work. There has also been a big increase in the number of assistants necessitated by the greater amount of office and clerical work that has grown out of the last year's development.

Mr. and Mrs. R. H. Porter arrived in Nanking last September. Mr. Porter had for several years been Assistant Extension Professor in Plant Pathology at the Iowa State College of Agriculture and Mechanical Arts, where he did both his undergraduate and graduate work. He was in charge of all the extension work in plant pathology for the state of Iowa. He will have charge of the plant disease control project of the famine prevention program. Mr. M. L. Hancock arrived from England in September also. He is a graduate of the Ontario Agricultural College, Canada. The year previous to his coming to Nanking he was connected with the Bell Experiment Station of the United States Department of

Agriculture engaged in plant propagation work. His wide practical experience fits him well for the horticultural and plant propagation work for which he will be responsible.

Mr. Hsu Chen-ken and family came to the College from the Kiangsu First Provincial Agricultural School, Nanking, where he had been in charge of the Extension Department. After graduating from the College of Agriculture and Forestry in 1919, he spent two years in America. He received his Master's degree in Agriculture from Cornell University.

We are glad to welcome sixteen of our graduates to the faculty. They have been appointed as follows:—

Associates in the Department of Agricultural Economics and Farm Management, Chiao Chi-ming and Swen Wen-yuh; Associates in the Department of Agronomy, Heh Ching-ming, Shen Sheo-tsuen who returned after an absence of a half year and Wang Sheo; Associate in the Department of Bacteriology, Chen Ken; Associate in the Department of Botany, Chiao Chi-yuen; Associate in the Department of Extension, Li Ying-hwei; Associates in the Department of Forestry, Kan Han after a half year with the Tsingtao Forestry Bureau, Li Teh-i, Reh Chen-tung, and Shen Hsioh-li; Associates in the Department of Rural Education, Chang Yuan-wei and Swen Fang; Associates in Research Library, Wang Kwoh-ting a graduate of 1920 who came to us from the Commercial Press, Shanghai, and Han Lih-wu, a graduate of the 1924 class of the College of Arts and Science.

We regret to record the resignation on September 1st of Mr. Chien Tien-ho. Mr. Chien had been head of the Department of Sericulture for five and a half years. When he arrived we were only beginning our sericulture work. When he left we had one of the best equipped sericultural plants in China. His ability and loyality were marked and his resignation to go into buiness was a distinct loss to the University. We are glad to report there have been no other changes in the faculty during the year.

Our effective faculty for the coming year will be nine full time foreigners; six part time foreigners, two returned students, twenty-four associates, who are graduates of the

College of Agriculture and Forestry, and twenty-five assistants. In addition we have two full time English secretaries and one-half the time of a third.

Instruction

The following is a summary of the class work in the College of Agriculture and Forestry for the year 1923-1924:—

	Autumn Semester.	Spring Semester.
Total number of classes	27	31
Number of teachers	11	15
Total enrolment of students in all classes	264	210
Average enrolment of students per class	9.1	6.8
Average number of classes per teacher..	2.54	2.07
Total number of credits offered	84	88
Average number of credits hours taught per teacher	7.6	5.87

One of the steps which is being taken to improve our instruction is to give the students more practical work in the form of projects. There has been a strongly felt need for such work not only on the part of the teachers but also by the students who have repeatedly asked for it. Beginning in the autumn of 1924 definitely outlined projects will be required of each student during his last two years in college. These projects will be such that they should equip our students with a degree of experience in handling practical problems which students leaving the college in the past have not all had.

Organization within the College

During the year considerable progress has been made in the internal organization of the College of Agriculture and Forestry which will contribute to the efficient and democratic administration of our work. The College has been divided into eleven departments as follows; Agricultural Economics and Farm Management, Agricultural Gardens, Agronomy, Bacteriology, Botany, Cotton Improvement, Extension, Forestry, Plant Pathology, Rural Education, and Sericulture. It

is hoped that the plans now under consideration for merging all the biological sciences into one department may materialize during the coming year.

Committees on instruction, extension, research and investigation, co-operation, herbarium, publications, and an executive committee handle a great deal of business which needs collective consideration and help to prevent duplication of effort and to plan most wisely for the best use of our whole resources.

Research and Investigation

During the year our research and investigational work has been reorganized and placed under the supervision of the committee on research and investigation. Every investigational project or research problem before it may be undertaken must be submitted to the committee in the form of a project giving the following information: name, object, reasons for undertaking, uses to be made of the results, location, co-operation, probable date of completion, and estimated cost. If the project is approved, a working plan of the project must be submitted in detail; giving a review of the present knowledge on the proposed project; indicating wherein the present knowledge is insufficient; outlining the methods to be used in the investigation, including the equipment to be used; and giving a careful estimate of the cost. Progress reports and project progress data must be submitted to the committee at regular specified times.

This committee has done a very real service in organizing our research and investigational work so that it is clearly evident how much of our time, energy and budget is being used in this way, and what is the type of work which we are undertaking. Nothing that we are doing is more important than these investigation and research projects because it is only as we gain accurate information relating to Chinese agriculture and forestry that we are able to develop a type of instruction that is based on actual Chinese conditions or may hope to make effective contributions through our extension program. A special word of appreciation is due to Mr. W. C. Lowdermilk who, more than any other, has been responsible for the organization of our research and investigation work on a project basis.

The following projects have been approved and for the most part assigned to members of the faculty.

1 A.D. ANIMAL DISEASES (including Poultry).
- A.D. 1. The Control of Epitheliome Contagiosum (Bird pox).
- A.D. 2. The Control of Hemorrhagic Septicemia (fowl cholera).
- A.D. 3. The Control of Epitheliome Contagiosum and Hemorrhagic Septicemia in Fowls.
- A.D. 4. The Control of Rinderpest in Cattle.
- A.D. 5. The Investigation of Nodular Disease in Goats.
- A.D. 6. The Control of Internal Parasites in the Domestic Fowl.
- A.D. 7. Control of Rinderpest at Nanhsuchow, Anhwei.
- A.D. 8. Rinderpest Control at Kaifeng, Honan.
- A.D. 9. The Investigation of Poultry Diseases.

2. A.E. AGRICULTURAL EDUCATION.
- A.E. 1. Nung Ming Tsien Tz Ko (Farmers' One Thousand Character Lessons).

3. A.H. ANIMAL HUSBANDRY.
- A.H. 1. Improving Native Cattle Around Kaifeng, Honan.

4. B.H. BOTANY, INCLUDING HERBARIUM.
- B.H. 1. The Herbarium.
- B.H. 2. A Manual of The Flora of Nanking and Vicinity.
- B.H. 3. An Index To The Chinese Names of Plants.
- B.H. 4. Woody-Plant Collection of Wang Shan and Nan Shan Ranges, Anhwei

5. F.M. FARM MANAGEMENT.
- F.M. 1. A Study of Present Day Systems of Rural Credit and Savings.
- F.M. 2 A Study of Present Day Rural Co-operative Enterprises in China.
- F.M. 3. A Farm Management Survey at Nanhsuchow, Anhwei.
- F.M. 4. A Study of The Marketing of Wheat, Beans, Sesamum and Kaoliang at Nanhsuchow, Anhwei
- F.M. 5. A Farm Management Survey at Yen Shan, Chihli.
- F.M. 6. A Farm Management Survey at Lin I, Shantung.
- F.M. 7. A Study of the Types of Farming at Lin I, Shantung.
- F.M. 8. A Farm Management Survey at Wu Tai, Shansi.
- F.M. 9. A Farm Management Survey at Swen Hwa Chen, Nanking.

F.M. 10. A Farm Management Survey at Liankan, Fukien.
F.M. 11. A Farm Management Survey at Nanan, Anhwei (1921).
F.M. 12. A Farm Management Survey at Nanan, Anhwei, (1922).
F.M. 13. A Farm Management Survey at Chung Hai, Chekiang.
F.M. 14. A Farm Management Survey at Wu-Siang, Shansi.

6. F.R. FOREST RESEARCH.

F.R. 1. Tree Studies.
F.R. 2. Seed Storage.
F.R. 3. Seed Testing.
F.R. 4. Source of Seed.
F.R. 5. Planting Site Indicators.
F.R. 6. Timber and Fuel Prices.
F.R. 7. Wood Distillation.
F.R. 8. Temple Forests.
F.R. 9. Vegetative and Surface Conditions of The Yellow River Watershed.
F.R. 10. General Forestry Conditions of The Localities Traversed During Woody-Plant Collection Trip. (Wangshan and Nanshan, Anhwei).
F.R. 11. Utilization of Waste Land at Yihsien, Shantung, by Practice of Reforestation.
F.R. 12. Weather Records and Reporting.
F.R. 13. River Dike Plantations.

7. HC. HORTICULTURE.

Hc. 1. Western Pear Collection.
Hc. 2. Persimmon Collection.
Hc. 3. Improvement of Pomegranates by Western Introductions.
Hc. 4. Summer Propagation of Mulberry.
Hc. 5. Methods of Grafting Mulberry.
Hc. 6. Citrus Collection.
Hc. 7. Improvement of Fruits at Yihsien, Shantung.
Hc. 8. Preservation of Fruits at Yihsien, Shantung.

8. IR. IRRIGATION PROJECTS.

Ir. 1. Irrigation of Winter Wheat at Nanhsuchow, Anhwei.
Ir. 2. Spring Irrigation of Grain at Kaifeng, Honan.
Ir. 3. New Design for Irrigation Pump.
Ir. 4. Improvement of Wells for Irrigation.

9. P.P. PLANT BREEDING.

P.B. 1. Improvement of Wheat.
P.B. 2. Improvement of Corn.
P.B. 3. Improvement of Cotton.
P.B. 4. Improvement of Soy Beans.
P.B. 5. Improvement of Rice.

10. P.P. PLANT PATHOLOGY.

P.P. 1. Collection and Classification of The Fungi of China.
P.P. 2. Control of Flag Smut of Wheat.
P.P. 3. Control of Fruit Diseases and Insects at Yihsien, Shantung.

11. R.L. RESEARCH LIBRARY.

R.L. 1. History of Famines in China.

12. SC. SERICULTURE, INCLUDING SILKWORM DISEASES.

Sc. 1. Improvement of Summer Silkworm Seed.
Sc. 2. Relation of Types of Silkworm Egg Layings to Incidence of Pebrine.
Sc. 3. Studies in Commercial Qualities of Varieties of Silk Cocoons.
Sc. 4. Determination of Percent of Silkworm Egg Layings From a Given Quantity of Cocoons of Different Varieties of Silkworms.
Sc. 5. An Investigation of Silkworm Diseases.

13. S.F. SOILS AND FERTILIZERS.

S.F. 1. Laboratory Studies of Bacteria Occurring in Chinese Soils.

Co-operative Extension Projects

The co-operative extension projects include co-operation with schools, missions, officials, or other famine relief or prevention agencies in carrying our projects definitely related to our famine prevention and agricultural improvement program. The requests for such co-operation with financial help have been greater than we have been able to meet. It is quite clear that in the beginning of our famine prevention work nothing will be more disastrous than to spread out over more territory or to undertake more projects than can be handled efficiently. The following factors have been used as the basis for co-operation: interest of missionaries and the assurance of permanency; willingness to co-operate and carry out plans agreed upon; presence of trained personnel to carry responsibility; value of the location as a demonstration center; availability of land and equipment and other extension facilities, such as churches, schools, teachers and preachers, etc.

The institutions and projects approved by the American Famine Fund Committee follow.

Kaifeng Baptist College, Kaifeng, Honan, with five projecs: namely, (1) farm crops improvement, (2) fertilizer tests, (3) improving native cattle, (4) rinderpest control, and (5) spring irrigation of grain.

Agricultural Department of the Presbyterian Mission at Nanhsuchow, Northern Anhwei, with five projects; namely, (1) irrigation of winter wheat, (2) new design for irrigation pump for local use, (3) improvement of wells for extensive irrigation, (4) rinderpest control, and (5) pure seeds farm.

Shantung Industrial School, Yihsien, Shantung, with five projects; namely, (1) improvement of winter wheat, (2) improvement of fruits, (3) preservation of fruits, (4) control of fruit diseases and insects, and (5) utilization of waste land by practice of reforestation.

Central China Teachers College, Wuchang, Hupeh; with whom we are co-operating in the development of a department of rural education that will provide more specific training in agriculture and village improvement for their students, the large majority of whom become teachers of rural schools.

Scholarships to provide training in agriculture have been granted to a number of missions interested in rural improvement but lacking in adequate personnel to project a program.

Department of Agricultural Economics and Farm Management

Instruction. During the autumn semester Mr. Buck taught the following classes: Agricultural Economics and Rural Sociology 150, five hours weekly; Rural Organization 161, three hours; Agricultural Economics 151, (projects), three hours; and Agricultural Economics 163 (projects), five hours, a total of sixteen credit hours. In the spring semester he taught the following classes: Farm Management 151, five hours; Farm Management Seminar 166, two hours; Marketing (Agricultural Economics 167), three hours; and Extension 161, two hours, a total of twelve credit hours. Mr. Hsu Chen taught a course in Agricultural Economics of one hour per week and Mr. Swen Wen-yuh taught a course in Farm Management of one hour per week during the spring semester to the students of the one year short course in agriculture.

Investigations and Research. The following investigation and research projects have been approved and undertaken by the Department:—

1. A Farm Management Survey at Nanhsuchow, Anhwei. The object of this investigation is to determine the reasons for the success or failure of various systems of farming in this region.

2. A Farm Management Survey at Yen Shan, Chihli.

3. A Farm Management Survey at Lin I, Shantung.

4. A Farm Management Survey at Wu Tai, Shansi.

5. A Farm Management Survey at Swen Hwa Chen, Nanking.

6. A Farm Management Survey at Liankan, Fukien.

7. A Farm Management Survey at Nanan, Anhwei (1921).

8. A Farm Management Survey at Nanan, Anhwei (1922).

9. A Farm Management Survey at Chung Hai, Chekiang.

10. A Farm Management Survey at Wu-siang, Shansi.

The objects of the above investigations in the regions named are the same as indicated for Farm Management Survey 1.

11. A Study of the Marketing of Wheat, Beans, Sesamum and Kaoliang at Nanhsuchou, Anhwei. The object of this study is to determine the present marketing conditions for the purpose of assisting the farmer in securing as great a value as possible for his products.

12. A Study of the Types of Farming at Lin I, Shantung. The object of this investigation is to find out what

the present types of farming are and the advisability of changing to other types.

13. A Study of Present Day Systems of Rural Credit and Savings. The object of this investigation is to find out what the present systems of credit and savings are and how they may be improved; and to determine (**a**) whether the "Rural Co-operative Credit Society" or "Rural Bank" is needed and practicable for Chinese conditions and (**b**) what would be the best type of co-operative credit or savings society which could be worked most successfully in the greater part of China.

14. A Study of Present Day Rural Co-operative Enterprises. The object of this investigation is to secure an understanding of the present systems of co-operative organizations in China.

The work in research and investigation in agricultural economics and farm management has so far consisted very largely in the securing and analysis of farm records obtained by students from their home villages during the summer of 1923.

The number of farm records and the places from which they were secured are indicated in the table below.

Place	Number of records	Place	Number of records
Wuhu, Anhwei (1921)	102	Wenshui, Shansi (1923)	150
Na-an, Anhwei (1922)	107	Yen Shan, Chihli (1923)	150
Na-an, Anhwei (1923)	101	Lienkan, Fukien (1923)	161
Wusiang, Shansi (1923)	251	Chung-hai, Chekiang (1923)	67
Wu Tai, Shansi (1923)	226	Swen Hwa Chen, Nanking (1924)	203
		Total	1,518

Steps have been taken to secure records of farms in other representative famine districts but most of our energy has been spent in making available the information already in hand obtained in the summer of 1923. In doing this it has been necessary to train inexperienced help in the analysis of the records and the work has been checked three or four

times so as to make sure of eliminating errors. The men are now becoming more proficient so that the work is being done more rapidly and accurately thus making necessary only one or at most two checks.

The work of analysing these records consists of the following steps:—

1. Original data in the record itself carefully checked.
2. Calculation of thirty-three factors for each record.
3. Calculation of the distribution and amount of labor for each crop (The original information for this is obtained at the time of securing farm records by means of labor survey blanks).
4. Calculation of the average yield per mow of the various crops.
5. Classification of the farms into groups for each set of records according to size, amount of capital, character of the operator, education of the operator, ownership, productive work units per farm, and value of land per mow.
6. Correlation of factors into twenty-five to thirty tables.
7. Summarizing the data secured under general information in the farm record.

The Wuhu survey is completed and part I has been published as Bulletin Seven, Agriculture and Forestry Series, under the title of "An Economic and Social Survey of 102 Farms near Wuhu, Anhwei, China." Part II is now in the printer's hands. The Yenshan and Na-an surveys are also about ready for publication. The average size of farms at Yenshan is nearly the same as those at Wuhu and the comparison will be a valuable and interesting one in that one is in north China and the other is in the Yangtze valley. The data as published in the Wuhu survey, part I, indicates the value of this work.

Mr. Swen Wen-yuh spent a month in Lin I, Shantung, where Mr. Torrey, of the American Presbyterian Mission, is co-operating and where the country suffers severely from

periodic famines. He is making a study of the present types of farming in that region to determine whether or not they are suitable to the conditions as found at Lin I.

Mr. Hsu Chen, who is dealing with rural organization problems, especially rural credit co-operation, has made several trips into Northern Anhwei in the interests of co-operative societies, and one to Djeng Chi, Kiangsu, for the study of the Rural Bank which has recently been established there. Mr. Hsu has also been giving considerable time to the promotion of rural co-operative societies in co-operation with the China International Famine Relief Commission of Peking. A society has already been formed at Nan-ing and one other nearly organized at the Gung village in Hwai Yuan hsien, Anhwei. Interest in several places has been developed in this form of co-operation in both the Nanhsuchow and Hwaiyuan districts, both of which are in the famine region.

Mr. Hwa Peh-hsiung has continued in charge of the office force, which is analysing and summarizing the survey data. He has also assisted in the revision of the Farm Management Survey Blank.

The **Rural Community Survey (or Inventory) Blank** has been perfected during the year and has been mimeographed in English and three thousand copies printed in Chinese. This survey is intended to be an inventory of a region, large or small, and is prepared for the person with limited time at his disposal and yet who desires to learn something about the community in which he lives. The information in this survey pertains to all rural problems, social and economic as well as the more strictly agricultural conditions. There are nine schedules in the blank, dealing with fifty-nine main subjects. Each subject has from one to twenty topics upon which information is asked. The department hopes to use this survey in a systematic way for one or more provinces, but its chief function will be in aiding the preacher, teacher, community worker, and student to have a better understanding of the problems of his own rural community.

Department of Agricultural Gardens

Through the department of agricultural gardens is handled the superintendence of all our field operations, including the very large single item of labor, all our tree, vegetable, and flower seed production and distribution, and all our plant propagation and horticultural work. Mr. Shao Teh-hsing is Superintendent of all field work. Mr. Hancock will take over, September first, all seed and plant work, assisted by Mr. Hwang Tsung who for several years has been responsible for the nursery and for tree seed collection and distribution. Mr. Hancock arrived in September and has spent the year in language study. After January first he gave considerable time to the department.

Labor. During the year we have used a total of 34,382 days of labor, an increase of about 10,000 days over the previous year. This is equivalent to 112 laborers throughout the year. The following table indicates the distribution of days of labor by departments.

Cotton Improvement	9,566 days
Sericulture	7,911
Nursery	9,408
Agronomy	2.815
Short Course in Agriculture	1,981
Agricultural Gardens	1,090
Miscellaneous	1,611
Total	34,382 days

Labor Conditions. The conditions surrounding our labor have very greatly improved, due primarily to the interest and efforts of Mr. Shao. Our scattered farms have always made supervision difficult and discouraging. To reduce the turn over has been a big problem. The living conditions for the workmen which have usually been crowded have been very greatly improved. Mr. Shao has been trying to make and is succeeding in making more than just "coolie workmen" out of the laborers. This is being accomplished by

evening schools, Sunday services, and Bible classes, an anti-gambling and antidrinking club, plays and other forms of recreation during the year. At the evening school, conducted this past year by students in the short course in agriculture and financed by the college students' Agriculture and Forestry Society and the Agricultural Gardens, there has been an average attendance of fifty, mostly adult workmen. Too much credit can not be given them for going to school in the evening after a hard day's work. Rev. A. Sydenstricker, veteran missionary and a member of the Theological Seminary faculty has had regular preaching services in the morning and Bible classes in the evening on Sundays. Every Thursday evening the city Y. M. C. A. also has Bible classes for them. Mr. Shao after preaching services each Sunday has given a talk on sanitation and other items of practical knowledge, of interest and help to them. The suggestion for the anti-gambling and antidrinking club came from the workmen themselves.

Regular increases in salary are given to the workmen and they are urged and encouraged to save something of each month's wages. This is being done increasingly. Sick laborers are sent to the University hospital at the gardens' expense for treatment.

Field Equipment. Hand tools of local design constitute a large share of our field equipment. Foreign plows are used entirely. The harrows used are Chinese. Simple animal cultivators of our own design are used for much of the field crops cultivation. An American threshing machine, a saw cotton gin, a bone crusher, all of small design and run by seven horsepower kerosene engine are our only departures from local field equipment. The animal labor is provided by six water buffaloes and two yellow cows.

Seeds and Nursery Sales. Sales of tree, vegetable and flower seeds, nursery stock, etc., amounted to $17,185.14 for the year. This is an increase over the previous year's sales which were about $15,000. Our sales to foreign countries,

chiefly the United States, of the seeds of wild fruit trees, forest trees and ornamentals amounted to $2,400 gold. Our greatest difficulty has been in anticipating demand for certain products with consequent inability to supply unexpectedly large orders. From the large number of letters coming from all parts of China, we have every reason to believe this part of our organization is performing a very real and appreciated service.

Field Houses. During the year a much needed enlargement of the main building at the gardens was made by adding a second story to seven of the rooms. This has made possible better quarters for the storage of tree, vegetable, and flower seeds, better facilities for packing and shipping nursery stock, an extra store and office room, and three large rooms for the laboratory and field products of the agronomy department. New and more adequate buildings are needed at the Taipingmen farm and these will be constructed this coming fall. A new green house was also added for plant propagation work.

Instruction. Mr. Hancock during the spring semester taught a three hour credit course in horticulture, including field work in plant propagation and orchard culture. Mr. A. N. Benemerito gave a number of lectures to short course students.

Investigations. The horticultural investigation projects and their objects are listed herewith.

1. Western Pear Collection. The object of this experiment is to secure a collection of American and European pears of the Pyrus communis type to test their adaptation for use in various parts of China.

2. Persimmon Collection. The object of this project is to secure as representative a collection of Chinese and Japanese persimmons as possible in order to study their characteristics and to standardize names, as well as to make orchard tests of their relative fruiting value in Nanking.

3. Improvement of Pomegranates. The object of this project is to improve the quality of pomegranates grown in China by introduction of foreign varieties.

4. Summer Propagation of Mulberry. The object of this project is to determine the practicability of propagating mulberry by summer cuttings.

5. Methods of Grafting Mulberry. The object of this project is to determine the most economical as well as the most efficient method of grafting mulberry plants on a commercial scale, particularly under Nanking weather and soil conditions.

6. Citrus Collection. The object of this project is to develop hardy varieties of citrus fruits for use in the areas between latitude twenty-eight and latitude thirty-two degrees North.

7. Improvement of Fruits at Yihsien, Shantung. The object of this project is to bring about an improvement in the quality of fruit in the Yihsien district.

8. Preservation of Fruits at Yihsien, Shantung. The object of this project is to determine the best way by which fruit grown in the Yihsien district can be preserved for export marketing.

Production of Flowering and Decorative Plants. This work has gone on as heretofore with increased production as regards potted roses and chrysanthemums. One item of particular interest during the past year has been the addition of some two hundred varieties to our chrysanthemum collection. These were very kindly donated by Mr. Orvar Karlbeck of the Tientsin Pukow Railway, Puchen.

Quantity propagation is being pushed wherever material is obtainable. Our big problem is shortage of material. A large number of shrub cuttings were obtained from Shanghai through the kindness of Mr. D. MacGregor, but a rather high percentage failed due to the extremely dry spring. We must be conservative in distribution of these until a good supply of stock plants is assured.

Our Western Collection of Pears of thirty varieties has been propagated for distribution. Unless later growth of the plants permits of considerable summer propagation, distribution will not be commenced before the fall of 1925.

Reimer's Blight Immune Strains of Pyrus Calleryana. Two strains of blight immune Pyrus calleryana, from this species of wild pear introduced from China into the United States, were received in February from Professor F. C. Reimer, pear expert of the Oregon State Experiment Station. These have both been propagated successfully and will be used as the basis of a plantation for the production of seed. This species of wild pear is resistant to the pear blight, also to the wooly aphis, two destructive enemies of the cultivated pear in the United States.

Citrus Collection. At present the whole collection, including the plants received from United States Department of Agriculture last year, are in pots. Where we have several of one variety, it is intended to plant out some this summer for a hardiness test during the coming winter.

Persimmons. Last spring we obtained grafting scion wood of as many varieties as possible. These have all been grafted and we have trees growing from thirty different sources. It is probable that not more than twenty distinct varieties are among this number, owing to duplication from different sources. It is intended to continue this collection as far as possible, and to make a thorough study of the varieties.

Pomegranates. The seventeen varieties received from America have been transplanted and further propagations made. They are looking very healthy and any which show particular merit will be very easily propagated for distribution.

Grapes. The varietal collection under Dr. Macklin's care is being relabeled. It will be necessary to make a new planting of these varieties soon.

Cherries. A survey of the local cherries was made during the fruiting season. Four distinct varieties were identified and described.

Apricots. A nucleus for a collection of grafted apricots has been started. One good grafted variety was from H. H. White, Nanhsuchow, and two good types from Nanking gardens have been budded.

Peach. Propagations have been made of varieties in the college gardens, and a study of local varieties is being conducted.

Tomatoes. Seed of four outstanding American strains have been obtained and are being studied in comparison with our early Detroit strain. Our aim is to obtain an acclimatized disease resistant strain.

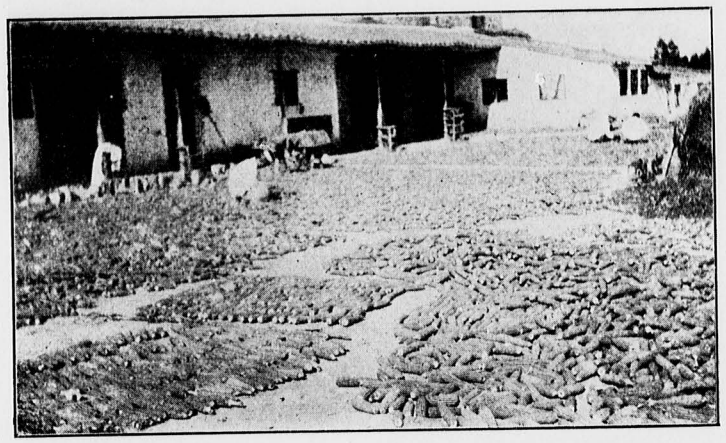
Department of Agronomy

Instruction. During the year Mr. Ritchey devoted about half his time to college classes in farm crops and soils. Mr. Shen Sheo-tsuen taught a course in general farm crops to the one year short course in agriculture students. Mr. Heh Ching-ming assisted in the soils laboratory. The farm crops courses were supplemented by field and laboratory exercises which included individual field plots on which students carried out actual field operations. The course in crop improvement affords opportunity for the student to work with the instructor in much the same way as an assistant, thus giving him valuable experience as well as training.

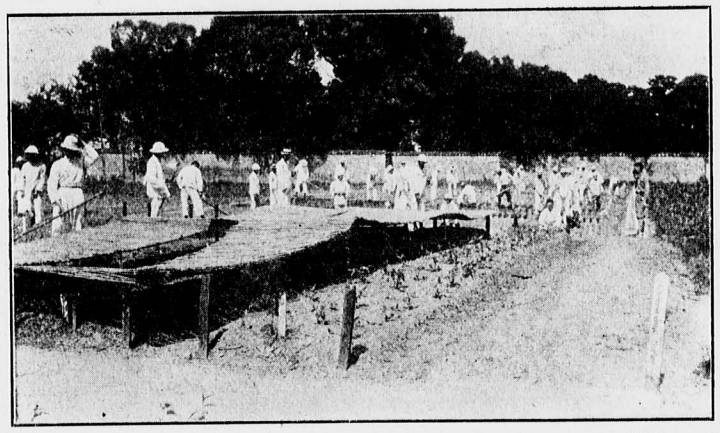
Farm Crops Improvement. Emphasis has been placed on improvement projects with wheat, corn, rice, and beans. A number of fertilizer experiments have also been gotten under way. Mr. Heh Ching-ming assists in the wheat work, Mr. Shen Sheo-tsuen in the rice work, and Mr. Wang Sheo in the bean work. The plant breeding work has been in charge of Mr. Ritchey since 1920. For convenience the work of the year is reported in the following sections.

A load of improved wheat seed starting on its way for distribution among selected farmers in the last year's famine area in Chekiang. (See page 27).

Our small power threshing machine in a nearby village. Much enthusiasm developed over it. Studies already made indicate that one man with the machine can thresh ten times more than with the flail and eight times more than with the stone roller. (See page 27).



Drying the crop of improved corn seed in the sun preparatory to winter storage. (See page 28).



Students of the one year short course in agriculture and of the rural normal school are required to produce tree plants successfully from seed. (See page 52).

Wheat. Rod row tests were carried on with eighty-three varieties and selections on low land, and with fifty-two on high land. The use of both high and low land is due to the fact that most of the wheat in the Yangtze valley is grown on land that is planted to rice in the summer and is naturally low lying. Of the nearly 300 varieties and selections which have been grown in rod row tests in the last six years, over half have been discarded because of undesirable qualities, the chief of which has been lateness in ripening. Of the varieties carried through the tests six have a five year average of over thirty bushels per acre.

Seventy-two **head selections** were planted and harvested during the year, and during the spring over a thousand head selections were made for next autumn's sowing. Careful data is kept on the performance of each selection and the more promising ones are placed in the rod row tests as soon as possible.

Three of the highest and most consistent yielding varieties were grown in increase fields giving us tabou 170 bushels of improved wheat. The field average of these varieties on rather poor land was 140 catties per mow compared with an average yield of eighty-four catties per mow for six farmers whose wheat we threshed and got careful records of.

There will be about **125 bushels of improved seed for distribution** for fall planting. Most of it will go into the famine areas of Anhwei, Honan, Shantung, Hunan, Hupeh, Chekiang, Shensi, and Shansi. The demand has been greater than we can supply.

The whole wheat crop was threshed with our eighteen inch cylinder Messinger threshing machine, except the head and rod tests which were threshed with a small machine which we had built on the plan of the Ames nursery thresher. The use of the threshing machines for both the experimental rows and general field crop has proved most satisfactory in every way. Some interesting time saving and cost studies have been made which indicate that one man can thresh with

the machine ten times more than with a flail and eight times more than with a stone roller. Preliminary studies indicate that, given a reasonable amount of business, the threshing machine with power engine will thresh wheat cheaper than will flail or stone roller methods.

The influence of the improved wheat and the modern threshing machines on our neighboring farmers has been most encouraging. Suspicion and doubt have given way to enthusiastic confidence and co-operation on the part of a few, and others are weakening in their Missourian attitude. We threshed the wheat crops of six farmers near the Taiping gate experiment station. Poor roads prevented us from doing more this year. One farmer expressed his satisfaction thus: "You have threshed this wheat for me in less than an hour and if I had done it with the same number of men it would have taken me two days." Another farmer remarked, "It looks like washed wheat." Our offer to exchange good seed wheat for an equal amount of their wheat has been taken up by a number of the farmers. They paid for the threshing of their wheat, and recognized and appreciated the saving in labor and time and the fact that the wheat was clean. By another year or two we expect to have a large area of improved wheat being grown by co-operating farmers.

Corn: The three lines of work with corn, namely, ear to row tests, plant to row tests for plants bearing two or more good ears, and hybridization of the local corn with a western dent variety were continued during the year. The object has been increased yield. On account of a poor season there was no corn from selected plants for distribution last year. The largest crop and one of the best we have every had is assured for this season, and there will be plenty of seed for distribution in the spring of 1925.

The plant to row test for plants bearing two or more good ears has already yielded some interesting results, which are being followed up again this year. The original selections were made in the autumn of 1922 from one of our own fields. The percentage of two ear bearing stalks in a row

varied from 5.8% to 70%. The following data will be of interest. Comparative yield tests with single ear stalks are being carried out also.

Stalks in the original field (1922) bearing two ears	12.1%
Stalks in the field grown from 1922 selections bearing two ears	32.6%
Highest percent of stalks in a row bearing two good ears in 1923 fields	70.0%

Beans. This is a relatively new project, the purpose of which is to locate high yielding and high oil bearing varieties of soy beans. In the spring of 1923 sixty varieties were planted. During the past year many more varieties from parts of China were added. This spring 220 varieties and selections were planted for careful comparative studies of yield, purity of varieties, oil content, etc.

Rice. Previously we have been so considerably handicapped both in land and personnel that very little work has been done on rice. The big differences in yield and the impurity of the varieties so far studied indicate great possibilities in improving this important staple food crop. Last year's yield tests showed a yield of seven bushels per acre for the lowest and of sixty-eight bushels for the highest yielding varieties. One hundred and two plant selections were made last year which have been included in our general testing this year.

Fertilizer tests are being carried out with ammo-phos, ammonium-sulphate, and superphosphate, both at Nanking and in co-operation with Mr. Middleton at Kaifeng, Honan, and with Mr. H. H. White, at Nanhsuchow, Anhwei. The tests have not run long enough for results to be published.

Department of Bacteriology

During the year wide spread epidemics of rinderpest in cattle, of poultry diseases, and of silkworm diseases have offered excellent opportunities for field work and research by Dr. Gibbs and most of the year was spent in these lines of activity. Serious illness during the autumn unfortunately

prevented Dr. Gibbs from following up more closely important results obtained in the control of poultry diseases at the Midland Packing Company in Shanghai. About three months of the winter and spring were spent in Honan, Shantung and Anhwei on rinderpest work. During the silkworm rearing season Dr. Gibbs co-operated with the department of sericulture in charge of sanitation and silkworm disease control.

Instruction. During the autumn term Dr. Gibbs taught a two hour credit class in biology to the short course in agriculture students, and in the spring term a five credit hour class in general bacteriology in the college.

Investigation and Research. The following investigation and research projects have been approved and gotten under way. The department has up until this last spring been greatly handicapped by lack both of laboratory space and especially of laboratory equipment. Mr. Chen Ken's appointment to Dr. Gibbs' department will make it possible for him to operate much more satisfactorily and assure continuity to laboratory work which has hitherto been so difficult because of Dr. Gibb's absence on field work. The projects and their objects are listed herewith

1. The Control of Epitheliome Contagiosum (bird pox). The object is to test the efficacy of epitheliome contagiosum vaccine in the control of bird pox.

2. The Control of Hemorrhagic Septicemia (fowl cholera). The object is to test the efficacy of hemorrhagic septicemia vaccine in the control of fowl cholera.

3. The Control of Epitheliome Contagiosum and Hemorrhagic Septicemia in Fowls. The object is to test the efficacy of a double vaccine consisting of the viruses of epitheliome contagiosum and hemorrhagic septicemia in the control of bird pox and fowl cholera.

4. The Control of Rinderpest in Cattle. The object is to try out various methods of immunizing cattle against rinderpest by means of vaccines and antisera.

5. The Investigation of Nodular Disease in Goats. The object is to study the prevalence, treatment, and symptoms of nodular disease in goats in China in an attempt to find some practical method of control.

6. The Control of Internal Parasites in the Domestic Fowl. The object is to control internal parasites in domestic fowls by the administration of vermifuges in flock treatments.

7. Control of Rinderpest at Nanhsuchow, Anhwei. The object of this project is to bring to the farmers of this area a knowledge of rinderpest control and more especially to treat cattle against this disease.

8. Rinderpest Control at Kaifeng, Honan. The object of this project is the same as in the above.

Field work on Poultry Diseases. During the summer and early autumn of last year with the hearty co-operation of the Midland Packing Company of Shanghai, Dr. Gibbs organized in their feeding plant a system of disease control which practically eliminated loss of birds after they had been admitted to the pens. The chief diseases were chicken pox, chicken cholera, and worms. The attendants were taught to recognize diseased birds and isolate them immediately. Dr. Gibbs in the laboratory arranged for him by the company prepared chicken pox and chicken cholera vaccines which were administered to incoming poultry from epidemic centers and gave complete control of these diseases. In spite of the fact that on account of Dr. Gibbs' illness he was not able to follow up his results as closely as he wished to, his work constituted an important contribution to the study and control of poultry diseases in China and was of great economic advantage to the company.

In April, Dr. Gibbs made a trip of inspection to Tenghsien in southern Shantung where a virulent epidemic of chicken cholera was wide-spread. The disease could easily have been controlled by killing off all the old fowls and allowing the premises to sterilize through the winter until the young chickens should come again from the incubators the following spring. This would have required an edu-

cational program which we were not in a position to carry on. The disease will undoubtedly return for several seasons in succession and make poultry raising a precarious undertaking.

Other poultry diseases observed during the year were, fowl diphtheria; fowl diphtheria complicated with coccidiosis; fowl diphtheria complicated with pinworms; fowl diphtheria complicated with fowl cholera; fowl cholera complicated with coccidiosis and fowl ascaris.

Field Work on Rinderpest. This work started in the fine Kaifeng (Honan) Baptist College herd of pure and mixed breed cattle in January, and as quickly as materials and equipment could be gotten together was extended to the Chinese villages first about Kaifeng, then in a small way about Taian, Shantung, and later to villages in north Anhwei. The foreign owned herds at Pochow, Anhwei, and Chengchow, Honan, were also treated. About four hundred head of Chinese cattle were treated for the farmers in the villages.

The rinderpest epidemic of 1924 was very wide spread, involving parts of Honan, Shantung, Anhwei, Kiangsi, Hunan, and Shansi. Mortality of cattle must be estimated in terms of hundreds of thousand. The farmers fear rinderpest more than floods or droughts. Loss of their cattle means to the farmers loss of productive capital, of the means of plowing their fields and of transporting their farm products to market, and of the natural increases in the herd which can be expected to provide additional family income. The loss of cattle is one of the most serious losses the farmer can sustain and his protection against such loss constitutes one of the outstanding agricultural problems in China.

There are two common methods of treating rinderpest known as the simultaneous inoculation of serum and virus, and a combined method which uses a preliminary inoculation of serum which is followed at the end of five days or a week with a second injection of immune serum plus rinderpest blood. The simultaneous inoculation has been used successfully in various countries and it was this method that was

first used by Dr. Gibbs in Honan. The results were satisfactory and next year the animals will receive a second injection of serum and rinderpest blood. It will be of great consequence to the animal industry to follow up these tests for several years to determine as accurately as possible how long the immunity produced by the simultaneous inoculation lasts. Some scientists claim that simultaneous inoculation against rinderpest produces permanent immunity.

One serious objection to the simultaneous method is that 10% to 15% of the cattle develop severe cases of rinderpest and die. It was with the idea of eliminating this mortality that Dr. Gibbs tried the combined method explained above. All of the animals so treated developed clinical rinderpest, but none of the symptoms was so severe as to cause death. This combined method is a little harder on the veterinarian and the calves than the simultaneous method because two inoculations take more time, use more serum, and hurt a little more than a single treatment but it is less expensive to the cattle owner in the end. If the experiments now in progress demonstrate that this method produces an immunity equal to that of the simultaneous method, then the combined method is the treatment that should be adopted for producing active immunity against rinderpest in China.

The chief difficulty encountered in keeping either of these methods under control was due to the fact that the virus in rinderpest blood will not last more than twenty-four hours and the best results are secured when the blood is used in less than twelve hours. This difficulty was experienced in Honan. At first Dr. Gibbs thought his work was limited to within a radius of twelve hours' time from the laboratory in Kaifeng, consequently he was obliged to turn down many opportunities to immunize cattle in villages beyond this area. The practice of securing a fresh supply of rinderpest blood every day consumed much valuable time. It seems the virus is present in the blood in most cases only during the inset of the disease and again just before death when all resistance has broken down. This meant that the animals from which the virus blood was taken had to be

under observation for some time; besides, a careful examination had to be made for the presence of other diseases. Many times a whole day's work was lost by the carelessness of an assistant during the process of collecting the blood.

The above method had so many limitations that Dr. Gibbs finally discarded it entirely and gave his time to experiments in an attempt to find some way to prolong the life of the virus from the anti-bacterial action of the blood serum. As a result of these experiments it was found that the blood could be kept active from five to seven days. This result has greatly increased the usefulness of the combined method. It is now possible to keep both the preparation of serum and virus under laboratory control and to work five days' journey away from the base. This discovery is also of great scientific importance.

One big factor in the problem of rinderpest control is cost of the materials and treatment. To secure commercially prepared serum from the port cities and use on the native cattle is out of the question as the cost of the serum would in most cases be more than the value of the animal treated. Dr. Gibbs worked on this problem also, and was able to produce the immunizing agents so that treatments could be made for from one to three dollars. In every case treatments were paid for by the farmer. The interesting part of this is that he paid gladly, and that the demand for treatments was many times greater than could be met. The farmer may be conservative about adopting new ideas, but this winter's experience would indicate that he is keenly alive to the possibilities of the protection of his cattle and is willing to pay reasonably for it.

Department of Botany

Instruction. Mr. Steward has taught three classes in general botany. This duplication was necessitated by conflicts and the changes due to the new curriculum but will make possible much more satisfactory schedule arrangements in the future. A course in systematic botany was given in the spring, which included a ten days' plant collecting trip in April to Chu Hwa Shan, Anhwei. Added equipment has made possible improvement both in class room and laboratory instruction.

The Herbarium. The herbarium has had steady growth during the year. The named plants have been augmented by about 300 specimens of the George Forest collection from Yunnan, sent through the Edinburgh Botanic Garden; by over 300 new species of Chinese plants from Professor Tsoong of Shanghai; and by 100 species from the Oregon Agricultural College. These were all secured on an exchange basis. The herbarium now consists of approximately, (a) 4,000 mounted specimens in the reference file, representing about 1,500 species; (b) 3,000 specimens awaiting identification, including the W. Y. Chun Hainan collection and a large collection of Hupeh plants which will be available for the reference file soon; and (c) about 10,000 identified duplicate specimens for sale or exchange.

The arrangement for the identification of our collections which we had with Dr. E. D Merrill, now Dean of the California State College of Agriculture, while he was Director of the Bureau of Science of the Philippine Islands is, happily for us, to be continued. We have recently sent to him in California about 800 named specimens from our herbarium, as well as a considerable number of plants to be named.

Our herbarium material is in excellent shape and easily available for use. Provision is being made in the new building for a generous development of the herbarium. During the year an herbarium committee was appointed which should hasten its growth and add to its usefulness. Mr. Steward is chairman of the committee and in charge of the herbarium collections.

A number of important botanical reference works have been added to the library during the year, including the Index Kewensis, with supplements to 1915; Hooker, Icones plantarium, third series; Engler und Prantl, Die Natürlichen Pflanzenfamilien; and Laufer, Sino-Iranica.

Botany Research and Investigations. The following projects have been approved and represent the more strictly scientific work of the department. Considerable progress has already been made on all of them. The projects are:—

1. The Herbarium. The object of this investigation is to build up a collection of the Flora of China and supplement this collection with smaller groups of specimens from various parts of the world.

2. A Manual of the Flora of Nanking and Vicinity. The object of this investigation is to produce a manual suitable for use in middle school and college botany classes in this part of China.

3. An Index to the Chinese Names of Plants. The object of this project is to build up an index to the local and literary names used by the Chinese in designating the various plant species found in China.

4. Woody-Plant Collection of Wang Shan and Nan Shan Ranges, Anhwei. The object is to make a large collection of the woody and herbaceous plants of this mountainous area for use in dendrological studies and instruction and to add to the herbarium collections.

Department of Cotton Improvement

The work in cotton improvement during 1923 was handicapped by a reduction in resources and by an unfavorable season due to excessive rains. An unexpected but much appreciated contribution of $2,500 Mexican from the Foreign Cotton Mill Owners' Association of China in September made it possible for us to close the season without a deficit.

1923 Seed Production. Selected Acala seed was grown on the Shentsemen, Kao, and Chilingmen farms at Nanking and on our twenty-four mow experiment station plot at Tangchuan. Trice and Million Dollar seed were grown on the Taipingmen farm and at Nanhsuchow. Besides these farms there were breeding plots of both Acala and Trice together with improved Chinese and Indian cotton on land

inside of the city. The co-operating farmer, Mr. Hu, grew Acala cotton from our selected seed which also served to add to the supply of seed for distribution.

On these various units a total of 19,600 pounds of highly selected seed was produced in addition to that grown by the farmers, many of whom saved their own seed.

The laboratory studies of both Acala and Trice progenies showed that the discarding of all but superior strains in the past has resulted in a higher average standard of seed. The new selections made in like manner averaged much higher than earlier field selections.

1924 Seed Distribution. The 1924 spring distribution of improved seed at Nanking was much heavier than ever before. The co-operating farmer, Mr. Hu, alone purchased fifty piculs of seed. The growth in interest was largely due to the fact that we had provided a good market for their seed cotton at favorable prices and this with the larger yields from our our improved seed gave the farmers an attractive income.

The bulk of the Acala seed was distributed to selected farmers about Wukiang and Tangchuan where pure seed communities are being developed. The interest at Tangchuan was especially keen, due to our rather extensive buying of the seed cotton from our 1923 spring distribution.

1924 Seed Production. The season of 1924 has been handicapped even more than in 1923 by a diminution of support. However the seed farm plantings are more extensive than last year, and a favorable season so far indicates an unusually large seed supply.

Cotton Stations. The station at **Tangchuan** was expanded this year by the addition of four mow of superior land in a conspicuous position on the main highway, in addition to the twenty-four mow previously used as a seed farm.

At **Wukiang, Anhwei,** eighteen mow of land were rented and planted in cotton and improved wheat. This station has been in charge of a graduate of the one year course, Mr. Li

Chi-chai. Besides the distribution work and the caring for the growing of cotton and wheat, he has made a local survey of the community and has a rural school with garden and nursery. This school has been running only in forenoons in order to give time for a people's school which has been conducted at night.

At **Lin I, Shantung,** a distribution of cotton seed made in the spring of 1923 gave a much higher average yield than the local cotton. The farmers, however, were not able to dispose of the foreign lint. We proceeded, therefore, to open the market by purchasing the cotton in the seed at the standard figure for seed cotton. Mr. Torrey, co-operating with us there, plans to establish a gin in the fall so that the work may be continued. The magistrate of Lin I has donated land for the cotton work. Seed was supplied this spring for this land and is in charge of Mr. Hsin Ping-hwan, a graduate of the one year course.

At **Nanhsuchow, Anhwei,** the mission experiment station reported heavy yields from the Trice cotton seed supplied by us and distribution of improved seed was made to an increasing number of farmers during the spring.

At **Kiangyin, Kiangsu,** a distribution of selected Kiangyin and Million Dollar Chinese cotton seed was made to farmers sufficient to plant a total of over 100 mow of land, through two country pastors of the Southern Presbyterian church of the Kiangyin district. Deep interest was shown by the farmers of that area following extensive programs and exhibits. The place of the pastor as an extension worker was thoroughly demonstrated.

Mill Tests of our Improved Varieties. In the Autumn of 1923 the Ewo Cotton Mill, the Naigai Wata Kaisha Cotton Mill, and the Laou Kung Mow Cotton Mill, all members of the Cotton Mill Owners' Association of China, co-operated in conducting careful mill tests on commercial cotton which had been produced on the University seed farms, with results which indicated better than any other tests could possibly indicate, the success of the cotton improvement work which

had been carried on during the previous three years with the co-operation and financial support of the Cotton Mill Owners' Association of China and the Shanghai Cotton Anti Adulteration Association.

These mill tests indicated that the American Trice variety was equal in every respect to Good Middling American and, quoting from one of the mill reports, it was "better than many deliveries of Good Middling American." The American Acala variety proved to be superior in all points to Good Middling American. Perhaps the most significant test was that of the Million Dollar, a Chinese variety which originated from a single plant selection from a cotton field in Woosung near Shanghai in 1919. To quote further from one of the reports, "this cotton supersedes our ordinary Chinese cotton in texture, length, quality and color, and was able to spin much finer counts with increased draft. Revolutions of front roller and revolutions of spindles were greatly increased, those predominant factors resulting with such a cotton as the sample, in far superior yarns, considerable increase in production, less waste, and less labor required, and we are confident that if it were possible to have this quality of cotton all through, it would reduce the cost of labor 50 per cent."

Department of Extension

Mr. Griffing has been sharing his time between the departments of extension and rural education in addition to his cotton work. Mr. Chow Ming-i has since February been devoting his full time to agricultural extension. Mr. Chen Yen-shan has been devoting much time to cotton extension work and Mr. Kan Han has been devoting full time to forestry extension. The Department has had more demands for its services than it could supply. A conservative estimate of the people reached in our direct extension activities during the year is 40,000. Through our newspaper and bulletins we have reached many thousands more.

Extension Materials. The department of extension has had to create practically all of its extension materials, at

the same time endeavoring to co-ordinate the work of the various departments such as agronomy, forestry, sericulture, farm management, cotton improvement, rural education, etc. Charts, photographs, specimens, lantern slides, moving picture films, and play materials have been prepared for extension use. The charts for farmers' use have been hand drawn and painted and are made as realistic as possible.

Field Extension Activities. Extension work has been carried on at Nanhsuchow where we held a conference with more than fifty of the teachers, preachers, and the mission school guarantors. We had an extensive exhibit, put on one of our rural instructional plays, which has been given in three centers about Nanhsuchow since the conference by the station workers, as well as holding two and three conferences each day on rural problems and ways in which the College could help the farmers in their work.

We also spent some time in Wukiang, Anhwei, where we had an educational exhibit, gave a play, distributed cotton seed, and organized a rural school. We co-operated with the American Church Mission at Wusih, putting on exhibits and giving plays and lectures in three places. Reference will be found on page 58 to the two weeks' extension work carried out during the 147th Celebration of the "Shwan Yang Hwei" in Chentseh, Mei-yeh, and Sengtseh, Kiangsu, in April.

About three weeks of exhibits, lectures, plays, and demonstrations were given to the Methodist Conferences in Nanking and Wuhu in April and May and ten days to a short summer school for pastors carried on by the Nanking Theological Seminary in June.

At the Shentsemen school we had a day's exhibit, with lectures and a play, and the same at a village outside of Taipingmen on a market day At both places we had large crowds. During the latter part of June Mr. Griffing and Mr. Li Ying-hwei attended a big conference of 325 pastors at Fenchow and a large teachers' conference at Taiyuan, Shansi.

Arrangements have been made for co-operation with the summer school at Peking managed jointly by Peking (Yenching) University and Shantung Christian University. Mr. Chow Ming-i will offer courses in general agriculture, rural economics, and village improvement.

An account of the forestry extension will be found on page 47; of the department of agronomy on page 28 and of the co-operative extension program on page 15.

Department of Forestry

The year has witnessed marked progress in this department both in personel, and in the quality and amount of work undertaken. Mr. N. K. Ip, head of the department, has carried a heavy teaching schedule, and last summer (1923) made an extensive field trip into Southern Anhwei. Mr. W. C. Lowdermilk, in charge of forest research, made two extended field trips into North China, besides organizing the forest research program and getting approved projects under way. The forestry faculty was augmented during the year by four associates, all graduates of the College of Agriculture and Forestry (See page 9).

Forestry in the public mind in China is closely associated with floods and famines. In the foreground of the thinking and planning of the forestry department is the problem of making our efforts contribute most directly to the alleviation of those conditions which so largely contribute to floods, especially in North China, and to the severity and hopelessness of famines; conditions which the continued absence of forests seriously aggravate and render impossible of adequate control.

Instruction in Forestry: A distinct advanced has been made this past year in making both the forestry curriculum and the content of the courses in forestry more adapted to Chinese conditions. Much needed additional equipment both for field, class, and laboratory work has been added. Nine weeks of organized field work in forest engineering, forest management, and reforestation were provided. A woody plant collection trip of ten days is required of all first year students in dendrology, and the efficiently managed and rapidly growing herbarium adds to the effectiveness of

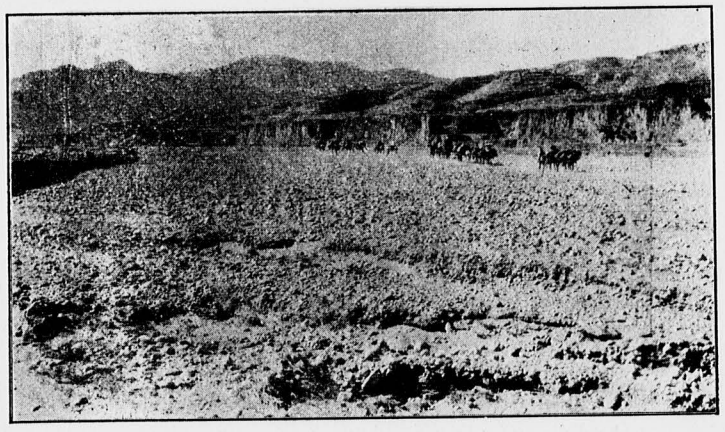
all the dendrology courses. Most of the forestry courses are now being strengthened by original data which is being secured by all members of the forestry faculty, particularly by the division of forest research. There has existed practically no accurate, scientific forest data in China. Forestry information has been founded mostly on general observations. The present emphasis of the forestry department in securing and making available data on the basis of actual field study is an important move in the right direction.

Forest Investigation and Research. The aim of forest investigations and research is to carry on exact studies of the establishment, development, treatment, and perpetuation of forests, as well as to make studies in utilization of forest products, with the definite purpose of determining the principles which are fundamentally and generally applicable to varying forest conditions. The discovery and evaluation of these principles will permit such selection of tree species, choice of methods of planting, thinning, cutting, tending, and such use of methods in utilization for each locality and species as will return to the forest owner and community the highest use of forest land.

The equipment for the investigative work in addition to office and laboratory and the facilities offered by the library and the chemistry department include a green house, an experimental nursery, a meteorological observatory, and field instruments. The experimental nursery was assigned to forest research in the winter of 1923-4. One growing season has not yet been completed. The results of the numerous experiments under way can not be made at this time but will be included in the annual report of forest investigations. In addition to experiment, the nursery has been used for instructional purposes both for the college students and for the short course students. Small areas of land about Nanking and in parts of North China for use as demonstration forest areas are needed.

The following projects have been approved and undertaken. Most satisfactory progress has been made and fuller

North Shansi forests being wastefully cut, with timber in great demand in the plains where the government is spending thousands of dollars planting new trees. A constructive conservation policy is as greatly needed in China as replanting defcrested areas. (See page 45).



North Shansi deforested mountains and dry, partially filled up, stream beds. This area is close by the forested area shown above and was likewise covered with forests up to a short time ago. The source of the floods on the plains is in the mountainous water sheds.

Administering antirinderpest serum to cattle in North Anhwei, a chronic famine area. The losses to farmers caused by animal diseases are incredible. (See page 32).

Adapting the western endless chain pump and the ordinary Chinese tread power to vertical lift of water from wells to supply irrigation of winter wheat in North Anhwei. Lack of available water invariably reduces the yield of winter wheat in North China and in most cases water can be had not far from the surface. (See page 61).

reports will be submitted after the projects have had longer time to run and the desired data have been secured. The projects are:—

1. Tree Studies. The object of this study is to bring together under one cover all useful information concerning each of the economic tree species of China and such exotics as may have promise for forestation work in China. And particularly the object is to ascertain the silvical characteristics of these species.

2. Seed Storage. The object will be to determine the most satisfactory methods of storing the seeds of the various economic tree species.

3. Seed Testing. The object of seed testing investigations is to build up reliable information on the tree seeds of Chinese and promising exotic species and to train students in the methods of seed testing.

4. Source of Seed. The object is to ascertain the influence of locality upon the quality of seed, and the transmission of characteristics through seed.

5. Planting Site Indicators. The object is to arrive at some convenient and dependable indicators of the suitability of areas for forest plantations.

6. Timber and Fuel Prices. The object of this study is to bring together reliable data on the prices of saw timber, lumber, and fuel to serve as a basis for studies in comparing the profitableness of forestry with other uses of land in order that land may be put to its highest use.

7. Wood Distillation. The object of this investigation is to determine the amounts of commercial chemical products which may be derived from various Chinese trees and to determine the practicability of combining wood distillation with the present charcoal industry in China.

8. Temple Forests. The object of this study will be to collect data on temple forests and forest plantations.

9. Vegetative and Surface Conditions of the Yellow River Water-shed. The object of this investigation will be

to secure the additional information needed on the status of the vegetative cover, on erosion, on climate, on sedimentation, on the economics of forests and forest products, on the classification of lands, on transportation and general conditions affecting the production of forests.

10. General Forestry Conditions of the Localities Traversed during Woody-plant Collection Trip (Wangshan and Nanshan, Anhwei). The object of this investigation is to secure information on the forestry conditions for the region in question and to obtain as much data relating to growth of timber in height, in diameter, and in volume as opportunity permits.

11. Utilization of Waste Land at Yihsien, Shantung, by Practice of Reforestation. The object of this investigation is to demonstrate that much waste land in this area can be profitably utilized as a side line to farming.

12. Weather Records and Reporting. The object is to collect, tabulate, and publish and otherwise make available representative meteorological data for the region of China periodically affected by famines.

13. River Dike Plantations. The object of this project is to determine the most profitable production of fuel and timber on the dikes of the Yellow River.

Regional Surveys. Two extended trips were made within the year by Mr. Lowdermilk under the project of "Vegetative and Surface Conditions of the Yellow River Watershed." The first was a trip in the fall of 1923 into northern Honan and Shantung. This survey is covered by the report entitled **"A Preliminary Survey of Forest Conditions in northern Honan and Shantung."** This report has appeared in part in the June 1924 issue of the University of Nanking Magazine. The conclusions of this survey are as follows:—

A careful study of climatic conditions should be combined with investigations of both forest and agricultural conditions in northern Honan and Shantung.

The village forest offers the best means of increasing wood and timber production in the regions described.

The program for increasing wood and timber production does not need to be elaborate; it should insist upon the use of the species common to the region, but should emphasize the need of more trees everywhere.

The Tsingtao area is an excellent example of the price required to pay to restore forest conditions in semi-arid regions where the ecological balance is sensitive.

This survey indicated the need of more detailed studies in the region. It is planned to carry forward such detailed studies at a future date.

The second regional survey was made in the provinces of Honan, Shensi, and Shansi. A report entitled **"Erosion and run-off conditions on the Yellow River Watershed."** has been published in the June 14, 1924, issue of The China Weekly Review. The detailed report is still in preparation. The conclusions of this report are as follows:—

The excessive erosion, occurring in the extensive loess deposits, is responsible for the flood damage in the plains. North China, with less rainfall, is afflicted with more and greater floods than the regions of greater rainfall.

The gullies of the loess regions are the agencies of excessive erosion. The peculiar characters of the loess deposits, namely, vertical cleavage and fine division, permit the torrential water to cut through the talus slope at the base of the gully wall and to undermine it. Great blocks of the loess drop in, consequently, and melt away like sugar in the torrential current.

The talus slope is the critical part of the gully. If it be held, excessive erosion can be stopped.

Instances were found where erosion was stopped both naturally and artifically by the growth of willows and elms in the bottoms of the gullies.

The method of checking and stopping excessive erosion consists in the planting up of the gully floors and talus slopes with trees in dense formation. It is rather in the bottoms of the gullies than on the hills that trees should be planted, for survival will be more sure and growth more rapid in the gully bottoms. Besides, the gully lands are waste land

which at present are a liability. By planting them up with trees they should become an asset—a distinct asset not only to the locality but to the plains region.

During the coming summer a detailed study of the comparative run-off from two watersheds is to be undertaken in north Shansi near the source of the Fen river.

A regional survey was made by Mr. N. K. Ip accompanied by several of the senior students into the forested areas of **Wuhu tao in southern Anhwei,** during August 1923. The chief purpose of the trip was a **study of the Cunninghamia industry of the area.** Much valuable data and information were secured of which the following is a brief summary:

Protection against fire and prevention of the devastation of the forest area by unrestricted cutting are the two important forestry problems of the area.

Every village has its own woodlot, ranging from a few mow to several hundred mow in area. These are managed according to strict rules and regulations. This type of woodlot has all the ideas of the western communal forest and should be greatly encouraged and extended to other places.

The forest area of Wuhu tao contains the following forest types: Cunninghamia type; Cunninghamia-pine type; pine type; bamboo-coniferous type; bamboo type, and hardwood type.

The common method of harvesting the Cunninghamia trees by cutting the stump below the level of the soil coincides with the best method of handling trees to produce sprouts and is commonly used to reproduce the species.

The seed tree and clear cutting methods of reproduction are commonly used to furnish new stands of Pinus massoniana. The clear cut area are burned over, cultivated and planted with corn for several years until a good stand of seedlings is produced either by direct seeding or natural seeding from the trees of adjacent areas.

Hardwood species of excellent quality in virgin stands in the lowlands because of greater weight and difficulty in logging and transporting have little commercial value within the region.

Surface forest fires are very frequent; crown fires are rare. Severe fines are imposed where responsibility for fires can be placed. The damage by fires to forest growth, particularly to forest reproduction is very great.

Elaborate systems of timber measurements have been developed, most of them in decimal form.

Timber guilds make and maintain strict rules and regulations for the lumber trade. They have a secret code which the lumber yards must abide by and follow for their mutual benefit.

A large floating labor population is a characteristic of the lumber industry. Work is commonly done by the contract system or on a piece basis.

A full report with illustrations has been written and will be published as soon as possible.

Forest Extension. The efforts of the department during the year have been concentrated on two extension projects, namely school nurseries and correspondence courses. In addition a number of articles to stir up popular interest and public opinion in forestry matters have been prepared and published in various magazines. About forty charts and colored drawings have been made for exhibit and lecture purposes.

The aim of the school nurseries is to get the school children interested in trees and in understanding their relation to national welfare. Two bulletins have been prepared, one "School Nurseries" giving information about the layout of the nurseries, kinds of trees to use, how to sow the seeds, to cultivate the seedlings, etc., and the other a "Teachers' Manual for School Nurseries" containing additional information that will be of help to the teachers in charge. Collections of tree seeds to suit various conditions have been prepared and sold at a nominal price to those who wanted them.

While exact figures are lacking we have much evidence to show that the school nurseries idea has met with a hearty response and should be pushed. Many requests for the bulletins were received and granted. There was active in-

terest among both provincial and district officials. Several officials asked for large quantities of the bulletins. Shensi, for instance, asked for 6,000 copies. Instead of supplying them, we gave permission to reprint the bulletins. Many encouraging letters came from high officials of Kiangsu, Kiangsi, Anhwei, Hupeh, Hunan, Shensi, Chihli, Fukien, and as far away as Jehol and Kirin. All this interest should be followed up and made to yield results in the actual establishment of the school nurseries. The large number of letters from school teachers in Anhwei province indicated the interest of the officials, and a number of these teachers have enrolled in the correspondence courses in nursery management which offers good evidence of the interest of the teachers in the project.

It is too early to see to what extent it will be worth while to offer correspondence courses in forestry subjects. It is evident that the project has limitations. On the other hand much information of help and value can be given, as indicated by our experience with teachers enrolling because of their interest in school nurseries. Two courses were offered, one in forest protection and the other in nursery management. Over thirty have enrolled in the latter course, from eight provinces. Twenty-one are primary or secondary school teachers.

Department of Plant Pathology

Mr. R. H. Porter arrived for this department September 20th, in time to enter the Language School for first year language study. All his time during the autumn semester was spent in studying Chinese, and in spite of the fact that he carried a heavy teaching schedule during the spring semester which necessitated his being absent from regular language school classes much of the time, he has completed the first year language requirements.

Instruction. During the spring semester three classes were offered in the department and taught by Mr. Porter; one in general plant pathology of three credit hours; one in forest pathology of two credit hours; and one in practical

biology of three credit hours to the students of the one year short course in agriculture. During Dr. Gibbs' absence in Honan in March, Mr. Porter carried the former's class in general bacteriology.

Field Survey. It has not been possible to undertake any work among farmers this year but surveys have been made around Nanking and Nanhsuchow, Anhwei, in order to determine the damage caused by various diseases. Among the important diseases about Nanking it was found that flag smut of wheat was common in practically every farmer's field, reducing the yield from five to thirty percent. An average of fifteen percent loss is fairly representative of the whole. In addition to smut, all wheat was infected with leaf rust. This first appeared about April fifteenth but as the warm, moist weather came on, this rust spread very rapidly, killing the lower leaves and reducing the vitality of the plants. A conservative estimate of the loss caused by this rust alone is eight percent. About ten days before the wheat ripened the black stem rust appeared and caused a slight loss. Following is a brief list, by no means complete, of other plant diseases observed this year around Nanking and an estimate of the loss caused by these diseases.

Other diseases of wheat: loose smut, 2%; powdery mildew, 5%; barely diseases: covered smut, 5%; loose smut, 5%; powdery mildew, trace; stripe disease, 2%; broad beans: rust 4%, leaf spot, 8%; rape: downy mildew, 4%; peach: brown rot, 4%; pear: cedar rust, leaves killed, 75% infection, yield reduction possibly 15%. In addition to the diseases caused by fungi it was noted that plant lice were very prevalent on many crops. On the broad beans the lice were so severe that large patches of the beans were killed before the pods were matured. Lice also did serious damage to peach trees. wheat, and barely.

During the month of April a visit was made to Nanhsuchow in north Anhwei. In this section the main crop is wheat. The country is very level. Irrigation is possible but it is not practiced to any extent. In this locality there

occurred this year according to the reports of the farmers, one of the worst epidemics of lice on wheat that has been noted in many years. Hundreds of acres of wheat were ruined, no crop was harvested, and the land was plowed up to be planted to a summer crop. Upon arrival at Nanhsuchow very few lice were at work but they had left evidence of their recent presence. It is very probable that they had simply died out, with the exception of a few winged individuals which had migrated.

One noticeable thing in this region was that irrigated wheat seemed to be less injured than wheat not irrigated. The reason for this is quite obvious. Any plant which is growing rapidly is often able to withstand the loss of food taken out by lice. Any factor which will contribute toward the rapid growth of the wheat will aid in reducing louse injury. The unusual lack of rainfall further increased the adverse conditions for the growth of the wheat.

Investigation Projects. Three projects have been gotten under way during the year. Additional projects will be developed after further observations have been made to determine what the more economically important plant diseases are and along what lines effective studies and demonstrations can best be made. The projects now under way are as follows:—

1. Collection and Classification of the Fungi of China. The object is to prepare a herbarium or Exisaccti of the fungi of China which may be used for reference work at the University, also to make specimens available to institutions abroad.

2. Control of Flag Smut of Wheat. The object is to determine the most effective and economical method for the control of flag smut of wheat under Chinese conditions.

3. Control of Fruit Diseases and Insects at Yihsien, Shantung. The object of this project is to discover suitable methods applicable and useable by the Chinese farmers for the control of the diseases and insects damaging the local fruits.

During the year over 300 specimens of diseases have been collected and added to the herbarium. Many of these have been classified and named. Others will be sent to America for identification. In the future this project will represent only a small part of the work to be undertaken by this department but it is a type of work which should be maintained and enlarged as much as possible.

Department of Rural Education

The activities of this department as planned, comprise the training of rural workers and the creation of educational materials and literature for the training of such workers and for use in general rural education. Two courses have been offered and given. The first course has had in mind the training of selected workers of junior middle school standard, this training being intended to prepare them for positions as community leaders, as teachers or pastors in the villages or smaller country places. The second course is for students of senior middle school standard. The training being given is intended to prepare them for positions such as experiment station managers, rural school superintendents, teachers of agriculture in the higher primary and lower middle schools, etc. Several practice rural schools have been organized as a practical demonstration of the type of rural education we are trying to teach.

Rural Text Books. The promotion of rural education along practical lines has been handicapped by the lack of suitable text books and teachers' guides. To remedy this difficulty a series of text books with teachers' manuals for higher primary or lower middle schools is being prepared in which the subject is being taken up according to the project method. The subject matter is being arranged according to the seasons of the year in which the various forms of practical work can be carried on and each lesson relates to specific projects or experiments that make possible learning by doing rather than the old fashioned process of memorizing the literature on the subject. The texts for each of the two

years work are divided into two books, one book for each semester, making four text books for pupils' use, while four additional teachers' manuals are being prepared which will set forth the methods of teaching the text lessons and outline plans for conducting the various projects. Both texts and manuals are being illustrated with original drawings prepared with the aid of Chinese artists. The translation is being done by Mr. Shao Teh-hsing.

Owing to the ease with which the project work can be adapted, these texts and teacher's manuals are suitable for the 5th and 6th years of the higher primary schools, or in case no agriculture has been given, to the first and second years of the junior middle school. This series is being published by Edward Evans and Sons, Shanghai. The first volume will be ready by September first.

Rural Normal Training School. In order to get the rural normal training work under way as quickly as possible, a special class of students was admitted in February, and continued through the University summer school of which it became a part by special arrangement. Twenty students were enrolled; nineteen were granted certificates. Six students came or were sent from Kiangsu province, two from Szechuan, three from Chihli, two from Shensi and one each from Honan, Hunan, Hupeh, Anhwei, Fukien, and Chekiang. The majority of those enrolled were rural school teachers sent by mission stations for the special rural training work.

New buildings are being erected this summer for use of the rural normal school. These consist of dormitory, dining and class rooms, and laboratories. A rural school to be used for practice is being erected close by. There will be land for play grounds and gardens.

Messrs. Griffing, Chang Chi-wen, Chang Yuen-wei and Swen Fang will devote most of their time to the rural normal work.

Special One Year Short Course in Agriculture. Thirty-six students were enrolled for the 1923-1924 special one year short course in agriculture of whom twenty-nine completed

the eleven months' work and were granted certificates. Eleven of the graduates were from Kiangsu province, four from Szechuan, three from Chekiang, two each from Kwangtung, Honan, and Anhwei and one each from Hunan, Hupeh, Kiangsi, Fukien and Shensi. Eleven were graduates of government agricultural schools. The practice of previous years of one half day study and one half day field and laboratory work followed by community games and athletics was continued. The third term was made a part of the University summer school. Requirements for admission have been raised to senior middle school graduation.

Mr. Griffing continued as Director of the short course. During the fall semester Mr. Chow Ming-i, and during the spring semester Mr. Chang Chi-wen, have acted as Associate Director. Mr. Chang continues in this capacity. The teachers for the normal and the short course have been Messrs. Chang Chi-wen, general agriculture, cotton culture, farm crops and rural education; Chang Yuen-wei, physics and chemistry; Chow Ming-i, horticulture and biology; Hsu Chen, rural economics; Kuh Ying, sericulture; Li Teh-i, forestry; Li Ying-hwei, biology; Liu Chiung-hsien, education; Shao Teh-hsing, horticulture and rural education; Shen Sheo-tsuen, farm crops; Swen Wen-yuh, farm management; R. H. Porter, biology; J. B. Griffing, horticulture; C. S. Gibbs, animal husbandry; and M. L. Hancock, field work in horticulture.

Department of Sericulture

The past year easily marked the most successful year in the history of the department of sericulture. This was made possible by the very excellent facilities offered by our new commodious sericulture building, the gift of the Silk Association of America, and by the strenuous and loyal efforts put forth by Mr. Kuh Ying, head of the department, and by his associates. The total egg production for 1924 is 592,374 layings compared with 340,300 layings for 1923.

Support. The second American Silk Mission during their visit to Nanking in the spring of 1923 pledged the support of

the Silk Association of America to the work of the department for 1923 to the extent of $4,000 gold, and for 1924 the Association has contributed $3,000 gold. These contributions have made possible our carrying on the work reported in the following paragraphs. Opportunity is here taken to express our appreciation of the help thus given.

The Spring Crop of Silkworms. A total of 50.08 piculs (6,670 pounds) of cocoons was produced which netted 584,694 layings of eggs. The moths laying the eggs will all be examined under the microscope for pebrine during the autumn months, and prepared for sale next spring. To produce this large crop of eggs, over 2,000,000 silkworms had to be cared for. This involved the incubation of 8,500 laying of eggs, the use of over 3,000 silkworm trays (shown in the accompanying photographs) which had to be cleaned each day and new paper added, the use of forty-four reams of large size newsprint paper, seventy-five tons of fresh mulberry leaves for feeding, two and a half tons of charcoal for heating the rooms, the labor of sixty-seven women workers to care for the worms, and the labor of eighty men and women workers to pick the leaves, carry them to the building, cut up the leaves, and carry out the waste from the rearing rooms.

The silkworms during the first growing stage were fed eight times throughout the day and night regularly, seven times during the second stage, six times during the third and fourth stages, and five times during the fifth stage. Caring for silkworms is a continuous performance and as careful attention must be given during the night as during the day. Twenty-eight to thirty-two days were required from hatching to the beginning of the spinning of the cocoons. Two-thirds of the days during the rearing season were wet and rainy in whole or in part, which added very greatly to the difficulty of keeping a supply of leaves on hand, and in regulating the temperature and moisture conditions in the rearing rooms. Dr. Gibbs, head of the department of bacteriology, co-operated in the control of sanitary conditions during the rearing season.

From Cocoon to Eggs. The season's cocoons were of very superior quality. In spite of this fact all the cocoons were very carefully picked over. After selection, there was, on careful estimate, about 1,900,000 cocoons from which moths were allowed to hatch out. During the busiest day there were probably as many as 600,000 moths to handle, including both males and females. More than two hundred women were employed to pick the moths from the trays, to separate the females, and to place them on the papers arranged on the trays on which the moths deposited their eggs. Each moth had to be covered with a small galvanized ring, one moth to a ring, and finally placed in the egg bag where it would remain with the laying until examined under the microscope. After experimenting with various laying devices, Mr. Kuh has worked out a combination individual egg card and moth bag which from standpoint of cost, efficiency in handling, and guarantee against mixing, is excellent. Six hundred thousand bags were required to handle the eggs and moths.

The Summer Crop of Silkworms. Because of the difficulty which we had experienced in getting rid of the summer silkworm eggs produced in 1923 only 110 catties (147 pounds) of summer crop cocoons were raised, from which were made, after careful selection, 7,600 layings of eggs. The quality of this summer crop indicated that our selection work on the 1923 crop had been effective in improving the quality of the cocoons. No disease appeared during the rearing season. The 1923 crop gave 60% diseased moths, the 1922 crop about 95%. Careful data on the incidence of pebrine will be taken from this year's crop. While it is true that the summer silkworm crop is of secondary importance, it often enables the farmers as in Nanking this year, to make use of their mulberry leaves when the spring crop as is frequently the case is a failure. Our emphasis in egg production is and of course will be on the production of the spring crop cocoons.

Mulberry Production and Sales. During the early spring of 1924 there were grafted by various methods, chiefly by

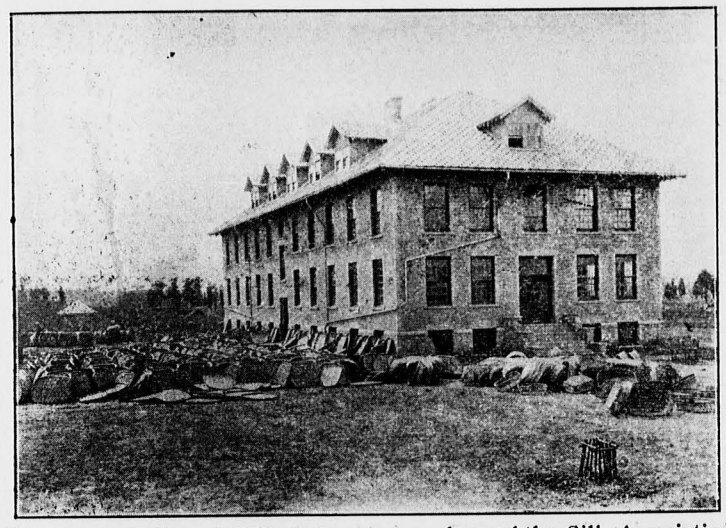
the common Chinese crown graft method, 101,000 mulberry seedlings. Considerable experimental grafting was undertaken, using Chinese or western methods or combinations. The results have been quite satisfactory considering the fact that all the grafters had to be trained. Some interesting results are appearing from the experiments. Much of the season's success is due to Mr. A. Benemerito, a graduate of the College of Agriculture, Los Banos, Philippine Islands, who was immediately in charge A large quantity of seedlings have also been grown for grafting in the spring of 1925.

During the spring 75,000 mulberry trees were sold at about cost prices. We were not able to meet the demand for grafted trees coming from many parts of China, for use both as replacements and for new orchards.

Mr. M. L. Hancock, an experienced and well trained plant propagator, will be in charge of mulberry production and the mulberry orchards beginning September, 1924. The mulberry production work is self-supporting.

Mulberry Orchards. Six thousand four hundred young trees were added to our mulberry orchards this last spring. The orchard therefore contains approximately 967 trees seven years old; 5,131 trees six years old; 297 trees five years old; 495 trees four years old; 3,064 trees three years old; 11,580 trees two years old, and 6,416 trees one year old, or a total of approximately 27,950 trees. The orchard as a whole is in excellent condition, the trees showing a vigorous appearance. Additional land for orchards is an imperative need in order that we may be independent of the outside market and that we can have good leaves available at a smaller cost. This past year the mulberry leaves used in our egg production represented about one-third of the total expenses. The mulberry orchard is self-supporting.

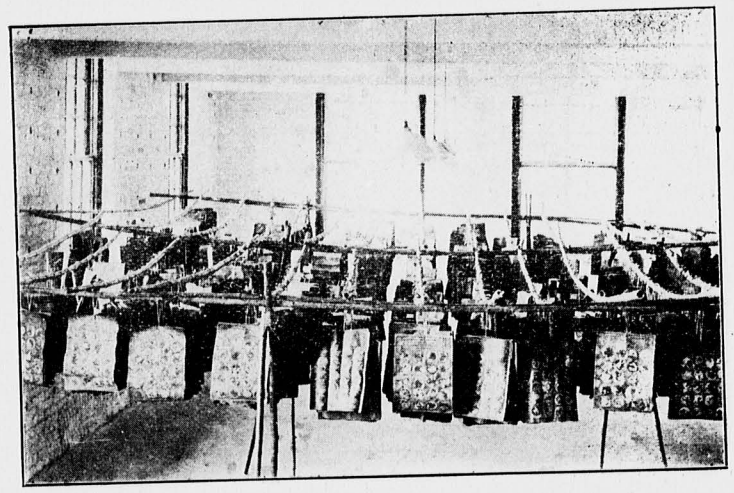
Collection of Varieties of Mulberry. The department is unable to report any progress during the year on the study and classification of mulberry varieties in our collection, undoubtedly the largest in China. The collection contains 330 varieties (or lots) of mulberry including 109 varieties from



The new sericulture building given by members of the Silk Association of America. Part of the silkworm trays and leaf baskets being "sunned" after use during the rearing season.

A rearing room in the sericulture building showing an assistant cleaning silkworm trays. Silkworms can be seen in the baskets on the rack. The room has a capacity of six hundred trays.

Cocoons for silkworm seed production. Removing the cocoons from the straw "mountains." Over three tons of cocoons were produced in 1924.



Tested silkworm seed cards from the 1923 crop ready for distribution to the farmers.

Japan and thirteen varieties from America. The other 208 varieties (or lots) have been secured from many parts of China. The collection is being managed as a regular part of our mulberry orchard, and is self-sustaining.

Distribution and Sale of Eggs. Our 1923 egg production of 7,361 standard egg cards of twenty layings each was disposed of for the most part in March and April, 1924. Advance demands by mail disposed easily and quickly of the cards of spring crop silkworms at an average of twenty cents per card. The disposal of the 5,017 standard cards of summer crop or bivoltine silkworm eggs was more difficult. This was due largely to the fact that improved disease free summer silkworm eggs was an entirely new idea to the farmers and that summer crop eggs are not used in large quantities, a few layings of the first crop being sufficient for a considerable second crop. Extension campaigns in several of the most important summer regions and the co-operation of a number of missionaries gave us a fairly satisfactory distribution, though we were compelled to offer them at a smaller price and in many cases to give them away in order to get them introduced.

This spring many farmers in and about Nanking came to the sericulture building to purchase more summer (the second) crop eggs than we could supply, which indicated both the growing confidence of local silk growers in our work, and that there is a place for the production of improved bivoltine varieties of silkworms in the extension and improvement of cocoon production.

No trouble is anticipated in the disposal at a fair price of our 1924 egg production which will, it is estimated, net about 20,000 standard egg cards.

Extension Work. Extension work was carried on in parts of Kiangsu and Chekiang provinces during the spring. Emphasis was laid (1) on the use of certified eggs to insure against loss by pebrine disease and to give better quality cocoons; (2) on rearing the worms under sanitary conditions; and (3) on the care and management of the mulberry orchard.

Interest was aroused by means of carefully prepared exhibit material, lectures, and plays. These latter were always most effective. During the 141st celebration of the "Shwuan Yang" Fair, a decennial event, in the Chentseh district in Kiangsu province, an important silk area, we had an exhibit for two weeks during which time at least 25,000 people were reached. Mr. Buck's extension class of thirteen students co-operated in handling the crowds and explaining the exhibits. The exhibit was in charge of Mr. Chow Ming-i and Mr. Hsu Chen. One old farmer, after he had been shown pebrine disease particles through a microscope, exclaimed: "Ah, now I know that silkworm diseases are not caused by the evil spirits"—an important discovery, that millions of his fellow farmers will have to make before cocoon production in China can be placed on a scientific basis.

Instruction in Sericulture. During the University Summer school of 1923 Mr. Kuh taught two classes of rural school teachers, one in mulberry culture and one in modern methods of sericulture, including disease control. Sixteen teachers were enrolled in each class. These courses were repeated during the year to the one year short course in agriculture students. There were thirty-six students in each class. This makes a total of four classes during the year with a total enrollment of 104 students. These classes were carried in addition to Mr. Kuh's principal work of egg production.

Investigations. Important investigations are being carried on in connection with egg production as follows: (1) a study of the type of egg layings in relation to the presence of pebrine, by Mr. Kuh; (2) a study of the commercial qualities of silk produced by the leading varieties of silkworms, being carried on in co-operation with the Shanghai International Testing House, Shanghai, who are making all the mechanical tests; (3) a study of the efficiency of various leading varieties of silkworms in producing eggs, by Mr. Kuh (our 1924 crop indicated a variation of from twenty-one to forty-three per cent efficiency on a basis of a total of fifty percent); (4) a study of silkworm diseases by Dr. Gibbs.

Research Library

The Research Library is a part of the University Library though in personnel it is directly related to the College of Agriculture and Forestry. It has taken over the books and catalog and index cards gathered during the several years of co-operative work with the United States Department of Agriculture, and, so far as Chinese literature is concerned, it is following the methods adopted at the beginning of the co-operative arrangement. Emphasis is placed on the collecting, cataloging, and indexing of Chinese literature pertaining to agriculture and on getting the information contained therein in an available form. Foreign books needed in the prosecution of research and investigational projects of the College of Agriculture and Forestry are also being secured. It is not generally known that China possesses a fairly rich literature pertaining to agriculture; in horticulture, sericulture, irrigation, land tenure, botany, zoology, entomology, farm crops, forestry, animal husbandry, fish culture, etc., etc. Much of this old literature is as useful in many ways for China as the more modern books, and the possession of the knowledge which it contains will be not only valuable but should also be considered an absolute necessity in any serious study of any phase of Chinese agriculture. In carrying out several minor investigations of Chinese crops, we have found that some of the most useful information has come from this little known literature. Recently the University library has published an exhaustive bibliography on Chinese agricultural literature which lists more than two thousand separate and distinct titles.

The Research library as such has been organized less than one year. Mr. Wang Kwoh-ting is in charge, Mr. Liu Shen-pu is Associate, and Mr. Ho Han-san is Writer. Mr. Han Lih-wu, Associate in Agricultural Research is making an intensive study of famines. The three principal lines of work being undertaken at the present time are: collection of books, cataloging of books, and indexing of important old Chinese works on agriculture and famines.

Chinese books added during the year. During the year 12,329 volumes of Chinese works bearing on agriculture, geography, famines, and kindred subjects have been added which bring the total number of volumes available for Research Library purposes up to 20,804, classified as follows:—

Class	Books in Library June 30, 1921		Added during the year		Total June 30, 1924	
	Sets	Volumes	Sets	Vo umes	Sets	Volumes
1. Official gazetteers	4	48	273	3955	277	4003
2. Other geographical works	4	151	169	1186	173	1337
3. Books on agriculture	17	243	41	1359	58	1602
4. Books wholly on famine	3	3	26	82	29	85
5. Books partly on famine	4	162	42	1657	46	1819
6. Li Shu (encyclopedias)	19	2685	22	791	41	3476
7. Ts'ung Shu (collectanea)	27	5183	44	3299	71	8482
Total	77	8475	617	12329	694	20804

Agricultural Literature Indexed. Three agricultural works have been indexed in part as follows: (1) "Nung Chen Chuan Shu," (農政全書), an encyclopedia of agriculture by Hsu Kwang-ki, of the Ming dynasty, first published at the beginning of the seventeenth century. This contains sixty parts, of which have been indexed two parts on the reclamation of land, nine parts on hydrography and irrigation, three parts on famine prevention and relief, fifteen parts on famine prevention plants and vegetables, a total of twenty-nine parts. (2) "Nu Ling Shu Chi Yao" (牧令書輯要), by Hsu Tze-chu and revised by Ting Yu-sheng in the nineteenth century. It is a book for district magistrates, containing ten parts, among which we have indexed two parts which deal with famine prevention and relief. (3) "Chiu Hun Chi Yao Chu Pin" (救荒輯要初編), a special famine book, edited by Mr. Feng Hsu, the president of the International Famine Relief Association. Mr. Liu is now working on a fourth work, "Huang Cheng Ts'ung Shu" (荒政叢書), a collection of books on famines, edited by Yu Sung in the seventeenth century.

Bibliography of Chinese Literature on Agriculture. This bibliography was mainly compiled by Mr. Mao Yung, formerly Associate Chief of the Co-operative Work, and its preparation for publication was completed by the members of the Research Library. Investigations were made in the libraries of Nanking and of neighboring cities in Kiangsu Province and in library catalogues. Over 2,000 titles are listed, and classified under twenty-one divisions. It was published in June 1924 as number one of the publications of the University Library.

Irrigation Investigations

The irrigation investigations by Mr. Griffing have been continued in northern Anhwei which is typical of a large region in North China where the yield of the important winter wheat crop is invariably reduced and resulting some years in partial to total failure of the crop, because of lack of water at some time during its growing period. The investigations have included experiments to test the effects of irrigation on the yield of wheat, the improvement of wells to supply water in larger quantities for extensive irrigation and the development of an irrigation pump that will make possible a more rapid application of water than by present methods.

Irrigation Experiments on Yield of Wheat. The wheat at Nanhsuchow was watered in three different ways: (1) by flooding long beds containing six rows one foot apart; (2) by furrow irrigation with rows two feet apart; and (3) by furrow irrigation between pairs of rows, the pairs being two feet apart and the rows of the pair one foot apart. Some plots were irrigated twice and others only once. Unfortunately much of the check plot wheat was also irrigated through carelessness of workmen so that reliable check results were not obtained. However the following facts were noted:

The third method described above was by far the most economical of both water and time. By this method the ground could be covered at the rate of approximately one

mow in one and three quarter hours. The second method required 50% more water, and the first 100% more water than the third method. The second method also has the objection that unless the the soil is very fertile the stand of wheat is too thin on the ground because of the elimination of every other row in order to make the irrigation furrows. The elimination of every third row, in method three, gives sufficient wheat to cover the ground under ordinary conditions when water is supplied.

On unchecked plots the third method gave 327 catties per mow with No. 6 (Mammoth Red) and 320 catties per mow with No. 5 (Fultz). Native wheat on the most fertile part of an adjoining farm yielded 176 catties on a measured mow. This yield of wheat was one of the best under local conditions that could have been obtained for the spring drought cut average yields far below the general yearly average of about 100 catties per mow, while barley, being earlier and failing to receive the benefit of the late spring rains was almost a total failure.

Improvement of Wells for Irrigation. Two wells north of the city wall at Nanhsuchow had to be abandoned because of the quicksand encountered. However a well was successfully put down on the nine mow tract south of the city in the fall of 1923 to the depth of fourteen feet when the workmen gave up the task on account of the great flow of water. In the spring of 1924 a force of twelve men operating for a day succeeded in lowering the level two feet more. While in Kaifeng study was made of well digging methods and an operation was observed which can be applied to advantage in Nanhsuchow for deepening wells inasmuch as it gives a quicker method of drawing out water and sand.

The fact developed in the course of operations that the sixteen feet well described above was used only to a small measure of its possible capacity in watering the greater part of the nine mow tract which would indicate that for furrow irrigation of wheat a well of the above type would be adequate for more than twenty mow.

In order to study both pumps and wells in greater detail a twenty-five foot test well was sunk at Nanking and is available for trial experiments.

New Design for Irrigation Pump. In developing the endless chain irrigation pump numerous changes have had to be made in the design of the pipe in order to work out water tight joints that would not interfere with the freedom of the chain and lugs in passing. A special type of joint was made from cast iron which possessed the desired characteristics. Next a modification of the application of power was sought inasmuch as the lifting of a heavy flow by means of cranks proved unpopular with workmen. A foot power design was therefore constructed which operated successfully, giving a flow of fifty gallons per minute at ten feet with three men. At the present time a design for use with donkey or cow power is under construction.

Publications

The following publications have been issued during the year in English.

Agricultural and Forestry Series, Bulletins.

Number one, School Nurseries, second edition, revised. By John H. Reisner.

Number six, Part I. Report of Three Years' Cotton Improvement work.

Part II. Observations on the Behavior of Cotton Plants especially during Acclimatization. By J. B. Griffing.

Number seven. An Economic and Social Survey of 102 Farms near Wuhu. By J. L. Buck. (Translated into Chinese by Hsu Chen).

Number eight. Summary Meteorological Records. University of Nanking, 1895-1923. W. C. Lowdermilk and Shen Hsioh-li.

Number nine. Famine Prevention Program of the College of Agriculture and Foresty as approved by the China Famine Fund Committee.

Agriculture and Forestry Notes. This is a new series, edited by the Dean and issued monthly in four pages form, of items of interest and information about the work of the College of Agriculture and Forestry. The first issue was in November, 1923.

Number 1.	November, 1923.	Number 5.	March, 1924.
Number 2.	December, 1923.	Number 6.	April, 1924.
Number 3.	January, 1924.	Number 7.	May, 1924.
Number 4.	February, 1924.	Number 8.	June, 1924.

Daily Meteorological Records. These records are published quarterly and contain the meterological data recorded at the Freeman Meteorological Observatory in charge of Mr. Lowdermik. The following numbers have been published.

Number one, October, November, December, 1923.
Number two, January, February, March, 1924.
Number three, April, May, June, 1924.

University of Nanking Bulletins, Volume six.

Number twelve. Annual Report of the College of Agriculture and Forestry and Experiment Station, 1922-1923.

Number fourteen. Special Training Courses for Rural Workers.

Miscellaneous:

1924 Nursery Stock and Seed List.
Rural Community Survey Outlines.

The following publications were issued during the year in Chinese:—

School Nursery Bulletin, by John H. Reisner.
School Nursery Manual, by Kan Han.
Forestry and Human Life, by Ling Kan.

Silkworm Rearing (Reprint), by Kuh Ying.
1924 Nursery Stock and Seed List.
Catalogue of Forestry Correspondence School.
Announcements of One Year Short Course in Agriculture and Rural Normal School.
Rural Community Survey Outlines.
Farm Management Survey Outlines.

The Faculty in Print

Each year we have published as full a list as possible of articles written by members of the faculty and appearing in current publications. This list would be greatly enlarged were we to include the very large number of articles which have been written by members of the faculty for our Agricultural and Forestry newspaper.

Chang, C. W., Agricultural Unrest may lead to Bolshevism. The China Weekly Review. September 1, 1923, pp. 8-9.

Chang, C. W., An Untilled Field of Rural Activity. The University of Nanking Magazine, Vol. XIII, No. 1, pp. 46-48, September 1923.

Chang, C. W., Rural Education (In Chinese). The University of Nanking Magazine Vol. XIII, No. 1, pp. 34-39, September 1923.

Chang C. W., Rural Psychology (In Chinese). The University of Nanking Magazine, Vol. XIII, No. 1.

Gibbs, C. S., Christ's Call to Youth, The University of Nanking Magazine, Vol. XIII, No. 2.

Gibbs, C. S., The Hygiene of Foods, Dietetics and Cooking, The University of Nanking Magazine, Vol. XIII, No. 2.

Griffing, J. B., Big Horses, The University of Nanking Magazine, Vol, XIII, No. 2.

Griffing, J. B., Saved Again. The University of Nanking Magazine, Vol. XIII, No. 3, June 1924.

Hsu, C. K., The Importance of Agricultural Extension in relation to the future agriculture condition in China, (In Chinese) Shanghai Times, special issue of the National Celebration Day (October 1, 1923).

Hsu, C. K., A Study of the Methods of Agricultural Extension in U. S. A. (In Chinese) Commercial Press (October 1923).

Jones, E. V., The New Chemical Philosophy. The University of Nanking Magazine, Vol. XIII, No. 1, pp. 24-31, September 1923.

Kuh, Y, Cocoon Judging (In Chinese). The University of Nanking Magazine, Vol. XIII, No. 1, pp. 47-49, September 1923.

Lowdermilk, W. C., China and Per Capita Forest Area. The University of Nanking Magazine, Vol. XIII, No. 1, pp. 43-45. September 1923. Also The China Weekly Review, Shanghai, November 17, 1923.

Lowdermilk, W. C., A Preliminary Survey of Forest Conditions in Northern Honan and Shantung. The University of Nanking Magazine. Vol. XIII, No. 3, June 1924

Lowdermilk, W. C., Erosion and Floods in the Yellow River Watershed. The China Weekly Review, Shanghai, Vol. XXIX, No. 2, June 14, 1924.

Lowdermilk, W. C., Slash Disposal in the Western White Pine Type. J. A. Larsen and W. C. Lowdermilk; issued as a Forest Service bulletin, number 292, of the United States Department of Agriculture.

Lowdermilk, W. C., Factors, Influencing the Establishment of Engelmann Spruce. Journal of Agricultural Research.

Chinese Scientific Agricultural Terminology

It will readily be seen that the development of generally accepted and understood Chinese terms for scientific agricultural terms and expressions is of great importance. At the present time there is much confusion and little standardization of scientific agricultural terminology. During the year Mr. Hsu Chen-ken with the co-operation of teachers and students compiled an exhaustive list of Chinese terms for new words and expressions which relate both directly and indirectly to agricultural science. The following subjects were covered: chemistry, entomology, farm crops, plant pathology, vegetable gardening, agricultural education, landscape gardening, poultry, beekeeping, fertilizers, soils, plant breeding, animal husbandry, dairy, farm management, rural economics, feeds and feeding, floriculture, veterinary science, agricultural engineering and farm mechanics.

Agriculture and Forestry Scholarships

The following scholarship funds are available for scholarships in the College of Agriculture and Forestry. The Forestry Fund Scholarship Loan Fund has been operating for five years. Loans made to students and fallen due have so far all been paid promptly.

Forestry Fund Committee Loan Scholarship Fund. The Forestry Fund Committee Loan Scholarship fund of $5,000 Mex. was established in 1919 by the Forestry Fund Committee, Shanghai, to be used as a revolving loan fund, $1,000 being available each year. Loans made to students are repayable annually after graduation in the amount and order in which they were received until the total loans have been rapaid.

Willard G. and Jennie B. Welker Memorial Scholarship Fund. The Willard G. and Jennie B. Welker Memorial Scholarship Fund established in 1924 provides $100 Gold each year for helping boys to "get an education in the University of Nanking—specializing in agriculture." Students receiving help from this fund must have good character, real ability, experience in the country, need financial assistance, maintain a scholarship of at least 80% and definitely plan to engage in agricultural work after graduation.

Famine Fund Loan Scholarships. The Famine Fund Loan Scholarships totaling $1,000 Mex. approved by the China Famine Fund Committee of Five for 1924-1925, are to be used for helping needy agricultural students. Loans made are repayable after graduation in the amount and order in which they were received.

Graduates

During the year there were 77 graduates from the various courses offered in the College of Agriculture and Forestry. Twenty-six graduates of the College were granted the degree of B. S. in Agriculture. Of these fourteen were agriculture students and twelve were forestry students. All except two had positions before commencement and these were placed shortly afterwards. There has been a greater demand for graduates of the College than we have been able to meet. In addition to our graduates from the five-year college course in agriculture and forestry thirty-four men were to be given certificates of graduation from the special one year short course in agriculture after they had finished the year's work in August. There were also 17 men to receive certificates of graduation from the special normal training course, which opened in February and will last through the summer school ending August 10th.

Student Enrollment

Last year there were enrolled in the College of Agriculture and Forestry sixty-seven students in the Senior College of Agriculture and Forestry, thirty-six students in the One Year Short Course in Agriculture and nineteen in the Rural Normal School, making a total of one hundred and twenty-two students.

There has recently been considerable feeling on the part of some that the student enrollment for the college course is not as large as it should be Careful consideration has been given to this problem during the year. There are a number of factors involved among which the following seem to be the most important.

Agriculture, as a profession, is not well established in China. The demand for agriculturally trained men is almost without exception limited to schools and experiment stations and practically the only demand for highly trained men is as teachers of agriculture. Moreover agricultural schools are unstable due chiefly to politics within the organizations and the ubiquituous lack of finances. Further, there is no demand in China, as there is in other countries, for graduates of agricultural colleges to fill positions in extension work, as managers of co-operative societies, farm bureaus, large estates, etc., or to enter agricultural industries such as the fertilizer and farm machinery industries which have in the past absorbed a goodly proportion of the graduates of our western colleges.

A third factor that has doubtless worked against a larger enrollment is that the expenses for the College of Agriculture and Forestry are higher on account of laboratory fees, higher cost of scientific text books and because laboratory and field work which usually fill all of the students' afternoons make it impossible for them to earn money by outside work with which to pay college expenses as is now possible and is done by so many of the students in the College of Arts and Science. Previously our enrollment may have been affected by the small size of the faculty and while we still need more men for established branches of agricultural instruction and investigation, I doubt if the size of the faculty is now or for the past few years has been a limiting factor. The high standards of the College of Agriculture and Forestry are clearly and widely recognized in China. Another factor is the desireable necessity of teaching in English. This however undoubtedly does keep away many boys from the interior schools with the proper rural back ground but with inadequate preparation.

One of the big problems affecting agricultural education in China is the creation of a demand for the services of men trained in modern scientific agriculture. Certainly there is a lack of such demand at the present time. Moreover all such services will have to be demonstrated to the farmers and just in proportion as agricultural schools and experiment stations

are able to demonstrate the value of the services which they can render to agricultural communities in China will there be an increased demand for agriculturally trained men.

Closely related to the problem just stated is the immediate necessity of agricultural schools providing training that is more closely related than at the present time to the actual needs of the farmer. The failure of agricultural schools and experiment stations to bring about co-ordination between their own programs and the actual needs of the farmer has very greatly retarded the demand for graduates of agricultural colleges and schools. The ideal of service needs to supplant the seeming necessity on the part of school graduates of maintaining face by restraining from active participation in the life, activities and interests of the farmers. In other words, the ideal of rural workers, and I am now thinking of practically all such in China will have to be changed; and actual sympathy with the people as well as active interest in their problems will have to be concretely demonstrated in helpful services rendered. The need for strong rural leaders is painfully evident. The problem is one of translating the needs into demands, and then of satisfying the demands with men adequately trained and with proper ideals.

ADMINISTRATION

During the year the office has received and sent out about 10,000 pieces of first class mail in English, and about 4.000 letters in Chinese. This does not take into consideration another 8,000 postal card acknowledgments, bills and receipts which have been sent out in English in connection with our nursery stock and seed distribution work. During the year we sent out about 60,000 pieces of second class matter; about one-third of this was in English and two-thirds in Chinese, including copies of the Agriculture and Forestry newspaper. Approximately 4,000 parcels of seeds and plants have been sent out also. Quite a bit of time has been spent on our mailing lists and we now have 1,000 special names on our foreign mailing list and about 3,200 on our Chinese

mailing list. In addition, we have also a general Chinese mailing list, including the following Chinese agricultural organizations: colleges, middle schools, primary schools, industrial and normal schools with agriculture courses, agriculture experiment stations, various kinds of agricultural associations, farm and forestry companies and non-agricultural organizations, such as commercial and educational associations, rural educational bureaus, newspapers, seed and nursery companies, libraries, museums, etc.

Mr. C. K. Hsu has been responsible for the Chinese correspondence and all second class mail matter. Miss Priest, along with a multitude of other duties, has kept very effective oversight of the nursery stock and seed orders. Miss De Groff arrived in February for secretarial work which very greatly relieved the situation. Miss Bertha Gless is expected in September for secretarial work and with her coming we shall be in much better shape to care for our rapidly expanding work.

ACKNOWLEDGMENTS

It is impossible to acknowledge by name all those who have helped us during the past year by supplying information, by sending seeds, cion materials, plants, fertilizers, etc. to us. However, we wish to express at this time our appreciation of all the many such services so generously rendered in the furtherance of our work.

Additional copies of this REPORT will be sent on request. Address all communications to the College of Agriculture and Forestry, University of Nanking, Nanking, China.