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April 24, 1930
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Nanking

TRANSFER

UNIVERSITY OF NANKING

COLLEGE OF AGRICULTURE AND FORESTRY

FAMINE PREVENTION PROGRAM

FIVE-YEAR REPORT

1930-34

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Letter of Transmittal

Nanking, April 24, 1930.

The China Famine Fund Committee,

Shanghai.

Gentlemen:

I have pleasure in submitting herewith the Five-year Report of the Famine Prevention Program of the University of Nanking (1923-1928), including the following Exhibits:

A. Studies in Chinese Rural Economy.

B. Factors Affecting Sufficial Run-off.

C. A Cover and Erosion Survey of the Hwai River Catchment Area.

D. Some Aspects of Plant Pathology in China.

E. Effect of Copper Carbonate on Covered Smut (Ustilago Hordei) of Hulless Barley.

F. Seed Disinfectants for the Control of Kernel Smut of Foxtail Millet.

Respectfully yours,

J. G. Chen, President,
University of Nanking.

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THE UNIVERSITY OF NANKING
College of Agriculture and Forestry
Nanking, China

FIVE YEAR REPORT

Famine Prevention Program

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CROP IMPROVEMENT

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In addition to the detailed report of the Department of Agronomy of its crop improvement work, prepared by Mr. Heh and attached hereto, the following items will be of interest.

Improved Seed Distribution: A summary of the improved seed of wheat, corn and cotton distributed by the college since 1923 shows that a total of more than 6,000 bushels or an equivalent of more than 100 tons of improved seed of these three crops has been distributed, with generally excellent results. Some of the farmers' reactions to these improved seeds will be found at the end of Mr. Heh's report.

The Cornell Cooperation: It is difficult to estimate the value of this cooperation. The Department of Plant Breeding of the New York State College of Agriculture is recognized as one of the very best in the world. The Cornell Professors have brought to our crop improvement work both years of experience and high ability. Our plant breeding methods have been made to conform to the best that have been developed in the West.

Crop Improvement Institutes: Two crop improvement institutes have been held, one of three weeks with Professor Myers present in 1926, the second of four weeks with Professor Love present in 1929. Lectures, laboratory work and field trips were provided. The enrollment and attendance included a majority of the men in China engaged in crop improvement. It is evident that the influence of these institutes has been very wide and very great.

Extent of the Crop Improvement Program: The table of plantings, following the second page of Mr. Heh's report, indicates the extent of the plantings. The Cornell representatives give as their judgment that the crop improvement program under way is one of the most extensive to be found anywhere in the world under one central administration.

(J.H.R.)

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SUMMARY REPORT OF THE AGRONOMY DEPARTMENT FROM 1923-1928.

by C. M. Heh.

Personnel of the Department:

G. E. Ritchey, J. B. Griffing, H. H. Love, C. H. Myers, R. G. Wiggans, T. H. Shen, S. Wang, T. T. Ong, C. C. Kwan, T. R. Chang, S. E. Tai, Y. S. Tsiang, L. S. Tsu, Ren Sha, Li Wei Chien, Miss B. M. Gless, T. C. Ten and C. M. Heh.

Introduction

This brief report covers the five years' work of the Department of Agronomy during the period of 1923-1928 as well as the work at the cooperative stations and our former Cotton Department. The latter department was considered as an individual department, but since the spring of 1927 all Cotton Projects have been taken up as a part of the regular program of the Agronomy Department.

In the absence of Messrs. Ritchey and Griffing, heads of the two departments mentioned above, the writer has the privilege and pleasure of writing the report.

The three distinct lines that are being developed in the department are as follows:

1. Plant Improvement.
2. Improved seed production and distribution.
3. Training men who are interested along the line of crop improvement work.

Before proceeding with the report, the writer wishes to express the deep regret of the department that Professor R. G. Wiggans reached Shanghai on March 25, 1927, and could not visit Nanking on account of the political upheaval at that time. We regret also that owing to the interruption of communications in this part of the country, it was impossible to visit our cooperative stations as frequently as was desired, particularly after the spring of 1927.

Cornell Cooperation

Dr. H. H. Love, the first representative of the Cornell University in connection with the cooperative plant improvement project, was here

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Fig. 1. General view of Tai-ping-men Experiment Station.

Fig. 2. General View of Shen-tsi-men Experiment Stations.

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from April 10th to October 27th 1925, and was followed by Professor C. H. Myers who arrived March 24th and remained until October 18th 1926. Professor Myers was accompanied by Dr. T. H. Shen, one of the professors of the department at t he present time. Professors Love and Myers both made various trips to our cooperative stations such as Kaifeng, Yihsien, Weihsien, Nanhsuchow, Wusih, Soochow, etc. During these visits plans and problems for the cooperative work were discussed carefully and a great deal of field work was supervised and directed. The members of the cooperative stations greatly appreciated the contact with Dr. Love and Dr. Myers and found their advice most helpful in carry ing forward the work. Owing to the political situation in Nanking, Dr. Wiggans did not come to the school but left Shanghai for America on April 18, 1927 after having held some very helpful conferences with members of the department.

Crop Improvement Programs.

Before going further into the details of the plant-breeding work, the writer wishes to express his appreciation of the work done by the founders of this department. Dean Reisner was the first one to begin work as early as 1925 on the improvement of wheat and corn and in 1920 Mr. Ritchey took up the work. The methods of improvement have been changed somewhat by the professors from the Cornell University, Ithaca New York since the arrangement in 1925 of the triangle cooperation between the International Educational Board, the Cornell University and the University of Nanking.

Cooperative Plant Improvement Stations.

The value of plant improvement cooperative projects have become more and more significant. As the organization is gradually perfected, methods of breeding, materials for breeding and the interpretation of data are standardized. Particularly is this true in the cooperative work which is proving most valuable in that the same varieties or selections of plants can be tested out at different stations in differ-

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ent stations in different points of China under different conditions. In this way selections or varieties that appear to be good at one of the cooperative stations can be made available immediately for use and trial by all other stations. These stations, with personnel directly responsible for the plant improvement work may be found on page 6 of the Twelfth Annual Report of the College of Agriculture and Forestry and Experiment Station 1925-26.

Plant Breeding Work at Nanking Station.

Plant improvement on wheat was started in the fall of 1924. Barley, soybeans, rice, corn, cotton and cabbage have been added gradually. During this period three improved strains of wheat have been developed, two representing local wheats and the third representing an introduction from Ithaca, New York. In addition an improved strain has been developed at Nanhsuchow. Details of amounts of distribution, number to whom the seeds were distributed and their reactions, e tc. will be found in the seed production and distribution section of this report.

Three strains of cotton have been developed: Acala and Trice of the foreign cotton and one variety, Million Dollar, of the Chinese cotton. The various tests on selfing, crossing and continuous selections have been followed, details of which will be found under the cotton section of this report.

One variety of improved Chinese corn has been developed and distributed to the farmers since 1924. Selfing, crossing, double ear study, and genetic study are still being carried on.

The following is a brief summary indicating the work that has been accomplished during five years at Nanking:

Wheat - Before taking up the various tests for wheat the writer wishes to mention the comparative yield test between the University varieties and Farmers' varieties. This test was begun in 1925 and was continued during the year of 1927-1928. The results of 1925-1926

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Table of Plantings --- Season 1927-1928.

Stations / Crops		Hsuchowfu	Kaifeng	Nanhsuchow	Nanking	Weihsien	Wuchang	Wusih	Yihsien	Total
Wheat	Hybrids				5149					5149
	Rod rows	1200	*3058	1871	5250	1005	1520	413	1428	15745
	Introduced			324	500					824
	Total rows	1200	3058	2195	10899	1005	1520	413	1428	21718
Barley	Rod rows		300		394					694
	Introduced				406					406
	Total rows		300		800					1100
Soybean	Plant test		1195	1195						1195
	Rod rows		1050	1093	2648	1195			700	6686
	Blank test				600					600
	Total rows		1050	2288	3248	1195			700	7431
RICE	Head rows				80		2000			2080
	Rod rows				1541					1541
	Transplanting rod rows				253					253
	Total				1874		2000			3874
Kaoliang	Plant selection			1050						1050
	Plant test		1366	490	238	1480			2415	5989
	Germination test			152						152
	Total		1366	1692	238	1480			2415	6953
Corn	"Ear to plot				486					486
	Remnant				16					16
	Inheritance Studies				69					69
	Total				571					571
Cotton	Plant rows				384					584
	Variety test				510					510
	Plot test				120					120
	Total				1014					1014
Millet			500							
	Total		500							500
Grand total		1200	6274	6175	18645	3680	3520	413	3577	44450

*Introduced varieties included.

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and 1926-27 are as follows:-

The average yield of farmers' wheat 25.9 bu. per acre.
" " " No. MN (University) 29.03 bu. per acre.
11.2% higher than farmers.

" " " No. 9 (University) 31.3 bu. per acre.
12.0% higher than farmers.

" " " No. 26 (University) 31.65 bu. per acre.
12.2% higher than farmers.

Average of averages - 11.9% higher than farmers.

During 1926-27 the three University varieties were used in the comparative test with farmers. In order to save space, may I mention only one of the three varieties as follows:

The average yield of the 6 farmers' varieties - 20.65 bu. per acre
The average yield of No. 26 (University) 24.00 bu. per acre
13.97% higher than farmers.

In the spring of 1923, 72 heads of selections were made at the Nanking station and planted in head row plots for observation and study of the behavior of each progeny. Over 1,000 heads were selected in the spring of 1924 from different sources and were planted in the fall of 1924. In addition to the head selection of 1923-25 rod row tests were carried on with 83 selections of the low landvarieties and 52 of the high land.

Fig. 3 Comparison of wheat heads.
(a) 3 heads at right -- University improved varieties. (b) 2 heads at left -- farmers' varieties.

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Fig. 4. Roguing improved wheat at University Farm.

The use of both high land and low land varieties is due to the fact that most of the wheat in the Yangtze Valley is grown on the land that is planted in rice in summer and such land is naturally very low. The object of this double test was to determine whether or not the various varieties and strains did act differently when grown under two different soil conditions. The close correlation may be found in the tests of 1923-24 and 1924-25 indicating that it is necessary to duplicate the tests on the two types of soil.

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No. 5. Hanging experimental wheat immediately after cutting.

The wheat breeding project represents the largest single undertaking. In October of 1925, 20,294 individual rows were planted at eight cooperating stations, including Nanking. There were 14,224 head-rows, made in the spring of 1925, representing 8,000 individual head selections. 465 varieties of foreign wheat introduced by D. H. H. Love are still under test. Nearly 400 varieties have been inocculated with flag smut by the division of Plant Pathology in the attempt to discover a flag smut resistant strain. The plantings distributed are shown by the table below:

Table of Wheat Breeding Planting --- 1925-1926

Tests	Year 1925-26	1926-27	1927-28
*Cornell hybrids:		3697	5149
Head row :	6322	360	
Rod rows :	1927	4921	5250
Foreign varieties:	537	892	500

*By Cornell hybrids 2569 rows for practical purposes and 2581 rows for genetic study.

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Table of Wheat Strains or Selections discarded or saved 1925-1928

Tests	Year			
	1925-1926		1926-1927	
	discarded	saved	discarded	saved
Cornell hybrids			2837	490
Head rows	4870	911	250	74
Rod rows	132	130	804	313
Foreign varieties	136	401	323	78

Fig. 6. Selection of Cornell hybrid wheat 1928 at Tai-ping-men Experiment Station, Nanking.

Besides rod rows and the Cornell hybrids, there are 108 plants planted in the green houses of the Cornell University and the University of Nanking for purposes of genetic studies of earliness, disease resistance and good yields. For genetic study, twisted awnness, double spikelets, ligulless, velvet node, etc. are included.

Fig. 7. Showing the earliness of wheat crosses in Research Garden of University of Nanking.

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Barley Improvement - This work has been progressing since 1925 and special emphasis has been put on loose and covered smuts by means of inocculation to 2439 rows which came from 1110 heads selected from the farmers' fields. The work was done close to the University farm and the treatment of loose and covered smut was done by cooperation with the Division of Plant Pathology.

Table of Barley Plantings

TESTS	Year 1925-26	1926-27	1927-28
Head Row	2439	70	
Rod row		1075	394
Introduced variety	339	130	406

Table of Barley Varieties saved and discarded.

Tests	Year 1925-1926		1926-1927	
	Discarded	Saved	Discarded	Saved
Heads	2232	207	54	16
Strain			143	64
Introduced	113	226	184	42

Soybeans: The purpose of improving soybeans is to find varieties with high yielding and high oil content. Seed samples were collected from various parts of China and the work has been growing since 1925. The following table is a brief summary indicating the accomplishment of the soybean work.

Table of Soybean plantings. 1923--1928

TESTS	Year 1923	1924	1925	1926	1927	1928
Plant rows	60	103	461	2775	905	
Rod rows			103	1520	3110	3248

905 rows of soybeans were introduced from Harbin during 1927. All died before harvesting, mainly due probably to the difference in the length of day.

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Fig. 8. General View of soybean experimental field at Shen-tsi-men Farm - 1925.

Table of Soybean Varieties or Selections discarded or saved. 1923--1928

Tests	Year											
	1923		1924		1925		1926		1927		1928	
	dis	sav	Dis	Sav.	dis	sav	dis	sav	dis	sav	dis	sav
Plant rows		60	45	58	338	123	2412	363	905	0		
Rod Rows					23	80	48	79	285	153		

Rice - Previously we had collected several samples of different varieties but owing to the lack of both land and personnel little work has been done on rice. Since 1923 special emphasis has been made upon the purification of 61 varieties, which were planted in rod row test. The test has been kept up by addition new selections and also introduced varieties. The work has been enlarged since 1925 by the help of Dr. Love. The following table will serve to illustrate the work accomplished during the last five years.

Table of Rice Planting 1923--1928

Tests	Year					
	1923	1924	1925	1926	1927	1928
Head rows		102	360	730	1945	80
Rod rows	183	327	396	675	420	1794

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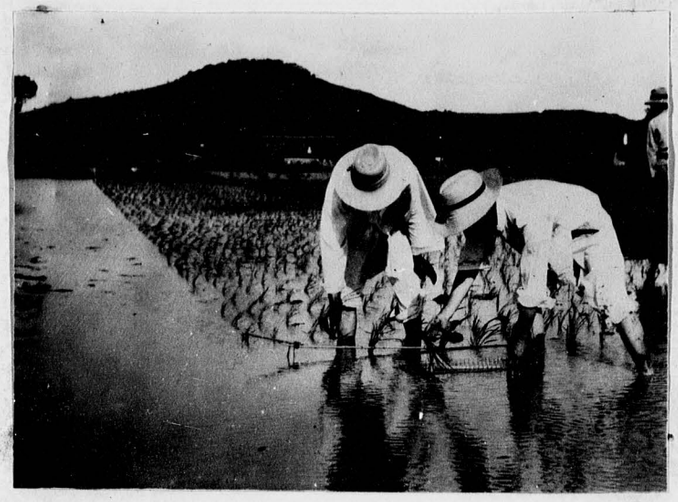

Fig 9. Transplanting rice at Heh Ma-ying Farm 1928.

Table of Rice Varieties or Selections discarded or saved.
1923 - 1928

Tests	Year											
	1923		1924		1925		1926		1927		1928	
	dis.	s	dis.	s	dis.	S	Dis.	s	Dis.	s	dis.	s
Head rows			82	20	25		74	705	25	1716	229	
Rod row strain	61		31	30	15		35	33	82	24	36	

Upon the suggestion of Professor Love, the test was conducted on the same p lan as rod and head rows for dry land crops such as wheat. In China transplanting is the rule so the experiment to test the value of transplanting has been started from 1928.

Kaoliang - Kaoliang work was started in 1925 and real planting begun in the spring of 1926. An experimental planting was made rather for a study of varieties and types than for securing yielding data in Nanking, the table below will illustrate the work accomplished during the last few years.

Table of Kaoliang Planting.

Tests	Year		
	1926	1927	1928
Plant rows	230		
Rod row		195	238

Table of Kaoliang varieties or selection discarded or saved

Tests	Year			
	1926		1927	
	Discarded	Saved	Discarded	Saved
Plant row	215	15		
Rod row			147	48

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Corn - There are 4 lines of work with corn, namely, ear to block tests, double ear tests, selfing and hybridization and genetic studies. The ear to block tests are accompanied by the remnant system in order to keep up vigor and high production. The selection of plants bearing two good ears during the four years under test show the following results:

Percentage of stalks in the original field bearing two or more ears (1922) 18.1%
Percentage of stalks in the field grown from seeds of selected plants (1923) 32.6%
Percentage of stalks in the field grown from seeds of selected plants (1924) 37.5%
Percentage of stalks in the field grown from seeds of selected plants (1925) 50.4%

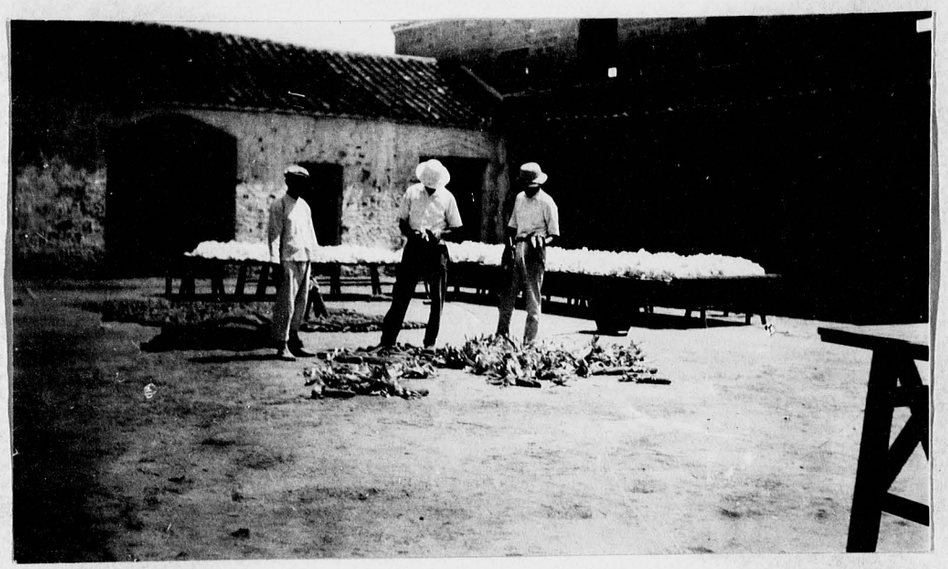

Fig. 10. Corner view of Tai-ping-men station -- Sunning corn ears for the block test of 1926.

After 1925 part of the seed were planted in the increased field and part were reserved for Mr. Ritchey to use upon his return from America.

One hundred selections were made in the fall of 1924 and the parallel method of ear to block and remant test has been used. There were 264 ear-blocks carried on in the test of 1928, called the fourth year's test. There are 112 ear-blocks called third year test. There are also 110 ear-blocks of new selections for 1928. The total blocks for 1928 plantings will be 510 blocks.

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Genetic study of corn - Five varieties of Chinese corn were selfed. Of these varieties six ears of them seemed quite pure through the last four year's selfing. 68 rows will be planted in the summer of 1928. Of these rows for crosses material will be furned and recipical crosses with American corn, in order to study whether their reactions may be the same or not.

Cotton - Since 1925 the University of Nanking has undertaken experiments in cotton growing, particularly with reference to the introduction of American cotton, and have demonstrated the practicability of successful production of American cotton around the regions of Nanking.

By cooperating with the Cotton Mill Owners Association of China and the Shanghai Cotton Anti-Adulteration Association, it was possible for the University to pay special attention to two things (1) the creation in the shortest possible time of a commercial supply of improved seed of both the Chinese and American varieties and (2) the recommendation of a plan to the farmers with a suitable system of maintenance and control of the improved seed supply. Two varieties of American cotton have been successfully acclimatized by the process of severe selection involving the careful study of 12,500 individual plants and their products as well as hundreds of progeny rows and plots. One promising variety of Chinese cotton has been originated from 5000 selections and its quality of lint is recognized to be equal to the American cotton.

The seeds from these three varieties, i.e. Acala, Trice and "Million Dollar" were propagated and distributed to the farmers. The detailed list can be seen under the seed distribution section of this report.

The breeding work upon cotton is still being carried on. Special emphasis on selfing and crossing between Chinese and Indian cotton was made. During the season of 1926 the F_2 plants showed some segregations and notes on the appearance and behavior were made. In the year 1927, 430 rod rows were p lanted representing 59 varieties only two varieties

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being discarded during the winter of 1927 and the remaining 57 varieties being put into various rod row tests, the total rod rows being 702.

In addition to rod row tests 146 million dollar plant rows were selected out of 450 plant selections; 222 Acala plant rows were selected out of 500 plant selections, and 15 Trice plant rows were selected out of 300 plant selections from the selections of 1927 and were all p lanted on the three farms during the spring.

Fig. 11. General View of picking cotton at Shen-tsi-men station.

Fig. 12. Comparison of improved and common Chinese cotton.
(a) number of locks, (b) Length of fiber.

Cabbage - This work was started in 1924 by the Department of Horticulture and is still carried on by the cooperation of the Horticulture Department and the Department of Agronomy. In 1927 the work was enlarged due to the help of Dr. Myers who helped to standardize it. The emphasis put on this work by continuous selections and selfing and careful tests in using the latest methods is to find out the best yielding varieties.

During 1926, 150 rows representing 27 varieties were planted. Of these 27 varieties, 11 of them did not produce seeds and only 16 varieties were carried forward in the year of 1927.

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Fig. 13. General view of experimental cabbage field. 1927.

Fig. 14. Selfing and crossing cotton.

Result of Work at Cooperative Stations.

Nanhsuchow - This station planted wheat and soybean for its major crops and kaoliang for the minor crop.

Wheat - Wheat work in Nanhsuchow was started several years ago and they have already developed one variety which superior to the local varieties, the distribution of which has been carried on since 1924. The details will be found under the seed distribution section of this report. The following tables will indicate the work accomplished during the last three years.

Table of Wheat Planting 1925-1928

Tests	Year 1925-1926	1926-1927	1927-1928
Head row	1198	1194	
Rod row	153	1464	1871
Introduced	340	612	324

Table of Wheat varieties discarded or saved - 1925-28

Tests	Year 1925-1926		1926-1927	
	discarded	saved	Discarded	Saved
Head rows	878	200	804	270
Rod rows	1	7	5	42
Introduced	224	82	3	79

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Kaliang - Tests were made from selections made in Nanhsuchow and the Northern stations as follows:

Table of Kaoliang Planting - 1926-1928

Tests	Year 1926	1927	1928
Plant rows	450	1320	1050
Rod rows		340	490
Germinative test			152

Table of Kaoliang varieties discarded or saved -1926-8

Tests	Year 1926		1927	
	discarded	saved	discarded	saved
Plant rows	326	34	726	330
Rod rows			21	13

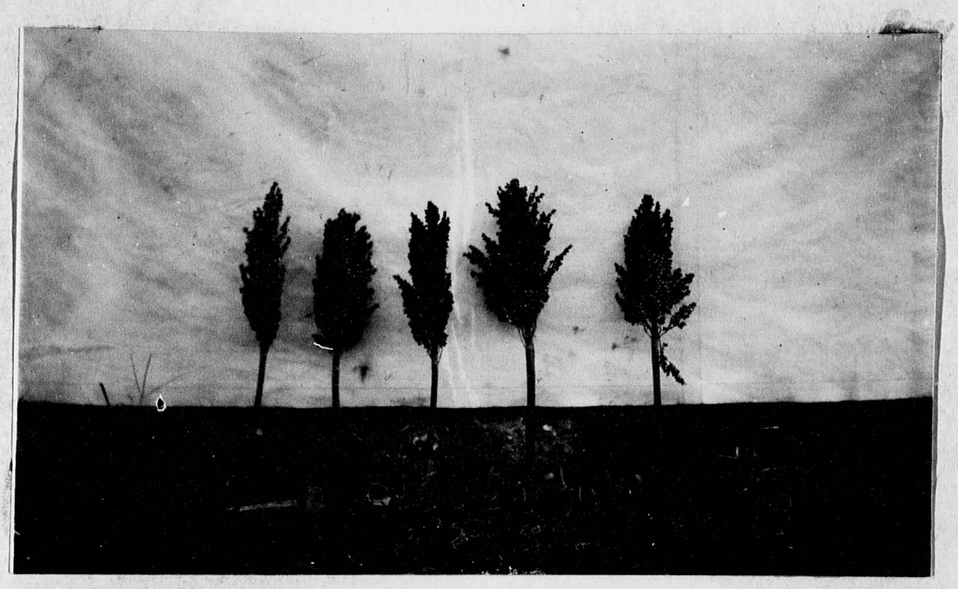

Fig. 15. A collection of types of Kaoliang heads where were selected at Nanhsuchow in the autumn of 1925.

Soybeans - Nanhsuchow is the only one of the cooperating stations which is making soybeans the major summer crop.

Table of Soybeans Planting - 1926-1928

Tests	Year 1926	1927	1928
Plant rows	3047		1195
Rod rows	1520	1625	1093

Table of Soybean varieties or selection discarded or saved -1926-8

Tests	Year 1926		1927	
	discarded	saved	discarded	saved
Plant row	2226	112		
Rod row	184	43	199	58

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Kaifeng - Wheat and kaoliang are their major crops. Soybean is the minor crop for this station.

Wheat - The progress made at Kaifeng will be shown by the following:

Table of Wheat Planting 1925-28

Tests	Year 1925-26	1926-27	1927-28
Head rows	2360		
Rod rows	1383	3784*	3058*
Introduced	345		

Table of Wheat varieties or selection discarded or saved. 1926-8

Tests	Year 1925-26		1926-27	
	discarded	saved	discarded	saved
Head rows	1760	364		
Rod rows	138	69	245*	188
Introduced	119	226		

*Introduced varieties included.

Kaoliang - The following tables will illustrate the work in kaoliang:

Table of Kaoliang Planting 1925-28

Tests	Year 1926	1927	1928
Plant rows	1460	580	
Rod rows		2760	1366

Table of Kaoliang varieties or selection discarded or saved

Tests	Year 1926		1927	
	discarded	saved	discarded	saved
Plant row	901	277	468	112
Rod row			135	142

Soybeans - Progress of soybean for the last three years will be shown by the following tables:

Table of Soybean Plantings 1926-1928

Tests	Year 1926	1927	1928
Plant rows	1275		
Rod rows		1325	1050

Table of Soybean Varieties or selection discarded or saved 1926-8

Tests	Year 1926		1927	
	discarded	saved	discarded	saved
Plant rows	1063	212		
Rod rows			125	87

Besides the above mentioned tests, 90 heads of millet were selected in 1924 and 1000 head selections were made in 1925 from the famous millet belt of North China. During the spring of 1928 the best

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nine varieties were planted in the advanced test. There has also been some work in barley. Six of their best outstanding varieties are under test at this time.

Yihsien - The work at Yihsien is done in cooperation with the south Shantung Industrial Agricultural School of the Presbyterian Mission. The kaoliang and wheat are their major crops and soybean their minor crop.

Wheat - This work was started before we entered into the agreement with them by Mr. Gordon. The following table will illustrate the progress of the work during the last three years:

Table of wheat plantings 1925-1928

Tests	Year 1925-1926	1926-1927	1927-1928
Head rows	2016		
Rod rows	1658	2094	1428

Table of Wheat varieties or selection discarded or saved 1925-8

Tests	Year 1925-1926		1926-1927	
	discarded	saved	discarded	saved
Head rows	1440	374		
Rod rows	50	82	326	133

Kaoliang -

Table of Kaoliang Plantings 1926-1928

Tests	Year 1926	1927	1928
Plant rows	1460		
Rod rows		2540	2127
Introduced	90	555	288

Table of Kaoliang varieties or selections discarded or saved 1926-8

Tests	Year 1926		1927	
	discarded	saved	discarded	saved
Plant rows	911	259		
Rod rows			144	115
Introduced	26	48	18	30

Soybeans: -

Table of Soybean Plantings 1925-1928

Tests	Year 1926	1927	1928
Plant rows	1975		
Rod rows		1145	700

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Table of Soybean Varieties or selections discarded or saved 1925-8

Tests	Year			
	1926		1927	
	discarded	saved	discarded	saved
Plant rows	1422	178		
Rod rows			73	105

Weihsien - The major crops are wheat and kaoliang, minor crop soybean.

The following tables show the progress made by this station:

Wheat -

Table of Wheat plantings - 1925-1928

Tests	Year		
	1925-1926	1926-1927	1927-1928
Head rows	1084	85	
Rod rows	243	2165	1005

Table of Wheat varieties or selections discarded or saved 1925-28

Tests	Year			
	1925-1926		1926-1927	
	discarded	saved	discarded	saved
Head rows	571	404	43	34
Rod rows	1	7	68	62

Kaoliang -

Table of Kaoliang plantings - 1925-1928

Tests	Year		
	1926	1927	1928
Plant rows	1490		
Rod rows		1580	1480

Table of Kaoliang varieties or selections discarded or saved 1925-8

Tests	Year					
	1926		1927		1928	
	dis.	saved	dis.	saved	dis.	saved
Plant rows	876	316				
Rod rows			30	296		

Soybeans -

Table of Soybean plantings 1926-1928

Tests	Year		
	1926	1927	1928
Plant rows	1430		
Rod rows		1500	1195

Table of Soybeans varieties or selections discarded or saved 1926-8

Tests	Year			
	1926		1927	
	Discarded	saved	discarded	saved
Plant rows	904	240		
Rod rows			149	91

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Wusih -

Wheat -

Table of Wheat plants for the years 1925-1928

Tests	Year 1925-26	1926-27	1927-28
Head rows		554	
Rod rows	228	228	413*

*approximately.

Table of wheat varieties or selections discarded or saved - 1925-28

Tests	Year 1925-1926		1926-1927	
	discarded	saved	discarded	saved
Head rows			430	124
Rod rows		27	2	25

Soochow - The test at Soochow is the same as Wusih for rod rows exeept there were no head selections in 1926. The cooperation has been discontinued since 1927 largely dur to the political situation.

Hsuchowfu - The cooperation with the Kiangsu Second Agricultural Experiment Station, Hsuchowfu, Kiangsu was started in the fall of 1926.

Wheat - there were 1497 rows planted, representing 32 varieties, including 22 famous varieties collected by the station from various parts of the northern provinces and 10 promising varieties from Nanking in the advanced tests. Unfortunately, in the spring of 1927, on account of dry weather, the seeds from these varieties did not fully develop so no yield was secured. During 1927-1928 the same test was repeated as described above for 1926-27.

Wuchang

Table of wheat plantings 1925-28

Tests	Year 1925-1926	1926-1927	1927-1928
Head rows	1244	1000	
Rod rows*	128	1520	1364

Table of wheat varieties or selections discarded or saved 1925-7

Tests	Year 1925-1926		1926-1927	
	discarded	saved	discarded	saved
Head rows	1012	107	765	135
Rod rows	6		82	53

*Note rod rows in 1925-1926 were discarded and no yield taken.

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In addition to wheat, there were 2,000 rice heads selected from farmers' fields in the fall of 1927 in the northern part of Hunan and around Wuchang for the head row test of 1928.

Seed Production and Distribution;

Wheat - there are four varieties that seem to be most consistently high yielding, inclduing one variety developed by the Nanhsuchow Station. Since the summer of 1924, these four improved varieties have been distributed to farmers and agricultural institutions. Most of the seeds have been sent to the provinces of Anhwei, Honan, Shantung, Hunan, Hupeh, Chekiang, Shangsi and Shensi. According to various reports from different sections, some of the improved seeds are not doing very well in some localities, especially in the northern sections. For this reason, we are trying to make such changes as will enable us to have the various seeds adapted to various climatic conditions. We are expecting our cooperating stations to do a large part of this work.

Fig. 16. Threshing improved wheat for distribution to farmers.

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Wheat Distribution

Weight in catties	Year 1924	1925	1926	1927
Production	9800	16,224	17,454	18,632
Distribution	5997	*	14,063	12,974.4

*On account of a very wet season during harvesting and threshing season, our wheat was effected with considerable loss in viability. It was not felt advisable to distribute large quantities of such seeds that year, it being wiser to keep on the safe side and keep the confidence of the farmers in our seed.

The one variety of wheat distribted by the Nanhsuchow Station.

1924 - 1,400 catties distributed to 9 farmers and 3 Agr. Inst.
1925 - 2,000 " " 12 " 4 "
1926 - 2,560 " " 20 " 7 "
1927 - There were no exact records kept but more than 100 mow of land was planted with this variety by farmers who are living near the station.

Fig. 17, Sunning improved wheat after threshing.

We have succeeding in interesting 150 farmers near our University farm to use our improved seeds. In the fall of 1926, one farmer said to our farm superintendent "I traded 1 tou (14 catties) of your improved seed in the summer of 1924 and planted 1½ mow that fall, and now I have enough seeds for 20 mow of my high land plantings and still have some left to be given to my son-in-law for his planting."

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Another farmer, at one time when he was in a rural tea house, talked with his friends, saying "I bought 5 shen (7 catties) of the improved wheat seed last fall (1926) and harvested more than a tou (10 shen) a mow in excess as compared with the same crop from the same piece of ground before."

Mr. M. I. Chow, head of our Extension Department, bought 3 tou of our improved wheat for his mother. Because of the fine looking grains and high yielding ability, she planted 60 mow for the season 1927-1928.

There are many similiar stories told particularly to our extension workers who visit among the farmers constantly and could give us many stories of the s uccess of our seed.

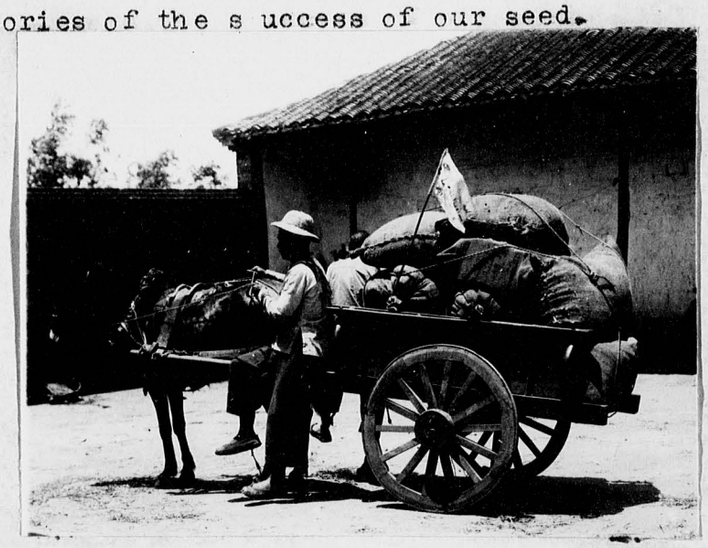

Fig. 18. Mule cart hauling improved seed to the city for distribution - fall of 1927.

There have been many remarkable reports from farmers and millers around Nanhsuchow for the No. 6 wheat since we commenced to distribute the seed. Farmers are always favorably impressed with the high yielding qualities of improved seeds - about 32 to 64 catties more than commercial varieties - as it lodges less and is more resistant to wheat-smut. The only defect is that it matures about one week later than the commercial varieties. Mr. Wang in Nanhsuchow

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has secured the opinion of the local millers which is that our improved wheat will produce more flour, about 2-3 catties per tou (32 catties per tou in Nanhsuchow) and there is less bran left than for the commercial varieties.

Corn - The University has developed one variety of Improved corn which has the highest rate of germination, 98.5%. The distribution of the seed commenced in the spring of 1925. The production and distribution are shown by the following table:

Weight in CATTIES	Year			
	1924-25	1925-26	1926-27	1927-28
Production	7,000	10,000	12,616.2	5,000
Distribution	1,200	4,000	4,216.2	4,000

One of the most interesting things is that our Improved corn is adapted to almost all conditions in China. In 1926 we visited a farmer's corn field around the Nanhsuchow station and had the farmer show us the results remarking as he did so "see how strong these plants are, with two big ears on them." A man from Tehchow wrote to Mr. Reisner at one time saying "I got corn and cotton seeds from your extension man two years ago, and we have planted 20 times the mowage last year as compared with the first year." We have fifty farmers around Purple Mountain who are using our Improved Corn, but there is not space to give all the interesting reports from this seed.

Cotton - Distribution of cotton seed was started very early and the following statement represents the quantity distributed yearly:

1923	5,200 catties
1924	9,966 "
1925	16,132 "
1926	20,000 "
1927	9,808 "
1928	47,539 "

Seed distributed from 1923-26 are approximate amounts.

Special Training.

Besides carrying on the larger projects of plant breeding,

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care and distribution of improved seed, we give special training to students along the line of plant breeding. Four college students have received this training and at the same time have been helped financially by the department. Our main reason for this special course and training is to have trained men to continue the work of crop improvement in various parts of the country.

Future problems:

Before listing some of our needs for future development, the writer wishes to express his great appreciation and joy of the privilege that he has had in working and watching the rapid growth of the department during the last five years. There are a few things that are greatly needed to add to the further development of the work:

1. Personnel - we should have two additional professors at least for the research and instructional work in Nanking.
2. Equipment - particularly green houses, calculating machines, etc.
3. Cooperative stations - better trained men - that is the funds to be able to pay more highly paid men.
4. Farms - a small residence outside the Tai-pin-men farm.
5. Library - additional books and journals are greated needed.

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FARM MANAGEMENT AND RHRAL ECONOMIC STUDIES

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DEPARTMENT OF AGRICULTURAL
ECONOMICS, FARM MANAGEMENT AND RURAL SOCIOLOGY.

A detailed report of recults accomplished under the above headings prepared by Mr. Buck follows. Special attention is called to the following items:-

Studies in Chinese Rural Economy (See Agr. Economics Exhibit "A"):

The results of the Farm Management studies of 2866 farmers in seven provinces and seventeen regions in China, including studies of the farm families, are now in book form and submitted with this report. For the first time, it is now possible to have a quantitative view of Chinese farming and a fair basis of comparison with other productive groups. The studies have been based on first hand information secured directly from the farmers, and will be of inestimable value in helping toward an understanding of the farmers' problems and in arriving at satisfactory solutions of them.

Not the least value of these studies is the Land Utilization Survey, invluding a study of rural population, which has grown out of them; sponsored by the Institute of Pacific Relations, and undertaken by the College at the direct request of the Chinese committee of the Institute. The cost of the survey will be around seventy to seventy-five thousand dollars, United States currency, and is being provided outside regular University income.

Rural Cooperative Credit Activities:

Special attention is called to this part of Mr. Buck's report as found on page 16 ff. Adequate credit facilities at reasonable rates of interest is one of the great needs of Chinese farmers. The experimental cooperative projects, in credits, and in purchasing and marketing products, under a variety of conditions have been of great value in helping to understand first hand problems of cooperative

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activities. Mr. Hsu Chen has has been primarily responsible for this project, has been granted a fellowship for study and travel abroad by one of the Rockefeller Foundations, in further preparation for this most important work.

FIVE YEARS' REPORT FOR THE DEPARTMENT OF AGRICULTURAL ECONOMICS, FARM MANAGEMENT AND RURAL SOCIOLOGY.

This is the only organized department pertaining to the subjects of agricultural economics, farm management and rural sociology in all China. For this reason special effort is being made to develop the department on a scale large enough to give adequate instruction to undergraduate and graduate students, and to provide sufficient research for good teaching and for practical extension work as well as for an end in itself. The research work of the department has created a great deal of attention, especially with the coming of the Nationalist Government, and has resulted in government men coming constantly to the department for its publications and for suggestions upon such proglems as farm credit, farm tenancy, and rural surveys. Several bulletins have had to be reprinted because of the demand.

INSTRUCTION

College courses are offered by the department in agricultural economics and rural sociology, farm management, advanced farm management, farm management seminar, rural organization, marketing, prices and agricultural statistics.

The amount of instruction by the department can best be judged by the number of teaching and student hours for the years 1925-1926 and 1926-1927.

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Kind of courses	Teaching hours 1925-26	1926-27	Student hours 1925-26	1926-27
College courses	315	406	8,148	9,318
One year short course	86	66	3,544	2,640
Summer School	20	60	2,280	1,410
Total	421	532	13,972	13,368

RESEARCH

Detailed studeis have been conducted of a year's farm business on 2,866 farms, in 17 regions of 7 provinces, comprising a total farm area of 21,000 acres or 33 square miles, and a capital investment equivalent to nearly 2,600,000.00 United States currency. The investigations for two regions have already been published. The data for the 17 regions is in page proof and appears as Exhibit "A". The purpose of the study is to determine the factors which make for success or failure of the farm business. Briefly, some of the results may be summarized as follows:

Capital: The capital investment of $900 United States currency per farm is distributed three-fourths in land, 14 per cent in buildings, 4 per cent in livestock and 2.6 per cent in tools and equipment.

Profits: Profits from the Chinese farm business are small and amount to $154 00 United States currency per year for the average family of 5.7 persons whien only cash expenditures are included and when produce supplied the family from the farm and income other than farm sources are considered as receipts. This amount may be compared with city incomes by adding the value of rent which is estimated to be $12.50 Chinese currency per family. On a monthly basis the net income is $12 00 United States currency per family or a trifle over $2 00 United States currency per month, per person (young and old) Primarily, the profits from the farm are returns upon labor rather than from capital. However, if labor is charged as an expense then the return upon capital investment is 9.4 per cent per

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annum - a low amount as rates go in China. It should, however, be a good guide in determining rates to be charged farmers' cooperative credit societies.

Size of Farm Business: While the amount of profits is important in any consideration of the standard of living, the factors determining profits are more basic. The size of the farm business is small, too small to give an adequate standard of living as is shown by the fact that the average size of the farm studied is only five acres and the number of ten-hour days of work per farm per year directly spent upon productive enterprises is only one hundred and ninety.

Classifying farms into several size groups, it was found that the larger sizes are more efficient economic units, in that as between the two extreme sized groups, the largest farms returned about three times greater profits, and used man labor, animal labor and implements from one and one-half to three times as efficiently. This greater efficiency on large farms is best shown by the net profits per acre which are three times as great on farms in the largest sized groups as those in the smallest sized groups.

The size of the farm business directly affects the size of the family in that the large family cannot be supported by a small farm. Farms of the smallest group had the equivalent of three adult male persons per family, while farms in the larger sized group had the equivalent of 5.9 persons per family. This close adjustment between size of farm and size of family is the best indication of the pressure of population upon food supply.

Type of Farm Business: The type of farm business is too extensive for the maximum production per farm. The dense population, three-fourths or more of which lives on the farm, requires a large amount of grain for food, thus limiting the amount of land that can be devoted to other crops. Nearly one-half of the products raised are

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consumed by the farm family itself.

A special study of types of farming made in three regions, Lin-I, Shantung and Suhsien, Anhwei, both famine districts, and Weihsien, Shantung, indicate that farming in the two famine districts is more extensive in the types of crops grown and in the amount of labor and capital applied. This is only natural since a calamity may bring no return for additional labor or investment in fertilizer.

Livestock: The farms in China are moderately stocked with animals, but differ from America and many European countries in that only twenty-two per cent of the total animal units are raised primarily for meat or other products. Their chief use is for farm labor. The animal density is enough to keep the land in a fair degree of fertility. The dense human population is of course, also a factor in upkeeo of fertility since most of the night soil is applied to the land.

Labor: It takes 24 days of man labor to raise one acre of wheat in China compared with two days of man labor in the United States where a reaper binder is used. But still almost as much animal labor is required to raise wheat in China as in the United States. The use of improved implements and machinery in the United States, the employment of capital, is the chief reason for this significant difference which makes the cost of raising wheat in either country about the same.

The semi-monthly distribution of man and animal labor shows great uneveness for most regions, there being periods when there is no much work to be done that day labor must be hired and other periods when there is no work at all to be done. Contary to general opinion, farm labor in China is not cheap. In general it forms as large a proportion of the farm expenses as it does in the United States and often constitutes as high as 64 per cent of the total farm expenses (exdluding the value of the operator's labor). This large item of expense for labor is caused by (a) the hand methods used which allow only for small accomplishment in return for a day's work and (b) the uneven

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distribution of work already mentioned.

Farm Dietaries: The farm is still the chief direct supply of food for the farm population as is shown by the fact that 83 per cent of all food is from this source. Because of this, the problem of a good dietary is closely linked with that of the kind of crops produced. A change in the farm organization may mean raising different crops or varying the area devoted to crops already grown and this in turn may affect the kind of food consumed by the family.

A classification of products from which food energy is obtained reveals that nine-tenths of such energy is from seeds and their products and nearly nine per cent from roots and vegetables, mostly sweet potatoes. In comparison, farm families in the United States consumed less than two-fifths of total food energy from seeds and their products, about the same percentage from vegetables and roots, thirty-nine times as much from animal products, fifty times as much from sugar and thirty times as much from fruit. The extremely large percentage of food energy obtained from seeds and their products is the chief reason why the Chinese farmers can obtain a living from such a small amount of land.

It may be concluded from this study that the food energy may be quite adequate or that it may, in some regions, amount to only a subsistence quantity. Such energy as is obtained comes through a large amount of bulky food, cereals and roots, rather than from a careful balance of bulky and concentrated foods. Unpalatableness is one of the serious objections to much of the food eaten. The supply of protein is sufficient but whether or not its source is the most efficient from a health standpoint remains to be shown. The vitamin content is evidently much below the amount necessary for good health, and especially is this true for Vitamin C. The mineral contents are perhaps in too small an amount for both calcium and iron. It is quite evident that the farmer should be producing more fruits, nuts, roots and vegetables.

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From a farm management standpoint this is also desirable since it would help to intensify and to diversify farming, thus utilizing more free time and distributing it to better advantage throughout the year. A good home garden would improve health conditions and would provide profitable additional labor for the farmer. The consumption of whole grains, while improving health, would also be more economical in that it saves the production of special crops or animals to supply the desired constituent.

Standard of Living: The total value Chinese currency of all goods consumed by all households is $228 per household and the range for the different regions is from $97 to $350. The value per household of the four physical necessities for all households is $136.29 for food, $25.32 for fuel and light, $17.31 for clothing and $11.32 for rent. All other goods amounted to $38.08 per household. The proportionate value of these four items to the total value of all goods consumed is 83.8 per cent while in North China it is 86.4 per cent and for South China it is 79.7 per cent. In general it may be stated that the lower the percentage for necessities the higher the standard of living, in that more may be expended upon things, other than necessities, which make life worth living. A comparison with many other countries indicates how farm households in China have less for these other purposes. It will be noticed that fuel is a very important item of expense, amounting to more than clothing or rent. Expensive fuel is accounted for by dense population and by inefficient utilization of hills and mountains for forests with the consequent need for depending upon stalks of crops as the chief fuel source, and by the non-utilization of coal.

Administrators of Christian organizations interested in the problem of self-support of the church should take particular notice that the average annual contributions of the families having such expenditures is only $2.18. This is a little less than that spent by other farm

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families for Buddhism or idolatry, but probably cannot be increased greatly beyond that - perhaps at most doubled upon the present income.

Comparing North with South China and allowing for any difference in price levels it is apparent that the standard of living is higher in South China, first because the proportion of total goods consumed is less for physical necessities and second because more is expended upon physical necessities either for quality or for quantity or possibly both. Without question the standard of living of farmers in China is too low.

Summary of Farm Management Studies: The collection of all this data upon farm management leads to certain conclusions in addition to the knowledge it gives one of conditions as they exist in the rural districts of China. The farmer's standard of living is reflected by the size of farms which in turn is determined by the density of farming population. It has been shown how profits increase with the increasing size of farms, but also how farmers have to accept the fate of small farms because of the dense population. Industrialization and the development of the professions will help to relieve the situation but cannot remove enough people from the farm very materially to enlarge the amount of land per capita of famring population. Reclamation and colonization of land not now cultivated but which could be so utilized, either through profitable reclamation or by colonization in the Northwest, would add only a minute fraction to the present average size of farms for all China. Intensive farming - the application of more labor and more capital to the present land resources - is probably the most hopeful way by which a farmer's income may be increased to meet his physical, social and spiritual needs. This may be accomplished by the farmer himself using better cultural methods, more intensive crops, and more fertilizer; by governments in conservancy projects to prevent floods and to supply water for irrigation, and by

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experiment stations for the production of improved seeds and insect and disease control method. Associated with more intensive farming methods is that of more economical production by efficient management methods.

Farm Credit

A detailed study of credit conditions has been made in three rural districts comprising a total of 486 farmers. The amount of credit per farmer for the three places was quite variable being $43 for Chuchow, Anhwei, $144 for Shwenhwachen, Kiangsu, and $292 for Yienchiawei, Kiangsu.

Of the total farmers 38 per cent made short term loans for productive purposes and 80 per cent for non-productive purposes. From 60 to 75 per cent of the farmers in the three places borrowed for the purpose of purchasing food. From 11 to 41 per cent borrowed for such purposes as funerals, weddings and new year holiday expenses. Loans made for productive purposes were chiefly for labor, fertilizer and land improvement.

Most small and middle class farmers are short of capital but rather than borrow at exorbitant rates of interest they prefer to use inferior farm practices. Interest rates of 36 per cent per annum are very common and rates of 80-100 per cent per annum are not infrequent. Profits from farming are small and therefore make it impossible to pay such high rates on loans for productive purposes. It is because the profits fail to meet high interest rates that farmers when once in debt can never pay back unless it is through some special assistance. High rates are caused by the monopoly of the professional money lender, the insufficient supply of capital, and the small amount of credit that the farmer can command.

The department has found in its experiments in the organization and conducting of cooperative credit societies that these societies offer one good solution of credit problems.

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FARM TENANCY.

A number of very significant facts have been revealed in the study of land tenure in the counties of Suhsien, Anhwei and in Nantung and Quinsan, Kiangsu. The similarity of farm tenant problems in China to those in other countries is indicated by such facts as: (1) the tenant farms are usually larger than owner farms because more than one family has to obtain a living from the same piece of land; (2) many kinds of renting systems are found but share rent prevails; (3) cash rent is more prevalent in such sections as Southern Kiangsu where land is fertile and expensive and where there is a preponderance of absentee landlords; and (4) the share of profits received by the landlord is not always in proportion to his share of expense. The interest on the landlord's capital investment in the farm averages about 12 per cent per annum which is not high as interest rates go in China. The dissimilarities of farm tenancy in China compared with United States, for instance, are (1) farm tenancy is not usually a stepping-stone to ownership; (2) the majority of landlords, especially in Southern Kiangsu, manage their lands through a business agent employed by the landlord; (3) the use of such a third party results in many evils largely to the detriment of the tenant; (4) the cheating of the landlord by the tenant, especially in share rent systems, when the tenant does not give the landlord his agreed share; and (5) most of the tenants remain on the same farm for life.

The landlord-tenant problem is one largely of curtailing large holdings, of a better lease-contract, of a realization that the tenant and the landlord are partners in a farm business where the best success is impossible if mutual suspicion replaces confidence and trust in each other, and of a farm credit system which will make acquirement of land ownership possible.

An outcome of these studies has been the preparation of a schedule

for the study of farm tenancy for use by the Chekiang Government. Recommendations on tenancy problems have also been made at the request of the Chinese Agricultural Association.

COST OF GROWING AND MARKETING PEANUTS

The crop area devoted to peanuts increased from 4 per cent in 1900 to 32 per cent in 1924 and then decreased to 31 per cent in 1925. The rapid increase of peanut acreage is because peanuts: (1) give higher net receipts, (2) are better adapted to the sandy soils and high land than are other crops, (3) have a high resistance to winds and floods, (4) are a good crop in crop rotation as a legume and in the distribution of labor, and (5) are an excellent food crop.

The wide differential in the price and cost of growing peanuts in China as compared with America accounts for the large export of peanuts from China to America as well as to other countries. The cost of producing 100 pounds of unshelled peanuts on 543 farms was 2.90 Chinese currency. The local price per pound was $4.40 Chinese currency, thus leaving a net profit of $1.50 per 100 pounds. The average farm price for peanuts in 1924 in the United States was $6.20 United States currency.

A study of the business transactions of ten peanut merchants shows a capital investment of $858 per merchant. The average operating expenses per peanut hong is $11,330 94 Chinese currency and the average receipts per hong are $12,360 32 Chinese currency. So the average profit per hong is $1,029 38 Chinese currency. The small amount of capital for such a large business is possible because the outside middlemem usually advance capital for their purchase.

The average distribution of costs of marketing by steps from Kaifeng to Shanghai for 30 marketing transactions is as follows:

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	Per cent of destination market price.
Paid the Famer	60.9
Transportation and other expenses of the middleman	19.7
Margin taken by the peanut hong at primary market*	6.1
Commission to peanut hong at destination market	3.0
Interest on capital investment of the middleman	2.6
Profit received by the middleman	7.7
Price at destination market.....	100.0

*The profit for the merchants at the primary market is greater than indicated because of the value received for peanut shells sold for fuel.

MARKETING OF FARM PRODUCTS

A limited investigation of grain marketing conditions in Suhsien County located in a Northern Anhwei and subject to severe famines indicates a number of conditions which affect the farmer's return upon products grown. Most of the marketing is done through middlemen rather than by direct marketing from farmer to consumer and this is especially true since the region is an export one for wheat, soybeans, and sesamum. Adulteration of products, largely by the middleman rather than by the farmer is very prevalent. Such a practice lowers prices at the destination market and causes losses in transportation and processing.

Since many farmers are in debt and it is the custom to make payments at harvest time a great deal of the marketing of farm products occurs immediately after harvest with the result of low prices because of the large supply of products. An adequate credit system would assist the farmer in obtaining better values for his crops.

It was also found that unstable paper currency is often paid the farmer for his crops, a practice which can only be prevented by Government action.

Absence of standardization and grading of products is a large factor in preventing farmers with grains above the average from obtaining higher prices. This in turn has its effect in keeping the agriculture of

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the region on a basis where there is little incentive for improvement.

Associated with the marketing of products at the market town are social evils such as gambling and drinking. Social custom compels the individual farmer to indulge in these practices which often absorb a large part of the money obtained for the crops sold. Since crops are sold in small quantities as money is needed the problem is especially acute.

Transportation is undependable because of political disturbances which cause delays, make shipments unsafe or even prevent movement of crops. But even in normal times there is need for improvement in time required for delivery, prevention of thefts of the products while in transit and the prevention of bribery in the obtaining of railroad cars by middlemen for their cargo.

Cooperative marketing may be a possible solution of some of the problems within the farmer's control. Enforced prohibition of gambling and the establishment of better forms of amusement in the market towns is very essential.

MAPPING THE RURAL COMMUNITY INTERESTS

The type of organization of rural community interests is important in any progress for improvement in the economic or social life of the farmer. For this reason four typical rural communities have been mapped with the purpose of showing the extent of these interests and with the idea of determining more exactly the boundaries of the rural community itself. The studies have shown that in all cases the market town is the center of most of the economic interests such as the selling of farm products and the buying of commodities for home consumption, or for farm use. Most of the other activities such as education, and religion serve a smaller area within this market town area. Most of the schools are of the old type and each school usually serves only one hamlet or village. In one market town studied there is a modern

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higher primary school which serves a number of villages along an improved highway. It was found that the number of schools fluctuate with crop production, a low yield in crops having the effect of causing schools to be closed because of the financial inability of farmers to support them. Religion is of several types. The local shrine (tu ti miao) occurs for almost every village or hamlet. Other temples of the Buddhist or Taoist type occur in two regions near Nanking quite frequently, there being as many as eight of these with their distinct areas from which the villagers come to worship. In one region there are 48 worship clubs to each temple. Another very significant fact is that the boundaries of the political area, the township, often cut across these natural areas of economic or social interests and in this way make progress in community affairs more difficult. A better integration of rural activities is essential for progress of rural life.

RURAL POLULATION

An increase in China's total rural polulation of four and one-half millions a year is indicated in a study by this department for the year 1924-25 of 4216 farm families, mostly of the patriarchal type (numbering 22,169 persons, or 5.3 persons per family) in eleven regions of four provinces which revealed the following pertinent facts:

Birth rate per 1000	42.2
Death rate per 1000	27.9
Natural rate of increase per 1000	14.3
Vital index	151.3
Infact mortality (per 1000 births)	254.3
Proportionate mortality of infants	28.7
Marriage rate	19.8
Fecundity (number of births per 1000 married women ages of 15-44)	179.2

The present study indicates that for the normal year studied there was an increase, which if continued would amount to a doubling of the population in every forty-nine years. If this is indicative of conditions throughout the country over a series of years it may be concluded that China's population shows a net yearly increase as do other

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populations of the world with the exceptions of certain periods of war, flood, drought and pestilence. Such increase, however, is accomplished with much human misery and with considerable economic waste because of the high birth and death rates. China's problem in addition to seeking an optium population density is also one of producing a population at less cost and with less human anguish.

WEIGHTS AND MEASURES

Any investigation in China in which units of weights or meansures appear must take into account the fact that variation occurs with each locality. It becomes necessary, therefore, to reduce local weights and meansures to some standard. Even within one county the "tow", which is the measure for capacity, may have as many as eight or ten different sizes. Not only does absence of a standard make more difficult studies such as are being made by this department but it also has its economical and social consequences in cheating and inconvenience in the marketing of products.

A brief study of weights and measure in different sections of the country has been made by the department for the purpose of obtaining information which helps to a better understanding of all the problems involved. It is, for instance, very common for people not well acquainted with conditions to confuse the picul, which is a weight with "tan" which is a meansure but both of which sound the same in spoken Chinese. Students in the College are continually making this mistake and for this reason this study which has been published in Chinese is proving to be be of much assistance.

EXTENSION FARM BOOKKEEPING.

Farm accounting work has been started on a few farms near Nanking for the purpose of helping farmers to reorganize their farm business. One farmer who is keeping such accounts is more progressive than his meighbors. Last year he made an experiment in his small peach orchard

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of about one acre to determine whether or not it is profitable to grow yellow soy beans among peach trees. Many local farmers think that the growing of crops in the peach orchard not only requires additional labor and results in a poor harvest of such crops but that it also limits the production of peaches. As a result of this accounting work the farmer gives his own conclusion as follows:

"The growing of soybeans in the peach orchard practically requires little extra labor because the utilization of the land by the soybean plant helps to keep down the weeds, thus saving the labor of hoeing the peach orchard every one or two weeks. Again, the yield of soybeans was as good as in other fields and the production of the peaches was even better than usual both in size and color."

Of cource this result might not always hold true as it represents only one year and labor saving implements might warrante a different conclusion, but undoubtedly this farmer has grasped the fundamental idea of keeping farm accounts.

Perhaps an even more important benefit that this farmer has received from his accounting work is that he is also keeping a record of his personal expenses. He found himself ashamed to put down such items as gambling or drinking and reports that as a result of the accounting these two habits have been discontinued. Plans are under way for increasing the number of farmers keeping farm accounts.

AMUSEMENT AND RECREATION

Two recreational centers have been established in a rural community near the University with various activities such as games for children, lantern slides and movies. During the Chinese New Year Holiday season some of the old forms of recreation have been revived and these so occupy the time of the farmers in preparation and performance that little time is left for gambling or other vices in the community.

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the mud for fertilizer.

Chungshan Cooperative Purchasing and Marketing Society: Farmers in this area just outside of the Tai Ping Gate of Nanking raise only enough rice for their own consumption for a period of four months because of other crops grown, so they have to purchase reice from rice shops at high prices. The chief activity of the society is to purchase rice from a producing district at Lu Ho, 20 miles distant. The rice so obtained is sold at a price slightly above all costs. Not only have the members obtained cheaper rice in this way but the activity has resulted in the rice shops lowering their prices thus helping non-members of the society to also obtain cheaper rice.

The Cooperative Union of Shangtang: Seven cooperatives of this region joined into a union to strengthen themselves. The chief project is the planting and growing of mulberries for rearing of silkworms in order to diversify the farming of the district which is chiefly rice and which often suffers from drought because of unavailable water supply. There is much uncultivated hill land not adapted to rice at all and this has been utilized for the establishment of mulberry orchards which can better withstand drought and still not interfere with the cropping system. The raising of silkworms does not interfere with labor required for growing wheat or rice. Altogether these societies have purchased cooperatively over 80,000 mulberry trees. Part of the work with the societies necessarily has been to teach methods of planting, cultivating, fertilizing and pruning mulberry trees.

The Wuking Cooperative Marketing Society: The first business of this society was the cooperative marketing of cotton to a mill in Wusih. By brading and the prevention of adulteration this cooperative enterprise netted the farmers a profit of $5.84 per picul (133-1/3 pounds) for ordinary cotton and of $6.84 per picul for improved cotton above the current local price.

It is generally recognized that the problem of rural improvement in

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China at present is an all-round one. In other words that in the program of rural improvement all of the different phases, such as the economic, moral, educational, sanitary, recreational and spiritual should be emphasized in order to give the greatest benefit to the farmers. A cooperative credit society can improve not only the economic conditions of the members but also their education and morality as well. One of the qualifications for members is that only honest men with good character should be admitted. This encourages men to be honest and good, and creates an atmosphere in the rural community that it is worth while to be a good man not only for a good reputation and for honor but also for material advantages; because, unless one becomes an honest person with good character, he cannot be admitted as a member and therefore cannot have the privilege of obtaining cheap credit.

In addition to the economic and moral functions, the educational function of the cooperative credit society is of no little value. In the general meeting, the members learn how to vote, to conduct a meeting, to discuss problems. Such common sense is fundamentally important in rural self-government. Such knowledge and mind training is not obtained either in people's school or in public lectures, because the farmers would not be interested in listening to instruction on principles and methods of conducting meetings and votings; but in a cooperative credit society they have to learn it by doing. In running the business, both the members and the officers have to learn how to compute interest, keep accounts, write loan contracts, etc. This certainly increases the member's knowledge.

The rural cooperative society is one of the most practical and most important organizations in the progfam of rural improvement. It is comparatively easy to start and produces substantial results in quickly bettering the farmer's condition. It assists the individual farmer

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and at the same time it benefits the community. It improves farm life socially as well as economically. It is the most practical, effective and direct way for agricultural extension. It has very strict rules and management and confines all activities within the society, and in carrying out the plan it produces no serious conflict with any old customs which already exist in the rural community.

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A brief Summary of the Research and Extension Work of the Department of Agriculture Economics, Farm Management and Rural Sociology.

Type of Work	Type of data collected, or kind of activity.	Unit studied	No. of units.	No. of Counties	Publications
RESEARCH: Farm Management	Itemized information on capital, expenses and receipts of a year's farm business, goods consumed by the family, and farmers' dietaries.	Farm	2866	15	Two bulletins for two regions Manuscript nearly ready on a comparative study for all regions.
Types of Farming	Cost of production of crops and factors affecting the types of farming.	County	3	3	Manuscript copy for one region.
Farm Credit.	Amount, Kind and purpose of all loans	Farm	486	2	Not ready
Farm Tenancy.	Tenant system and relation between landlord and tenants.	County	3	3	Two bulletins one in Chinese and one in English
Growing and Marketing of peanuts.	Cost of production of peanuts status of the industry and of marketing conditions.	Farm	543	19?	Manuscript
Marketing of farm products.	Factors affecting cost of marketing and price paid farmers.	County	1	1	Manuscript
Mapping the Rural Community interests.	A map locating the various interests, and a description of these interests	Market town and its surrounding villages	4	2	Bulleting article
Rural Population	Vital statistics for one year	Farm family	4216	6?	Article
Weights and measures.	Comparison of local weights and measure unit standard	County	40	40?	Articles

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Brief summary continued:

Type of Work	Type of data collected, or kind of activity.	Unit studied	No of Units	No. of Counties	Publications
EXTENSION: Farm Accounting	Complete set of accounts for all farm enterprises	Farm	22	1	Not for publication
Rural recreation	Games, lantern lectures and movies, clubs, etc.	Community	2	1	———
Rural cooperative societies	Credit, marketing production	Village of community	16	6	———

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EXTENSION ACTIVITIES

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In addition to the report on extension activities prepared by Mr. M. I. Chow, attached hereto, the following items will be of interest:

Control of Smut.

This extension project developed by our division of plant pathology, referred to briefly under demonstrations, deserves special consideration. In 1928 more than 2000 demonstrations with as many individual farmers were carried out. A number of government agencies have already been interested. The attached lithograph reproduction indicates the essential features. The treatment applies to certain common smuts of barley, wheat, millet and kaoliang. These smuts often take up to 50% of the farmers crop. Losses of 10 to 20 per cent are common. The cost is but a few cents per mow for the copper carbonate. The treatment is so simple any farmer can do it. The control is practically 100% successful and usable wherever the above crops are grown.

It is clear that the discovery of this smuttreatment and the development of simple methods of applying it will in a short time save for th Chinese farmer, in the increased volume and value of his crop, many times the original capital of famine funds allocated to the University of Nanking.

Agricultural and Forestry Newspaper.

This has proven to be an extremely valuable extension agency. The subscription list has varied from time to time, ranging from around 1000 to as high as 2500, with annual reading audiences estimated at between one and a half and two millions. The newspaper has provided a channel for many articles by members of our faculty, for replies to many questions relating to agricultural production by correspondents, for advertising improved seeds, method of controlling smut by the use of

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copper carbonate, courses of study, special summer schools, etc. The many letters of appreciation from all over China indicate its high place of usefulness not only in disseminating useful information, but in stirring up interest in many lines of rural improvement.

Farmers' Week

The college has attempted to develop a "Farmers' Week"at the college along the lines of similar institutions in the West. Three "Farmers Weeks" have already been held, with increasing success. This is an attempt to bring prominent farmers and gentry to the college for lectures, exhibits, demonstrations and a discussion of the practical problems with which the framers are beset.

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A SUMMARY REPORT OF THE DEPARTMENT OF EXTENSION 1923 - 1928

By M. I. Chow, Acting-head.

Personnel

Mr. J. B. Griffing, with his past experience in cotton extension, was made head of the department in February 1923 until he left on furlough in 1925 during which time Mr. Reisner spent part of his time in taking charge of the department. In 1923 there was only one college graduate spending full time in the department with two men spending part time; two graduates spent full time 1924, four in 1925 and now in 1928 we have ten men on the working staff; five extension workers, one editor for the newspaper, one secretary, one artist and two field workers.

Materials

We have produced about three hundred charts each year, all hand done by our artist. Our aim is to make these charts as realistic as possible so that the farmers will catch the idea at a glance. Farmers like to see photographs arranged in albums for exhibition which are true to life. All kinds of speciments in tins, cases or

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mounted on paper or made up in scrolls are very useful and effective for exhibits, fairs or markets in showing the farmers what should be done. Lantern slides are made into sets such as mulberry tree planting sericulture, agricultural education, forestry and agronomy. They are very useful for evening meetings. We have also prepared several thousand feet of moving picture films and have bought about 10,000 feet from the United States Department of Agriculture both of which have interested thousands and tens of thousands of farming folks. All of our play material is good for country theatres. We act out the problems and then give the solution on the stage using rather a short time, but the farmers are always greatly moved by this method. There are many farmers who are ignorant and very poor and who have not the knowledge or funds to go to a modern doctor for their illness, especially the common ailments such as scabies, trachoma, malaria fever or sores of any kind. We prepare medicine cases and charts and give them simple remedies or advice.

Demonstrations

Our demonstrations are divided into many kinds. When we are in a teachers' conference or school we demonstrate how to run a rural school and how to take care of a class of country children. When we are among preachers we teach them how to make their country churches a center of rural service. When we are in a village on a market day or at a fair we demonstrate the mthods of smut control, plowing, spraying, pumping for irrigation, etc. When we go to the individual farmer's home, we deomonstrate cultural methods and seed plots, or show them how to improve the silkworm industry, etc. etc.

Cooperators

We have several kinds of cooperators. Gentries who are leaders of villages and those who are patriotic in common affairs give us their

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Fig. 1. Play given by extension workers during the Wuhsien fair.

Fig. 2. A crowd of farmers listening to a lecture on cotton improvement at Lin-i hsien, Shantung.

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Fig. 3. Extension worker with his outfit on the wheelbarrow starting for a trip into the country.

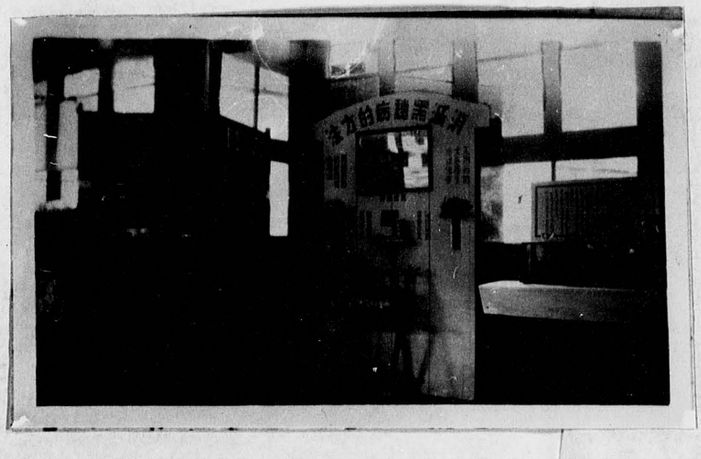

Fig. 4. Agr. exhibits from the University of Nanking at the West Lake Exposition at Hangchow.

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copper carbonate. When harvest time came, she found there was no smut. She was still doubtful whether the chemical treatment made the change or whether the devil forgot to visit her. Our extension man went to her a second time and asked her to let him try it once more, with the result that she is now perfectly convinced of the value of the treatment.

We have very good reports of the cotton seeds shipped to Tsangchow and Tehchow. Demonstrations made by local leaders have been successful and every year they are using more of the seed. Corn has the same record in these same cities.

After the first year we asked the farmers around the cooperative experiment station at Nanhsuchow to use our No. 6 wheat. A man named Chang lives in the west suburb and came to the station complaining that the other farmers were harvesting their crops while his field was still not ripe. That wehat proves to ve five days later than the local wheat as far as maturity is concerned. After another week Mr. Wu, our extension worked, met Mr. Chang on the street and found him so pleased with the final results of the wheat that he had decided to plant all of his land with our improved wheat the next year. Although it is a little later the yield proves to be two tous more than the local variety.

In Changshu district, a fellow named Hsu Yiun Ken, planted hullless barley in one field and used our chemical treatment on the same kind of seeds in another field. His report was in the demonstration plot with area of 8/10 of one mow there were 408 smut heads, while in the field planted with the treated seeds - which was the same area - there was not a single smut head. In conclusion the report is that at least 30% of all barley crops are lost in smuts and on many farms the smuts amount to over 50%.

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Fig. 5. Agricultural training for repatriated military officers.

Fig. 6. Extension workers treating seed with copper carbonate dust for use by farmers.

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Table showing activities of the Extension Department

Month	Place	Occasion	Methods of extension	Audience
1923 February	Ginling College Nanking	C.C.E.A. Conference	Play Exhibits Lectures	500
March	Christian Miss. Chuchow, Anhwei	Preachers & teachers con ference.	Exhibits lectures	500
	Presbyterian Mission. Nanhsu-chow, Anwhei	Preachers & teachers con-ference	Plays exhibits lectures	500
April	Lingyi, Yuchen Shantung	Magistrates special meeting	Plays Exhibits lectures	5,500
	Tantsuen, Kiangpu Kiangsu	Cooperation with Christian mission	Plays exhibits lectues	500
May	Kiangwangmiao Nanking	Market day	Plays Exhibits lectures	1,800
June	Hochow, Anhwei	Cooperation Advent Miss.	Plays Exhibits lectures	500
July and August	Yenching Un. Peking	Summer school	Teaching classes Exhibits Recreation	1,000
September and October	Country around Nanking		Exhibits lectures	1,200
	Wukiang, Hochow Anhwei	Experimental rural school	Plays exhibits lectures	500
1924 February	Chufu, Tsotsien Shantung	Methodist Conference	Plays, exhibits lectures	3,000
March	Wusih Kiangsu	American Ch. country stas.	Plays exhibits lectures	5,000
April	Chentseh and Shentseh Kiangsu	154th big Religious celebrations	plays lectures exhibits	25,000
	Wuhu and Nanking	Methodist Conference	plays ehibits demonstrations lectures	1,000
May	Wukiang, Hochow Anhwei	"Pa-wang hwei" Hero Temple	Lectures Exhibits demonstrations	1,000
	Shentan, Kao-tse, Pei-tu, Pao-yien, Tan Yang, Kiangsu	Methodist country sta.	Exhibits lectures	1,200

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Table showing activities of the Extension Department

Month	Place	Occasion	Methods	Audience
1924				
May	Kiangwanmiao Nanking	Market day	Plays lectures exhibits	1,800
July and August	Tsinan, Shantung	Bd. of Ed.		1,500
	Taiyuan, Shansi	Am. Bd. conf.	"	3,000
September	Chinkiang, Ku.	Meth. country stations	"	2,300
	Tanyang			
	Hengchow and Changsha, Hunan	Presbyterian stations	"	3,000
October	Ketsehmen, Naning	University Rural School	"	1,000
	Chilingmen Nanking	Farm	"	1,000
	Wuhu, Anhwei	Meth. mission	"	8,400
	Weihsien, Hwang-hsien, Tenchowfu and Tsinan, Sung.	Meetings arranged by various missions	"	5,500
November	Tehchow, Enhsien, Shaching, Kaoting Pingyuan, Sung.	American Board country stations	"	9,000
	Lingyihsien, Sung	Presbyterian sta.	"	1,000
	Wukiang, An.	Fair	"	800
December	Ningpo, Shao-hsing, Shooshan Hangchow, Che.	Baptist Mission stations	"	11,400
1925				
February	Kiukiang and Nanchang, Ki.	Methodist sta.	"	1,500
	Jukaohsien and Nantungchow, Ku.	Nantung Academy and Pres. mission	"	3,000
Mar15th - April 1st	South country of Nanking.	Methodist stations	"	10,000
April	Luchowfu, An.	Disciples stations	"	6,000
May	Taian, Wenshan Mingyang, Yen-Chow	Methodist stations	"	5,000
	Hsuchowfu, Ku.	Pres. So. city and country stations	"	1,500
	Wukiang, An.	Religious procession		5,000
June	Anking, Wankiang	Am. Church mission	"	
	Lukiang, An.	stations	"	5,000
	Kiangwanmiao Nanking	Market day	"	1,600
July	Nanking	Summer school		500
	Nanhsuchow, An.	"	"	500
July-Aug.	Fengyang, Shansi	"	"	
	Weishien, Sung.			
	Tungchow Peking	"	"	3,200

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Table showing activities of Extension Dept.

Month	Place	Occasion	Methods	Audience
1925 July	TanTsuan, Wukiang Anhwei	Cotton stations	Instruction	100
September	Hangchow, Chek.	Pres. country stations	Movies, exhibits lectures	20840
	Nanhsuchow, An.			2,400
October	Wuhu, ShuiYang	Methodist country sta	"	5,000
	Ningkuofu, An.			
	Chowtsun, Tsou-ping, Sung.	Baptist fair	"	3,500
	Weihsien, Sung	Presbyterian country fair	"	4,930
	Yinshan, Molingkwan Nanking	Meth. stations	"	300
(to Dec)	Ningpo, Shaohsing Yuyao, etc. Chek.	stations of the Bapt. and Pres.	"	23,500
November	Tsinanfu, Sung.	Pres. Middle Sch.	"	500
	Lingyihsien, Sung	Pres. station	"	4,670
	Tsangchow, Chihli	London mission	"	2,500
December	Kaifeng, Chenchow Honan	Baptist mission	"	1,960
	Guyung, Kiangsu	Pres. country sta	"	2,300
	Changshuhsien, Ku	Personal visits	"	500
	Wukiang, An.	Cotton exhibits	"	600
1926 January	Tappingmen farm	Farm exhibition	"	800
	Hansimen, Nanking	Meth. Middle Sch.	"	200
February	Taichow, Ku.	5 shows Presby.sta		1,500
March	Chuchow, An.	2 shows, Christian mission station	"	1,300
	Tungli, Nanking	Am. Church Mission	"	1,300
	Wusih, Changchow Kiangsu.	Silk merchants club	"	1,000
	Kiukiang, Hwangwei Susung, Ki.Hup.An.	Country stations Methodist miss.	"	1,100
	Wusih, Kiangying Kiangsu	Distribution of 28,000 cards silk worm eggs		300
	Wuchang, Hupeh.	Normal School short course	"	1,000

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Table showing activities of Extension Dept.

Month	Place	Occasion	Methods	Audience
1926				
April	Hanchuan, Hupeh	Am. Church Miss. Station	Lectures Movies Exhibits	8,000
	HweiYuen, Anh.	Pres. Station	"	5,000
	Yangchow, Ku.	2d Prov. Silk Exper. sta.	"	1,000
May	Nanking South Country	Methodist station	"	7,273
	Hsuchowfu, Ku.	Miss. & Govt. middle schools	"	1,500
	Wukiang, An.	Religious procession		2,000
(and June)	Shanghai, Sunkiang, Kaihsing, Hangchow, Soochow Wusih, Changchow Chinkiang, Etc.	Middle Schools		24,000
	Kiangwanmiao, Nanking	market day	"	1,000
June	Nanking	Middle Schools	"	3,000
July	Sutsien, Nanking	Summer School	"	2,000
September	Nanking South Country	Personal contacts Distributing 38 pic.	wheat	2,000
	Kiangyin Ku	" 12	"	1,500
	Kiangwanmiao Taipingman farm Nanhsuchow, Szchow	" 10	"	800
	Lingpihsien, An.	" 10	"	3,000
October	Yihsien, Sung.	Presbyterian sta.	"	1,000
	Weihsien Sung.	" fair	"	5,000
	Chingchow, Sung.	Baptist fair	"	4,000
	Lingdze, Sung.	Schools	"	300
	Lingshiu, Sung.	Rural Com. center	"	4,000
November	Tsinan, Sung.	Cheeloo Theo. Sch.	"	500
(&Dec)	Changchow, Chihli	London Mission sta.	"	9,000
	Tunghsien, Chihli	Am. Bd. middle Sch.	"	3,130
(and Dec.)	Hangchow, Yuhang Chekiang Wusih, Ku.	Personal contacts	"	15,000
	Nanking South Country - selling silkworm eggs			300
1927				
February	Nanking	Farmers Week		100
	Kiangyin, Wusih	Silkworm eggs		
	Changchow, Ku.	extension only		4,600
	Huchukwan, Nanking	Special for farmers		100
	Shantan, Chinkiang	Org. of Cooper. Soc.		500
March	Hankow, Wuchang, Hup,	Visit all schools		2,000
and	Nanking district	Distribution silkworm eggs		100
April	Kiangyigyin	Personal contacts		100
May	Kiangwanmiao	Market day		1,000
June	Wusih, Kiangying	Coop. market at cocoon hongs		1,000
	Yienchichi	Market day & farmers union		1,000
July	Nanking	Summer schools		500
and	Changchow, Ku.			500
August	Kiangmingchen	Farmers union		1,000
	Changshu, Changchow, Wuinsan, etc.	Visiting cooper org.		3,211

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Table showing activities of Extension Department.

Month	Place	Occasion	Methods	Audience
1927				
October	Yiachichi, Nanking	Rural school	Movies, exhibits, etc.	1,000
	Sheochuan, Nanking	Rural Normal	"	1,000
	Yaohwamen, Nanking	Rural School	"	1,000
November	Hangchow, Che.	Hangchow Chr. college and country churches	"	5,000
1928				
February	Tangchi, Che.	30 villages	"	13,000
	Nanking	Farmers week	"	500
	Shanghai	London Mission conference	"	500
	Soochow	Preachers conf.	"	500
March	Nantungchow	Personal contacts	"	1,900
April and May	Soochow	Pres. country stations	"	3,930
	Nanking - 6 big villages	market days	"	3,300
	Kiangwanhao	Fair	"	1,400
	Kintan, Liyang, Changchow, Wusih Quinsan, Kiangyin Tanyang, Chinkiang Changshu, Chingming Haimen, Soochow	Personal contacts seed distribution demonstration plots etc.		50,000

NOTE: This will indicate approximately the number of people who have been reached through our Extension Department during the past five years -- estimated roughly as 390,000 people.

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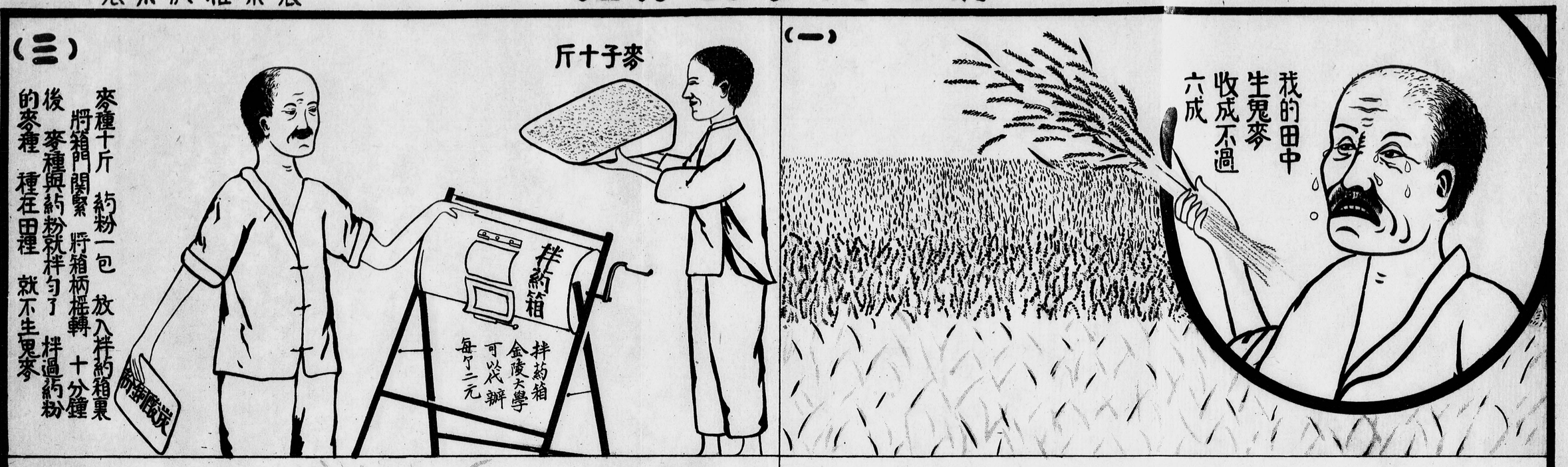
金陵大學農林科
農業推廣系製

消滅鬼麥的方法

金陵大學有炭酸銅粉出售



種田的朋友們 鬼麥的害處很大 我們要消滅他的法子 必須在未下種以前用炭酸銅粉拌在麥種裡 再將拌過藥粉的麥種 下在地裡 下年就可豐收 鬼麥完全消滅

金陵大學農林科是幫助農人的機關 有好蠶子養了不生病 能得有利好麥種了 豐收有好玉蜀黍種了 豐收

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FORESTRY

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FIVE-YEAR REPORT

DEPARTMENT OF FORESTRY

This volume contains a summarized report of the research work in forestry, including a list of the research projects (page 2 and ff.) undertaken by the College of Agriculture and Forestry since 1922. Special attention is called to Forestry Exhibit "A", "A COVER AND EROSION SURVEY OF THE HWAI CATCHMENT AREA", which has been in eager demand by the present Nanking Government; and to Forestry Exhibit "B," "FACTORS AFFECTING SURFICIAL RUN-OFF OF RAIN FALL AND SURFACE EROSION OF SOIL PROFILES," being a report of certain studies begun in China and finished in California by Dr. W. C. Lowdermilk. These findings are of fundamental importance to our understanding of the problems of soil and water conservation and flood control in China.

By special request, Dr. W. C. Lowdermilk has prepared a statement on "STUDIES IN THE CONTRIBUTIONS OF SCIENTIFIC FORECTRY TO FAMINE PREVENTION." This statement is attached hereto. Dr. Lowdermilk was for six years, 1922 to 1928, in charge of our forestry research program. The conclusions beginning on page 2 of his statement are of special significance in showing the broad relations between forestry and famine prevention.

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In addition to its research program, the Department of Forestry has provided instruction and required field work to a large group of forestry students and has done considerable extension work. The lack of a more aggressive extension policy has been due to the fact that insufficient forestry date exists on which to base an extensive extension program. The results of our research work had been much sought after by government officials in their attempts to develop national and provincial forestry policies. The research work has also been invaluable in providing Chinese forestry data for student instruction instead of having to rely on ill-adapted foreign text books as has been the necessity in times past.

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STUDIES IN THE CONTRIBUTIONS OF SCIENTIFIC FORESTRY TO FAMINE PREVENTION

By W. C. Lowdermilk, Ph. D.

As a result of the five years of studies in the problem of what the science of forestry may contribute to the prevention of famines in Central and North China, the following general conclusions named below have been reached. Toward an understanding of the significance of these conclusions it is in place to state that our objective, first of all, was not a general reforestation scheme. It was, on the contrary, an attempt to diagnose the situation surrounding the cause and consequences of the absence of forests. We therefore made expeditions into the remote mountain regions and to temple forests to find remnants of the former cover of vegetation, and to interpret the causes and results of the destruction of the original vegetation. It was illuminating to find in Southern Honan, for example, forestry practiced in greater detail than I had ever seen in my studies in Germany. Such practice had been in force for centuries, certainly the methods had not been learned from the West. This finding as well as the fairly good forest management of the temple forests for continuous production lead to the necessity of revising former interpretations of the absence of forests. The following conclusions contain the substance of these findings:

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1. The clearing and cultivation of sloping lands in Central and North China have accelerated processes of erosion in excess of the rate of erosion that existed before cultivation began.

2. This accelerated erosion has reduced the capacity of the landscape to absorb rain fall and has accelerated the rate of run-off which is reflected in the increase of transported eroded material.

3. Accelerated erosion has contributed greater quantities of silt to streams which formerly had carried large silt loads and will in many regions, especially in the Hwai, jeopardize engineering conservancy works.

4. Forest destruction in the past few centuries has been done primarily to make favorable the cultivation of the soil for food production. The most important measure required in Central and Northern China to increase the conservation of rain fall, and the soil, as well as to contribute to flood and silt control is the control of erosion. Vegetation is the chief ally in doing this. Erosion control works will consist of agricultural engineering and revegetation.

5. Central and North China originally were not uniformly covered with high forests. The mantle of vegetation varied from a grass cover to pine and spruce forests. The present temple groves and forests which are now recovering their growth naturally furnish the most reliable index of the former

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natural cover of vegetation. Consequently it is not to be expected that forests can be returned where grass formerly grew.

6. Erosion control will assume the nature of reclamation of lands. The first stages will be generally the introduction of hardy shrubby growth to establish a cover, to build up a vegetable litter on the soil surface and to put insect and burrowing animal life in the soil. The result of this preliminary cover will be to restore a porous soil sheath protected by the litter to prevent erosion, so as to absorb rain to the possible maximum. As the fertility and depth of soil is restored more valuable crops of trees may be introduced.

In some instances trees may be introduced at the start, but this statement refers to those regions where the present unfavorable condition is accelerated erosion. These erosion control measures will furnish opportunity for work relief generally over the country in drought famines.

The scientific studies on the influence of vegetation on erosion and run-off which were begun in China were continued along the same lines in California and were concluded in one phase. The findings have served to establish scientifically a new concept of the forest in water and erosion control. The finding in its simplest terms is: that the baring of a soil to the full force of rain of intensities over one-half inch per hour permits run-off to become muddy. Suspended soil particles of the muddy flow are filtered out at the surface to form a thin layer of fine ground material which tends to seal up the

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soil, and thereby to reduce the rate of penetration of water into it. It thus destroys the natural percolation of a soil containing its seepage channels whose openings are protected from sealing and clogging by the natural layer of forest or shrub litter on the surface. The forest litter is the most important part of the forest, not in absorbing rain, but in preserving and protecting the natural porous condition of the sheath of soil on a landscape.

This is a principle which is applicable to all forest-clad landscapes, or where a forest of shrubs or trees is capable of growing. It applies equally in the United States where it is now being used as a more accurate understanding of the role of the forest in water and erosion control, and in China where the need of erosion control transcends the need for the production of timber material.

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THE MAP OF CHINA AND JAPAN

Showing the Traveling Route of Forestry Department College of Agriculture and Forestry University of Nanking

金陵大學農林科森林系

森林調查行程

Mongolia

He-lung-kiang

Kirin

Charhar

Jehol

Fengtien

Suiyuan

Sienkiang

Chili

Japan

Korea

Shansi

Shantung

Kansu

Tsinghai

Shensi

Honan

Kiangsu

Tibet

Hupe

Anhwei

Chuenpian

Szchuen

Chekiang

Hunan

Kiangsi

Fokien

Kweichow

Yunan

Kwangsi

Kwangtung

Hainan

Explanation 圖例

~~	National boundary	國界
~~	Provincial boundary	省界
.....	Traveling route	森林調查行程
~~	Railroad	鉄路
~~	River	河流

Scale

1 : 12950000

0 200 400 600 800 Li

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SUMMARY REPORT ON FOREST RESEARCH

DEPARTMENT OF FORESTRY

COLLEGE OF AGRICULTURE AND FORESTRY

UNIVERSITY OF NANKING

1923 - 1927

The purpose of instituting a division of Forest Research is to find out the causes and to devise preventive measures for the frequent famines in China, especially in her northern and central parts. Through this division it is now possible to carry forward a program of investigation and research for that purpose. From careful observation and deliberation there are two important points which must be specially emphasized in order to achieve this goal. They are:

1. Making a special study of the forest problems of a definite locality. Forestry is an applied science. To solve forestry problems, the forester must look into the political, economic and rural conditions, as well as the geological, atmospheric, and biological factors of a locality. The failure of the direct adaptation of foreign forest policies in China in Chinese foresters in the last fifteen years has proven the importance of this point.

2. Becoming familiar with the most important Chinese forest problems and making a record of these, because, although these problems vary in different localities, their relationship is important, as sometimes the problems of one locality cannot

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be solved without knowing those of other localities. Due to unsettled conditions in China, the government finds no time for this study. The Division of Forest Research is practically the only organization in position to undertake the work for the government and for the people at large. In a very short time, 1923 to 1927, we have been able to arouse public interest and secure the attention of the Nationalist Government recently established in Nanking.

The list of Chinese forest projects has been compiled as below. The current projects are those which are being undertaken by present personnel. Delayed projects are those which are listed but on which assignment and work are delayed by reason of shortage of personnel, funds, or some other cause. It will, however, be convenient to have these projects listed and files preparted to collect such material pertaining to them that may accumulate from time to time.

100 - GENERAL

101 - Forest Bibliography, References and Abstracts (Current)
102 - Forest Terminology (Current)
103 - Weather Records (Current)
110 - Forest Surveys and Resources (Current)
111 - Forest Survey and Resources (Shansi)
112 - Forest Survey and Resources (Southern Anhwei)
113 - Forest Survey and Resources (Kiangsu)
120 - Forest Policy (Delayed)
130 - Development of Forest Laws in China (Delayed)
140 - History of Forestry in China (Delayed)

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200 - DENDROLOGY

210 - Woody Plant Collection
(Current and in cooperation with the Herbarium)

220 - Key for the Identification of Trees in Winter Condition. Nanking Vicinity. (Current)

300 - SILVICAL STUDIES

310 - Tree Studies (Current)

310 - Introduction of Exotic Trees (Current)

310 - (a) Results of Planting Black Locust Robinia Pseudo-acacia in Shantung, Shansi and Kiangsu. (Delayed)

320 - Vegetation Type Studies
(Delayed)

330 - Temple Forests
(Current)

340 - Site Classification
(Delayed)

350 - Plant Succession on Denuded Areas

351 - Tung Tsa, Shansi
(Current)

400 - FORESTATION STUDIES

410 - Seed

411 - Characteristics of Forest Tree Seed
(Current)

412 - Seed Storage
(Current)

413 - Seed Testing
(Current)

414 - Source of Seed
(Current)

420 - NURSERY PRACTICE

421 - Preliminary Treatment of Seed
(Current)

422 - Methods of Sowing in Seed Beds
(Delayed)

422.1 - Amount to Sow
422.2 - Time to Sow

423 - Shading (Current)

424 - Watering (Current)

425 - Root Development and Pruning
(Current)

426 - Planting Stock Storage
(Delayed)

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430 - FIELD SOWING AND PLANTING PRACTICE

431 - Choice of Species (Current)

432 - Planting Site Indicators (Current)

433 - Classes of Planting Stock (Delayed)

434 - Methods of Direct Sowing (Current)

435 - Effect of Vegetative Cover on Tree Plant Survival and Growth (Delayed)

436 - Spacing of Tree Plants (Delayed)

437 - Artificial Mixtures (Delayed)

438 - Underplanting (Delayed)

439 - Planting with Cuttings (Current)

500 - SILVICULTURAL MANAGEMENT STUDIES

510 - Natural Reproduction and Restocking (Current)

520 - Thinnings (Delayed)

530 - Pruning (Current)

540 - Grass Fuel Production (Current)

550 - Leaf Raking and Forest Growth (Delayed)

560 - Methods of Outline (Silvicultural Systems) (Delayed)

570 - Protection Forests (Delayed)

580 - Woodlots (Current)

581 - Farm Woodlots; Kianglinhsien (Current)

582 - Woodlot Management: Chingfongshan (Current)

590 - Communal Forests (Current)

600 - MENSURATION

610 - Volume, Growth and Yield. (By stands.) (Current)

620 - Volume, Tables by Species (Current)

630 - Paper Curves (by Species) (Delayed)

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700 - FOREST PROTECTION

710 - Protection from Fire (Current)
720 - Protection from Trespass (Delayed)
730 - Protection from Insects (Delayed)
740 - Protection from Diseases (Delayed)

800 - UTILIZATION STUDIES

810 - Uses of Wood (Delayed)
820 - Uses of Bamboo (Delayed)
830 - Timber and Fuel Prices (Current)
840 - Sawing Practice and Sawmills (Delayed)
850 - Transportation Practice (Delayed)

900 - FOREST PRODUCTS

901 - Wood Sample Collection
910 - Mechanical Properties of Indigenous Woods (Delayed)
920 - Structure Macro and Microscopic of Indigenous Woods (Completed)
930 - Derived Products

931 - Wood Distillation, Nanking (Current)
932 - Wood Oils (Delayed)
933 - Wood Varnishes (Delayed)

940 - By-products of the Forest

941 - By Products of Hardwood Forests, Yangtze Valley (Delayed)

1000 - WOOD PRESERVATION (Delayed)

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1100 - FOREST INFLUENCES

1110 - Surface and Run Off Conditions (Current)

1111.1 - Surface and Run-off Conditions - Yellow River Watershed (Current)

1111.2 - Surface and Run-off Conditions - Tsingtao

1111.3 - Surface and Run-off Conditions - Shensi, Honan, etc.

1112 - Surface and Run-off Conditions - Hwai River Watershed (Current)

1120 - RECLAMATION OF WASTE MOUNTAIN LANDS (Current)

1130 - PREVENTION OF EROSION (Delayed)

1131 - Prevention of Erosion, loose lands, Shansi (Delayed)

1132 - Prevention of Erosion of River Dikes, Kiangsu (Delayed)

1140 - WATER CONSERVATION (Delayed)

1150 - FIXATION OF SAND DUNES (Delayed)

1160 - WIND-BREAK PLANTATIONS (Delayed)

1200 - FOREST ENGINEERING STUDIES

1210 - Methods of Torrent Correction (Delayed)

1300 - GRAZING STUDIES

1310 - Relation of Grazing to Afforestation (Delayed)

1320 - Regulation of Grazing

1321 - Regulation of Grazing in Shansi (Delayed)

1330 - Forage Plants (Delayed)

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TWO HYPOTHESES

After careful observation while travelling widely in Northern and central China, Prof. W. C. Lowdermilk and other members of the Forest Research Division have arrived at two general hypotheses of importance related with forestry. They are: Forest destruction or approaching desert conditions in North China; and the changing evaporation-precipitation cycle of North China. These are briefly stated as follows:

1. Forest Destruction or approaching desert conditions in North China. In former times the original forest area extended over great areas in North China. Now only small, isolated remnants of this cover exist. The principal loss of the forest has occurred in the past twenty centuries and is still in progress. It is quite improbable that the increasingly arid conditions can be attributed to cosmic processes. The increased run-off from the mountains following denudation of the slopes is believed sufficient to produce the increasing aridity and reduced rainfall in North China. The general denudation of North China's former forest cover has brought in its train a group of calamities, so far as the prosperity and well-being of many generations of millions of people are concerned.

2. The Changing evaporation-precipitation Cycle of North China.

According to the balance sheet of the world's evaporation-precipitation under cycles prepared by Bruchner, the precipitation on the peripheral land areas comprises moisture derived

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to a large extent from evaporation from the land surface. Only two-sevenths of the precipitation consists of moisture evaporated from the oceans, transported by landward winds. Enclosed basins are the scene of closed evaporation-precipitation cycles, where the rainfall is practically equivalent to the net evaporation from the basin area. The run-off of the rivers back to the oceans is a measure of the moisture which is transferred by winds from the oceans to the peripheral land areas. Since the discharge of the rivers of the world is equivalent to 20% to 30% of the world's rainfall, then 70% to 80% of the rainfall comes from the evaporation, including transpiration, from the land's surface.

The transfer of moisture from the Pacific Ocean to the land area of China is primarily dependent on typhoons and cyclonic storms which sweep over a narrow border of the continent. It follows that the precipitation near the sea shore is derived almost, if not entirely, from the moisture carried over from the ocean by winds; but more inland it is derived both from moisture aarried by winds from the ocean and from evaporation from the land surface; and at the outer rim of the peripheral area the portion of moisture derived from land evaporation (including transpiration) forms the major portion of the precipitation. Convectional rainfall, characteristic of the latter region, is primarily rainfall due to land evaporation.

The inner half and more of the peripheral area in China is characterized by steep topography and by convectional rainstorms; Shansi is a good type area.

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Comparative run-off studies in Shansi made by means of run-off plots located on slopes covered with native vegetation of shrubs and forest and on adjacent slopes denuded by cultivation yielded results which show that the run-off from denuded slopes exceeds many times that from the forested slopes.

The cultivation of the slope areas in Shansi, has been carried on for many centuries over a wide extent and has, it is believed, changed the regimen of run-off in a very important way. The result has been that erosion has gone on to a remarkably dangerous extent and has increased the aggregate run-off from these regions back to the sea, being an increase over the run-off obtaining before the slopes were generally denuded. The net result has been to reduce the evaporation opportunity in the inner part of the peripheral area, and has by so much reduced the aggregate precipitation. The process is credited with producing the conditions of increasing aridity of North China as witnessed by various findings.

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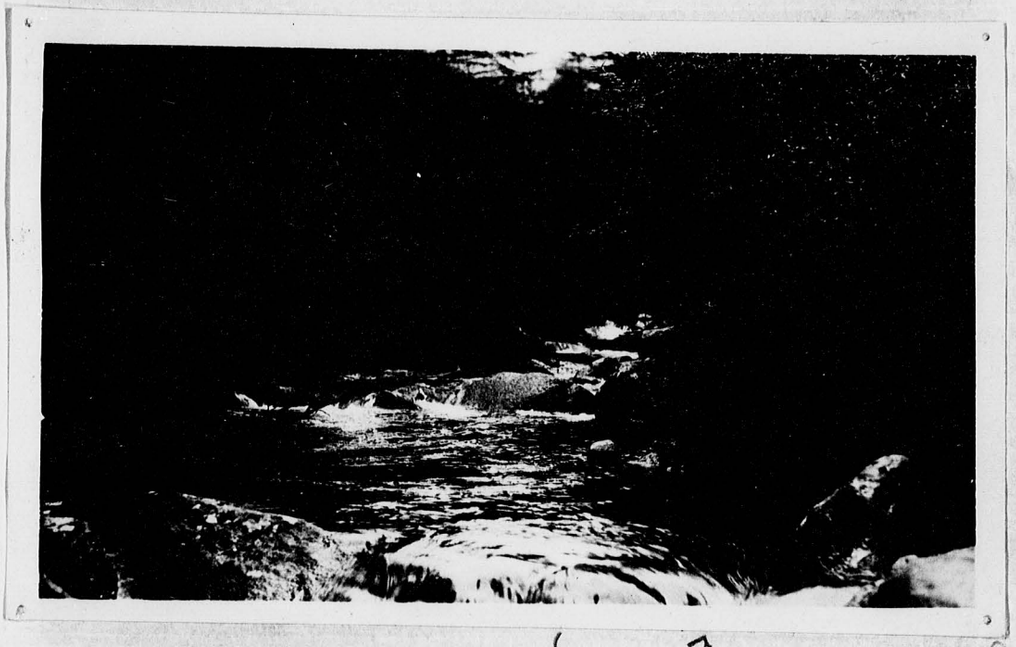

Photo by W. C. Lowdermilk

Figure No. 1

This is a perennial stream which flows out of a natural forest area, the soil of which has not yet been denuded. This stream showed practically no effect from the rains which produced torrents in denuded valleys, illustrated in following pictures. This is a life-giving resource which can be destroyed by unwise destruction of the forest soils on the mountain slopes.

Lu Yeh Shan, Shansi.

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Photo by W. C. Hamberlin

Figure No. 1

This is a perennial stream which flows out of a natural forest area, the soil of which has not yet been denuded. This stream showed practically no effect from the rains which produced torrents in denuded valleys, illustrated in following pictures. This is a life-giving resource which can be destroyed by unwise destruction of the forest soils on the mountain slopes.

In Yeh Shan, Shansi.

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Photo by W. C. Lowdermilk

Figure No. 2

Contrast this picture with picture No. 1. The slopes of the two converging valleys have been cleared and cultivated. A perennial stream which once flowed here was converted into this torrential dry rocky bed. Only when it rained hard did water flow down this valley, and then in a raging torrent.

Tung Tsa, Shansi.

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Photo by W. C. Lawdermilk

Figure No. 2

Contrast this picture with picture No. 1. The slopes of the two converging valleys have been cleared and cultivated. A perennial stream which once flowed here was converted into this torrential dry rocky bed. Only when it rained hard did water flow down this valley, and then in a raging torrent.

Tung Tas, Shansi.

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BRIEF REPORTS ON INDIVIDUAL CURRENT PROJECTS

111. Forest Survey and Resources - Shansi

The purpose of this project is to make silvical and economic surveys of forest conditions and resources of forest regions in China. This information is required for instruction in forestry and for furnishing the basis for the formulation of forest policies.

Prof. W. C. Lowdermilk, accompanied by Messrs. Charles O. Lee, T. I. Li, C. T. Ren and Tsiang Ying (a student in forestry)in the summer of 1924; and by Messrs. T. I. Li, C. T. Ren, H. L. Shen, Chang Wen-tah (a senior student in forestry), and T. S. Tseh, Director of the First Experiment Station of Shansi, in the summer of 1925, took two trips to Shansi province. The following studies were made:

1. General forest conditions.
2. Vegetative cover and run-off conditions.
3. Reproduction studies.
4. Comparative soil studies.
5. Erosion studies.
6. Succession studies.
7. Rainfall and forests.
8. Transportation.
9. Waste of material in forests.

Governor Yen Hsi-shan most cordially gave the parties each summer valuable assistance and greatly expedited the work in many ways. Some of the results are contained in

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the illustrated reports in Chinese submitted to him and which also serve as progress reports of the project.

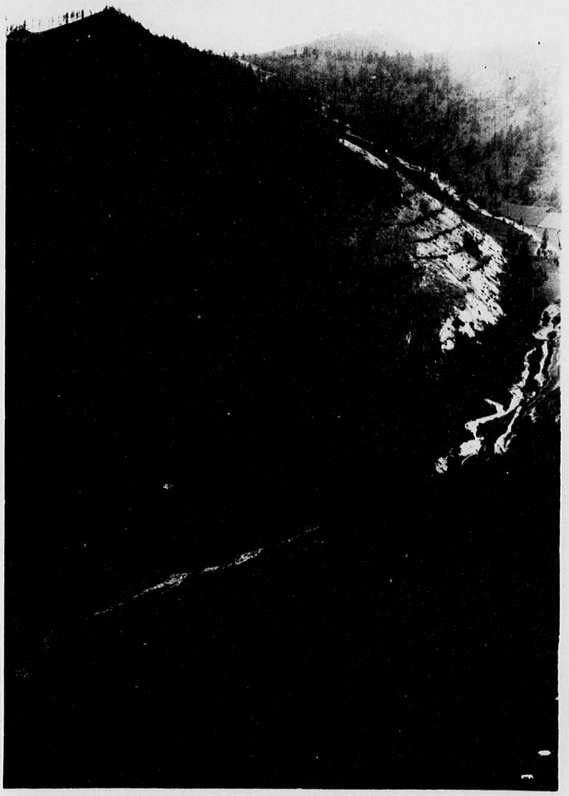

Photo by W. C. L.

Figure No. 3

This picture shows splendidly how the process of cutting, cultivation, and denudation follow each other around the slope. This is reducing the ability of the region to support its inhabitants.

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Summary of the Study. With steep topography and a conventional type of rainfall, Shansi is a stage well set for the for the play of the processes of excessive erosion and denudation. The condition of the soil layer is the only factor within the effective control of the inhabitants. The exposure of the soil on the slopes to torrential rains has brought about immeasurable ills to the resident inhabitants in the loss of productive soil resources, in the irregular regimen of run-off, and in the reduction of the aggregate food supply. Forest destruction appears in Shansi to have been only a preliminary stage of a more disastrous process of slope cultivation, which is considered essentially responsible for the unfortunate conditions of the mountain lands and river plains.

As a remedy for this unsatisfactory condition, unselfish and enlarged associations of owners of mountain lands should be in the hands of public servants, men who are concerned primarily with protecting the public from the injurious actions of private interests. Thus the protection and administration of forest areas should be in the hands of honest provincial officers. Whatever the means employed, the remnant of the original forest area should be either declared or purchased as a provincial forest or put under certain wise restrictions by the provincial governor for

1. Starting a program ~~of~~ for conserving the remaining soil and forest.
2. Scientific study.
3. Conserving the three most essential resources of forage, wood, and water.

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Photo by W. C. L.

Figure No. 4
So eager are the mountain farmers to put in oat crops on the slopes that valuable timber is cut and allowed to rot. Fully $900.00's worth of timber was rotting in this place. More timber is rotting than is being grown in forest plantations near the plains.

In addition, the party discussed with Governor Yen Hsi-shan in person the possibility of changing the provincial forest policy from purely raising trees in agricultural soil down the plain, which trees even need to be watered, into protecting existing forests with a portion of the forest funds and the partial time of the forest officers of the province.

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112. Forest Survey and Resources - Southern Anhwei (including some parts of Kiangsi)

During August 1923, Prof. N. K. Ip, accompanied by several of the senior students, took a trip into the forest area of Wuhu Tao, Southern Anhwei. The chief purpose of the trip was to study the cunninghamia industry of the region. 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 managed according to strict rules and regulations. This should be greatly encouraged and extended to other places.

The forest area of Wuhu Tao contains the following types: cunninghamia, cunninghamia-pine, pine, bamboo-coniferous, bamboo, and hardwood.

The seed tree and clear cutting methods of reproduction are commonly used to furnish new stands of pinus massoniana. The clear-cut areas are burned over, cultivated, and planted with corn for several years until a good stand of seedlings is produced either by direct seedling or natural seedling from trees of adjacent areas.

Hardwood species of excellent quality have little commercial value within the region.

Surface forest fires are very frequent; crown fires are rare.

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Elaborate systems of timber measurement have been developed, most of them in decimal form.

The Timber Guild makes and maintains strict rules and regulations for the lumber trade.

A large floating labor population is a characteristic of the lumber industry. Work is commonly done by the contract system on a piece basis.

In the summer of 1924, Mr. N. K. Ip, accompanied by Messrs. A. N. Steward and K. Ling, undertook a study of general forest conditions and a collection of woody plant specimens in southern Anhwei and Kiangsi. A few new species of plants ~~used~~ new to the world and many plants not previously in the University Herbarium were secured. Particular attention was given to forest management and forest protection.

Mr. Ip suggests that if the present government policy of establishing experiment stations and reforestation sites on which considerable sums of money are used each year were changed to a policy that would make possible the purchase of existing forests and their management for sustained yield, existing forests could be preserved and could be made to earn enough money to keep such work expanding without increasing the burden of the government. The present government policy of reforestation rather than of protection of forest sites is undoubtedly due to lack of careful forest study.

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113. Forest Survey and Resources - Kiangsu

This study was made by two field-trip parties, one in charge of Prof. N. K. Ip, who was accompanied by Messrs. K. Ling, K. H. Cheo; and the other in charge of Mr. C. T. Ren, accompanied by Mr. Y. T. Tao, a student.

1. Forest Conditions in Southern Kiangsu. Southern Kiangsu, as far as our travel covers, presents very favorable conditions for forestry development on land not permanently suitable for agriculture - this will necessarily exclude even the gentle slopes of rolling land, for they can be used profitably for some high land crops eventually, as the use of some portions have already indicated. In the mountainous parts, the inhabitants have in the majority of cases very sound judgment as to the right use of land, as shown by the presence of numerous woodlots, bamboo forests and pine plantations, etc., on non-agricultural soil. The climatic and physiographic factors, on the whole, are admirable for the growth of a wide range of trees. Sustained market conditions and stable prices for every description of forest products, from timber to branches, are present throughout the area. In some places the production of fuel wood is not sufficient to meet the local demands of the pottery ovens. With care and protection, followed by common-sense forest management, even seriously denuded areas will recover their vegetation mantles in a comparatively short time and should discretion be applied in the selection of right species, a dense stand of forest trees would be obtained without any effort of planting. In I Hsing district the hills are

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excellent for the growth of bamboo, a highly profitable crop, and from which quite a few towns derive their livelihood.

2. Forest Conditions in Northern Kiangsu. "Exhausted mountains and cruel waters" is a common local proverb which describes only too truly the result of widespread destruction of the mountain resources in Northern Kiangsu, particularly in the Hsu Hai Tao. Within this political division about forty per cent of the total area is bare mountains and about forty per cent is level lands, subject to annual floods. Only twenty per cent of the land can be safely devoted to two crops a year. Over-population adds greatly to the problem of getting a living from the natural resources inherent to the region. The people generally are impoverished and banditry is a very common means of livelihood.

Outside of a few small areas of temple forest, the mountains carry no trees, no shrubs and practically no grass. Sheep, goats and cattle eat off the grass as soon as the new shoots appear and the fuel gatherers dig out the roots of grass and shrubs during the winter. Thus the natural reproduction of the vegetative cover is effectively hindered. On the other hand, the topographical features of the land evidently favor reforestation, although rainfall is very irregular and there are frequent severe droughts during the spring and floods during the summer. A very fine natural hardwood forest was found and measured in Siao Hsien, which forest surrounded a temple and indicated what was probably the condition of the forest slopes earlier and what might reasonably be expected of the mountain slopes if protective measures were instituted.

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Some very good stands of evergreens were noted in the temple area. Village trees flourished wherever they were given an opportunity to grow. Apricot, pomegranate, persimmon, pear, date, plum and apple trees were found throughout the area, which indicates favorable conditions for successful fruit culture.

As a result of these studies it seems clear that with proper protection the present barrent mountain slopes would naturally recover their vegetation; that excellent natural forests could be developed; that the destruction of forests and vegetative cover in the past is, in large part if not wholly, responsible for the present conditions in the plains which make agriculture on forty per cent of the land a precarious undertaking.

Besides these trips, a number of extended ones were made by Prof. W. C. Lowdermilk to Northern Honan and Shantung; Honan in the fall of 1923; Honan, Shansi, Shensi in the spring of 1924; Japan, Korea, etc. (see map No. 1). For each trip a report has been prepared. (Detail reports are completed.)

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Figure No. 5

Kaifeng.

Elm near North Gate, Kaigeng, with roots exposed by the advance of the sand dune seen in the background.

Oct. 25, 1923.

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Elm near North Gate Kaifeng,
with roots exposed by the
advance of the sand-dune
seen in the background.

Oct. 25, 192

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Figure No. 5

Kaifeng.

Elm near North Gate, Kaifeng, with roots exposed
by the advance of the sand dune seen in the background.

Oct. 25, 1923.

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1111.1 - Vegetative and Surface Conditions of the Yellow River Watershed - Shansi

The object of this investigation is the securing of additional information on the status of vegetation cover, on erosion, on climate, on sedimentation, on the ecomomics of forests and forest products, on classification of land, on transportation and general conditions affecting the production of forests.

The study was made by Prof. W. C. Lowdermilk with several associates and students of the Department of Forestry. During the summer and rainy season of 1924 observational and empirical studies and gaugeing of mountain streams by chemical methods (see Fig. No. 6) were made of the development of torrents as a consequence of slope cultivation in the region of the headwaters of the Fen River, Shansi. During the rainy season of 1925 comparative quantitative run-off studies were made in three regions of Shansi; namely, the Tsin Yuan watershed in the southeast, the Fan Shan mountains in the west, and the headwaters of the Fen River in the northwest of the province. Ten run-off sample plots were established, one set in each area being located on soils which had been built up and were protected by the natural cover of vegetation; the other set being established on adjacent slopes which had been denuded as a consequence of cultivation. The results show a marked influence in the absorptive capacity of the two conditions of surface soil layers. The amount of surface run-off from the

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denuded plots averaged fifty-fold that from the plots in the forest soils when run-off occurred on the forest soils.

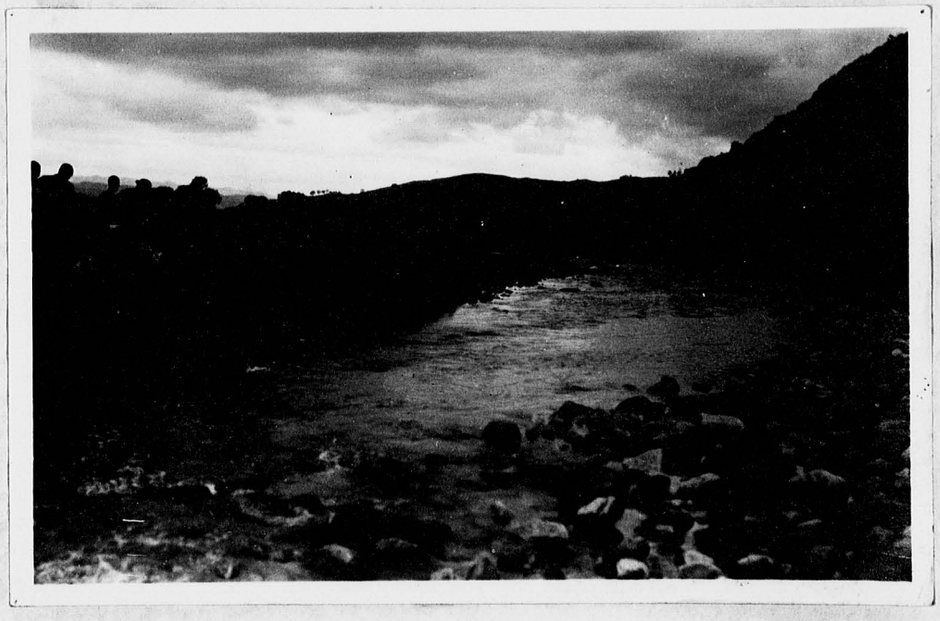

Photo by W. C. L.

Figure No. 6

Gaugeing the flow of a mountain stream by the chemical method. 1924.

Tung Tsa, Shansi.

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Figure No. 7

A detailed view of the tipping bucket devise for measuring run-off water from the forested plot.
Summer, 1925. TSing Yuen reginn, Southeastern Shansi.

Figure No. 8

The weir located near our camp at Fan Shan, showing the methods used in measuring water stages upon the watershed under observation.
Summer, 1925. Fan Shan, Shansi.

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Figure No. 9

A view of the pair of plots nn the denuded slope showing the section chief of the village and members of the village of Tung Tsa who inspected the run-off studies. Summer, 1925.

Contrast Valley,
Tung Tsa, Shansi.

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1111.2 - Surface and Run-off Conditions - Tsingtao

This study was continued by Prof. W. C. Lowdermilk, assisted by Mr. P. C. Yieh for the entire summer and Mr. T. I. Li for the latter part of the summer, at Tsingtao, during the rainy season of 1926, to determine the effects of works of reclamation carried out by the Forest Administration during the German occupation as compared with unreclaimed slopes. The experiment was favored with unusually heavy falls of rain. After seventeen years' accumulation of a partial soil cover of litter and humus under cover of a stand of black locust, the absorptive capacity of the soil has been significantly increased but does not yet equal the absorptive capacity of a soil under natural vegetation. Especially notable was the use of continuous recording instruments whereby the intensity of rainfall and the rate of run-off may be correlated. In addition to these data, there were collected by means of special instruments information on comparative evaporation and temperatures. Soil samples were collected to determine the relative fertility in combined nitrogen content and bacterial life within the compared areas. A preliminary report of these studies was read before the China Society of Science and Arts in January, 1926. A second progress report was presented before the Engineering Society of China on March 23, 1926. A third progress report was read before the Third Pan-Pacific Science Congress at Tokyo on November 3, 1926. See also accompanying photographs, Figures 10, 11.

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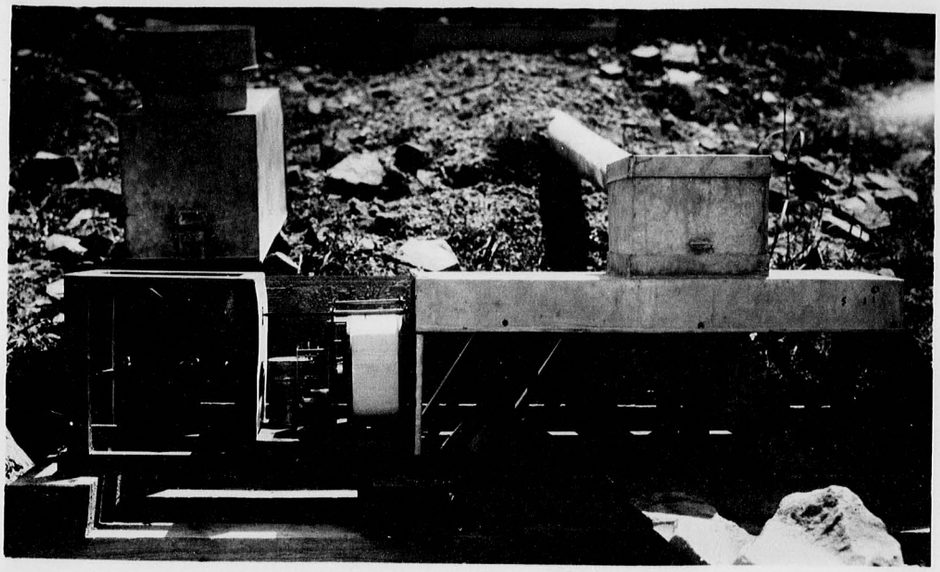

Figure No. 12

Detailed view of the continuous recording instrument whereby intensity of rainfall and rate of run-off may be correlated.

Figure No. 13

View of the continuous recording instrument at work in Tsingtao.
Summer, 1926.

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1111.3 - Surface and Run-off Conditions - Loess Deposited Area of Honan, Shensi, and Shansi

This is an extensive study of these areas made by Prof. W. C. Lowdermilk.

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 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 ~~torrential rains~~ deposits, namely, vertical cleavage and fine division, permit the torrential waters 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 critcal part of the gully. If it be held, excessive erosion can be stopped.

Instances were found where erosion has stopped both naturally and artificially 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

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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 lands which at present are a liability. By planting them with trees they should become an asset - a distinct asset not only to the locality but to the plains region.

Photo by W. C. L.

Figure No. 14

A half-buried pileo. A similar instance was used by Baron von Richtofen as a proof of the deposition of the loess. Here it is quite probable that the fill is due to the wash from the hills which is kept level by cultivation. Yenanfu, Shensi.

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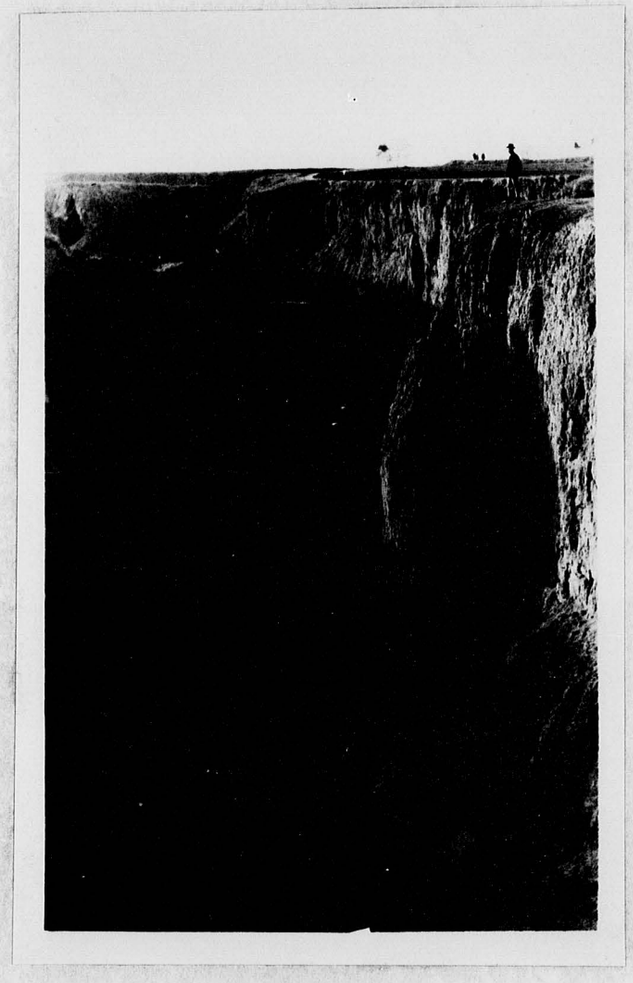

Figure No. 15

An erosion gulch in the loess showing vertical cleavage.

March, 1924. Near Fu In Tsuen.

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Photo by W. C. L.

Figure No. 16

View of the landscape from a ridge 20 li from Ma Pu showing the denuded condition of the landscape and the large area devoted to tea culture. Unfortunately no attempt at terracing is made in this region. Terracing is the only justifiable method of cultivating such slopes as these.

Spring, 1926.

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1112. Surface Cover and Run-off Conditions - Hwai River Watershed

(See separate detailed Report)

The object of this project was to determine the causes which are responsible for the heavy run-off from the Hwai River watershed and to ascertain to what extent such run-off conditions may be remedied and by what means.

During the spring of1926, a field party directed by Prof. W. C. Lowdermilk, Mr. T. I. Li and Mr. T. C. Ren, and for part of the trip Prof. N. K. Ip, made a two months' study of surface and erosion conditions in the southern part of the Hwai River watershed between the Tientsin-Pukow and Peking-Hankow Railways. The full report, containing more than 200 pages with a number of maps, pictures, tables, diagrams and charts, has been made. A summary with recommendations is given below.

Summary of Report

This report is based upon field studies of the northern slopes of the Hwai Yang Mountain Range from Hofei to Sin Yang Chow - a distance of approximately 1,000 li (330 miles). The survey was not completed, due to unavoidable circumstances. There remains yet to be surveyed the region to the west of the Kin Han Railway, the region to the north of the Hwai River, and the watersheds of the Yi and Hsu rivers in Southeastern Shantung.

Evidence exists in temple forests and in the blackish

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blue clay flood plain deposits of the Hwai and its northbound tributaries that an extensive primeval mantle of forest vegetation covered the highlands to the south of the Hwai River. The plains were, however, from time immemorial, inundated with flood waters which deposits whose bedding planes parallel the propile of the present drainage system.

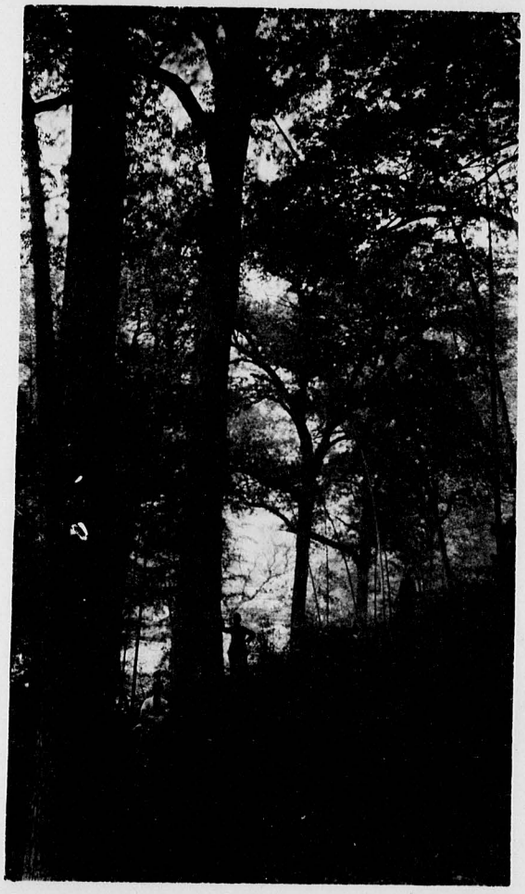

Figure No. 17

An example of the temple forest of Shui Ging An and of the primeval forest cover in the region of the headwaters of the Pi Ho. Note the splendid oak and liguid amber trees, as well as the bamboos.

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Photo by W. C. L.

Figure No. 18
In the region of the headwater of the Hsi Ho, where a small valley belonging to a clan is managed according to an excellent tradition, the preservation of the tree cover on the slopes is followed. Rice fields are terraced below.
Spring 1926.

Photo by W. C. L.

Figure No. 19
A view of a well-managed valley in the watershed of Pi Hwa, where others are bare and dry. Spring, 1926.

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The conquest of the forest vegetation, which was begun many centuries ago, has been completed, leaving only small areas in temple forests, which serve as remnant samples. The present treatment of the region is dependent on several factors. Chief among these is the cultivation of sloping lands to food, tea and China root crops. The increased population of the mountain areas where level lands areas are far too small to supply food and other crops for the resident people, has brought about the progressive and general working up and cultivation of the sloping lands. Lack of graded roads for wheel transport is an important factor in stimulating slope cultivation.

The progressive baring of the mountain lands has produced a corresponding progressive change in flood plain deposits from the blackish blue clays to brown and yellow superimposed silt and sandy silts found along the rivers, and finally is chiefly responsible for the rivers of sand which have been set in motion and are working their way northward down the tributaries and eastward down the Hwai River proper. This sand has reached Wu Lung Chi on the Hwai, and has reached the Hwai at Cheng Yang Kwan from the Pi Ho. These sand rivers are believed to derive the quantities of sand partly from a general sorted deposit from the erosion of the igneous mountains in recent geologic times, and from the accelerated erosion following the general baring of the slopes through cultivation within the past millenium and more particularly in the past five centuries. Evidence points to a marked acceleration in these processes during the past century.

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Figure No. 20

A. In the course of surveying a cross section of the Pi Ho two miles below Liuangchow. The sand-filled condition of the channel is evident.

Figure No. 21

B. When the sand channel has reached great widths attempts at reclamation of marginal sand ~~is~~ made willow plantations.

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These rivers of sand fill the channel of the Hwai and its tributaries, causing local overflowing of flood waters, and in their downstream movement will in time progressively jeopardise the permanency of projected costly engineering works in the lower Hwai. Particularly will the sand, unless controlled, interfere in time with navigation and with the simple discharge of flood waters to the sea.

Erosion above the geologic norm, or excessive erosion and its control, therefore, is one of the most important factors which must be studied further in the catchment area and its effect on the progress of the rivers of sand down stream.

The extensive northern slopes of the Hwai Yang Range are excellently suited to forest growth. Forests will grow naturally with little or no human assistance if cultivais abandoned. Little can be done in increasing forest areas, however, until improved transportation increases the opportunities for equitable exchange of food products from the plains for wood products from the mountains. The forestry measures will at present be confined to the control of erosion through check dams and through the treatment of eroding areas.

Recommendations

Recommendations growing out of a preliminary study of the Hwai catchment area south of the river are embodied under four general topics:

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1. It is recommended that this preliminary cover and erosion survey be extended to the remainder of the watershed when conditions for field work are restored, with the object of determining what tributaries deliver the bulk of the flood waters and what additional intensive studies should be made in the remainder of the watershed to determine the rate and status of erosion, shoaling and corrective measures.

2. It is recommended that a comprehansive study of the hydrology of the Hwai watershed be made. This will involve a continuation of the present meteorological stations and the establishment of additional stations to the number of at least ten, whereby the mountainous areas will be equally represented with the plains. It will also involve the gauging of the run-off and flood flow of tributaries and of the Hwai proper at strategic locations. Seven localities are thus recommended under Part II, "Rainfall and Floods of the Hwai River.

3. It is further recommended that a comprehensive study of erosion in the regions of run-off be made with the object of determining the rate of supply of sand to the streams, the movement of the sand rivers down stream, and the content of silt which the run-off waters are transporting; and also with the object of determining what measures are possible and practicable for controlling the existing excessive erosion.

4. Finally, it is strongly recommended that watershed protection and erosion control within the catchment area

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be made an integral part of the plans for the Hwai conservancy project; that provision be made in these plans for government initiative and supervision, and for partial financing by the government (the ratio to be determined upon after further study) of the engineering work required to control erosion, since the value of agricultural lands would then be raised and more revenue would be received by the government.

Twenty-five meteorological stations have been established in cooperation with Zi-Ka-Wei observatory, which will make possible a more scientific study of the rainfall of the Hwai watershed.

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101. Forest Bibliography

The object of this study is to make a list of the works that would be valuable for reference on forestry subjects and to select such articles and books as would facilitate forest investigations. Cooperation has been established with the University Library and various libraries in China and other countries. About one thousand abstracts have been made from articles and books in this list and are on file. (See sample form on following page.)

102. Forest Terminology

There is no modern Chinese terminology for scientific forestry terms. Intelligent advance in scientific forestry will be hindered until such terms have been standardized and accepted in practice. To make a start on this problem of forest terminology, a Committee on Forest Terminology was appointed. During the last two years Gerschels Voculaire Forestiere in English, French, and German was stencilled and mimeographed on forms, including spaces for corresponding Japanese and Chinese terms. Thirty-nine sets of these mimeographed sheets have been bound. More than one thousand suggestive Chinese terms have been filled in in the list. A large number of Chinese students of forestry will be asked to cooperate in determining suitable terminology.

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Sample Form

FORM - FR-1. No. _____

FOREST INVESTIGATIONS AND RESEARCH

Abstracts and Bibliography

Erosion
Subject Classification

Feng Er Tsien 方爾謙
Author

Chuyi Hsien Chi 盱眙縣志山川
Title

Chuyi Hsien Chi
Publication

Vol. 2, p. 43
Pages

光緒己亥冬十一月
Date

The University Library
Location of reference

Abstract of Reference:-

邑境東南多崗嶺乾隆後棚民占墾幾遍開鑿既久真氣盡失求所謂螺黛蒼翠者不可見矣時雨驟降山溜挾沙而下其弊兼受之水淮身淤墊半由於此

Chuyi Hsien Chi

Southeastern part of the Hsien was mountainous. A group of colonists called Peng Ming (棚民)* occupied and cultivated almost all parts of this mountain area from the time of Tsing Mung of the Ching Dynasty (1795). After a long time digging and cultivating, its natural or original condition was completely destroyed. The deep green vegetative cover was n o longer visible! Then a storm suddenly fell on the bare mountains and mountain torrents brought down the sand which caused more trouble beside the torrent itself. One half of the cause for silting and elevating the Hwai bed was due to this eroded sand.

*Peng Ming was the people who were living in the wooden huts called "peng" in Chinese. These huts were easily moved from place to place.

Dec. 1926
Date

Li Teh-i
Abstractor

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103. Meteorological Records

Thus far eighteen publications have been issued, namely:

Summary of University Meteorological Records - by W. C. Lowdermilk and Shen Hsioh-li.

Quarterly weather records - October to December, 1923
" " " January " March, 1924
" " " April " June, 1924
" " " July " September 1924
" " " October " December, 1924
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The Forestry Herbarium

Chinese flora is the richest temperate flora in the world. A greater number of different kinds of trees and shrubs are found in China than in the whole of the other north-temperate regions. The forestry herbarium of the University has been built up with the hope that all species of Chinese ligneous plants will be represented and studied here.

The herbarium has made a rapid growth since 1924. Now it contains about 8,000 mounted sheets, representing about one-half of the Chinese ligneous plants. All the specimens in the herbarium have been authentically named by several botanists. For instruction and research the herbarium surpasses all other institutions in China.

310. Tree Studies

A number of species of trees have been collected. Excellent reports on the bamboos of China, Quercus serrata, and Ginkgo biloba are on file. A considerable amount of data on pinus massoniana cunninghamia lanceolata have been collected.

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310. Introduction of Exotic Trees

It is to test the suitability of certain exotic trees to various climatic regions in China that this project has been undertaken. The following species have been introduced and the conditions under which they grow are indicated:

1. The Burbank royal walnut, a cross of the Eastern black walnut (Juglans nigra) and the Black walnut of Northern California (Juglans Californica), was introduced to Nanking from California, United States of America, in the year 1925 and adapted to the climate of Nanking within the last few years.

2. Pinus sylvestris was introduced from Germany in the summer of 1924. After three years' testing in Nanking it has been found that one-half shade is desirable for its growth.

3. The Tamarix of Arizona was introduced from the United States of America in the year 1923. It will be a good plant for fixing the sand dunes in North China. A successful method of propagation is under study in the nursery and it is very necessary to find a method.

4. Cumperus pathybbloca was introduced from Colorado, United States of America, in the year 1924 and has proved nothing more than a very fine ornamental tree.

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330. Temple Forests

The object of this study is to collect date on temple forests and forest plantations, because it is urgently needed in the development of productivity of forest stands in various sections of China. Since the country in general is denuded of vegetation, the temple forests furnish the best source of information of this nature.

Survey work has been carried on for the most part within the province of Kiangsu, partly as a by-product of the main projects being carried on. The number of temples surveyed amount to sixteen at the present time. The result of the survey shows the following important facts:

1. All bare mountains, which are considered non-productive regions and also a source of terrible floods, were practically covered with fine forests in ancient times and are capable of being reforested if careful protection is applied. This is demonstrated by the many useful and beautiful species of trees and shrubs growing in temple forests under the same climatic, topographic and geological conditions.

2. The beauty and dignity of temple forests in the same regions is due chiefly to the ornamental forests, which include various kinds of trees, shrubs and bubaceous plants, since the most prosperous temples always have good forests.

3. The survey has shown which are the best species to be used in starting reforestation. Due to the severe destruction of former forests, the temples forests are the only guide in reforestation work.

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4. Temple forests are a good place to study all kinds of scientific forestry work, which will be dealt with separately.

5. Temple forests inspire one to study more along the line of landscape gardening in order to improve the present temple forests so that they will refresh the mind and improve the health and character of man.

Figure No. 22

Temple forest of Nu Teo Shan, Kiangninghsien, Kiangsu, showing the general condition of the existing forest. The blacker portions are bamboo and pines, the rest is a mixed strand of hardwood species.

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350, 351. Plant Succession on Denuded Areas - Tung Tsa, Shansi.

Importance of the study: One of the most important points that every Chinese forester should keep in mind is that he should go out into the fields and study the ways of nature and find out what he can do to combat the damage done by it rather than to just sit in an office and theorize on what he can do to control nature, because the work will not be effective if theory and practice do not harmonize, and money and effort will be wasted. Because of limited financial resources and the vast area of bare mountains in China to-day, even though foresters have right ideas as to what should be done, they cannot do much practical work. Mr. R. Duesberg says: "Nature, unguided by man, produces a forest which is in complete harmony with soil and plant and animal life in forests. Man should not interfere with Nature's work, but should seek to understand the life-history of unmanaged forests and natural laws which determine it. With this knowledge, he would decide upon proper methods of management, try to improve upon Nature's method and direct the natural force to the production of economic value." Since China has more bare mountain than forest areas Chinese foresters should concentrate on developing vegetative cover related to forest formation as well as on forests. This is why the writer has come to believe that succession study is very important in the reclamation work in China. This is a very complex study because different ecologists have different opinions. A simple and practical method is desirable

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for foresters. The method for succession study used in Contrast Valley, Tung Tsa, may be taken for illustration.

Contrast Valley, about several hundred mow in area, located about 300 li north of Taiyuen, Shansi, may be regarded as representative of mountain regions in Northern and Central Shansi from the point of view of vegetative cover. The whole cover valley was once covered with forests (larch and spruce predominating). The southern slopes were denuded sixty years ago and cultivated several times. Some parts are still under cultivation. A part of the northern slopes were denuded ten years ago and most of them completely, while some are still under cultivation. About one-third of the forests remain, so that the vegetative cover is irregular and all types of vegetative cover of northern and central Shansi are represented. For succession study the "listing method" is used; that is to say, a list is made of all important species of plants in different types of representative vegetative cover in the valley. The accompanying diagram is made up of all these lists, showing the series, trend, climax, cause and importance of succession in the locality.

An analytical study of the diagram shows that under the combined influence of climate, physiography, and botic factors, the spruce and larch (the climax of the succession) are obtainable. Due to the authropic case, however, (such as cutting the forest clearly, cultivation, and over-grazing, etc.) the trend was to become retrogressive and sometimes the climax would be changed to the primitive stage by cataclysmic action within ten years. It will then take a very long time for biotic factors to build up the site for the climax by enriching the

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soil and forming the shade gradually. From conversations with farmers and observations made of the valley, it is roughly estimated that it requires from eighty to a hundred years to complete the succession series, if all goes well.

As a matter of fact, the length of time required to complete the series of succession is variable. The biotic factor if allowed to do more than usual will shorten the time required to complete the series. For example, two very fine larix dahurica associations were found direct from chrysanthemum indicum association without going through the intermediate stages. Again, one or two of the one-year larch seedlings appeared in the bare site near semi-denuded sample plots.

On the other hand, authropic agents sometimes do severe reversing, due to repeated cultivation of the area after it has been partially recovered. This is why most of the southwestern slopes in the valley, sixty years after being cut, are still in a primitive stage.

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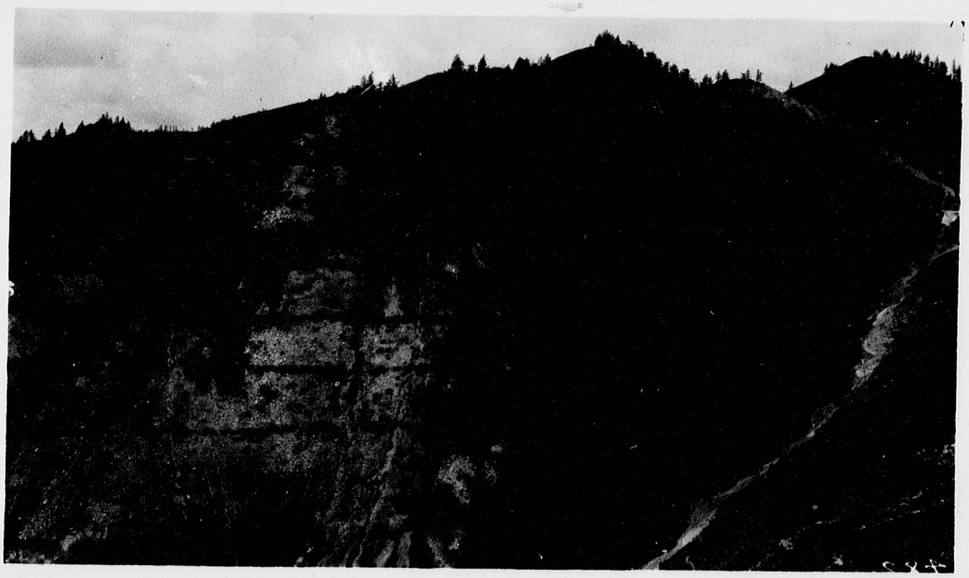

Photo by W. C. Lowdermilk

~~Figure No. 23~~

A view of a remnant forest area and the denuded slopes side by side, showing the ruinous results of slope farming.

~~Summer, 1925.~~

Contrast Valley,
Northern Shansi.

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Fig — The diagram showing the distribution of some important species in each association or consociation of the succession series. The unit of area taken from each association and consociation for the illustration is 10 square feet.

- • = Chrysanthemun indicum
- ✕ = Artemisia sacrorum
- ⊗ = Hippophae rahamnoide
- ✳ = Rhamnus glooss
- ⊗ = Populus tremula
- ✳ = Larix dahurica
- ⊗ = Picea wilsonii most
- O = Avena sativa

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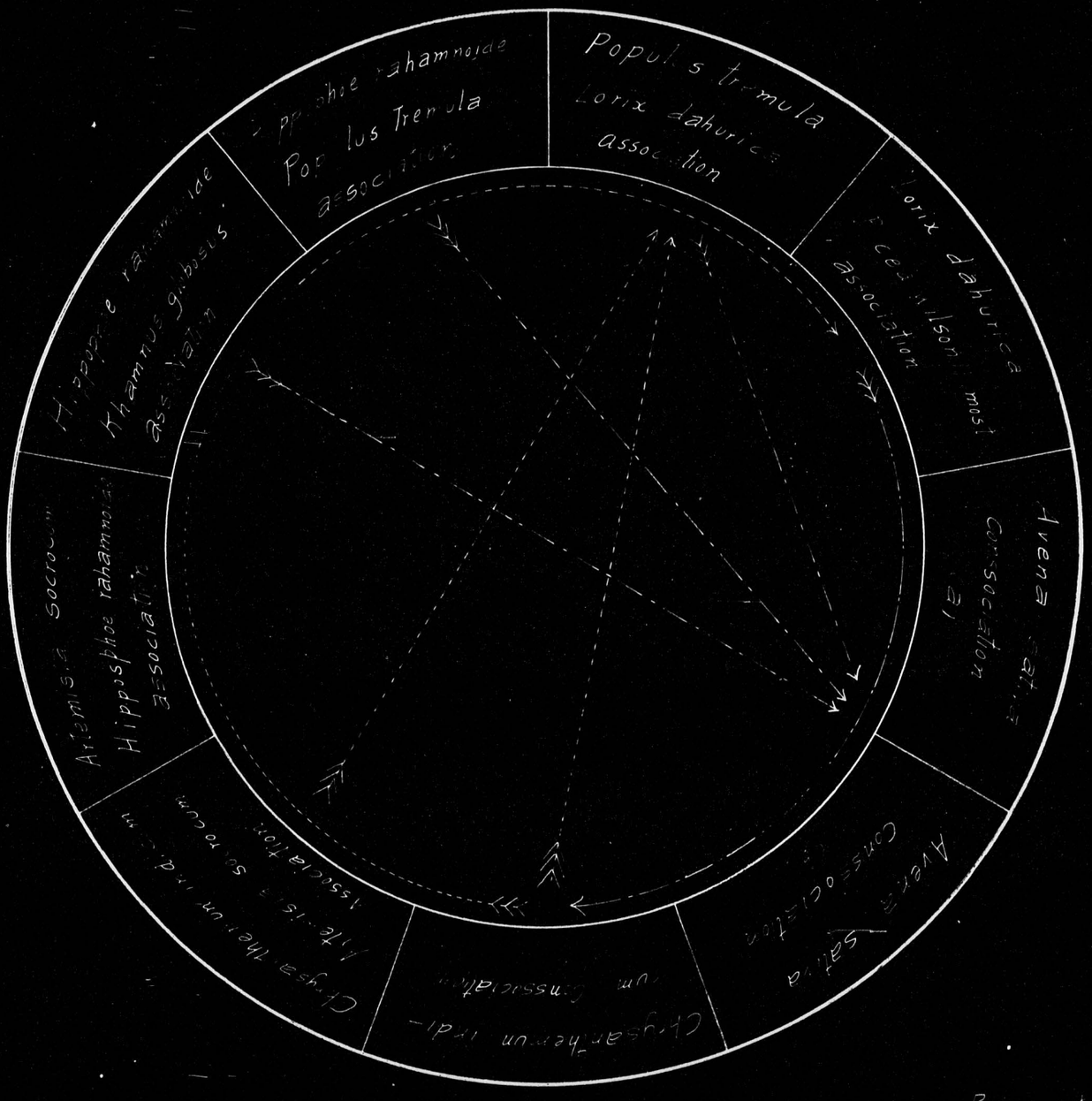
Fig — The diagram showing the regular trend of the succession and cause of it and most irregular or abnormal trend or a direction of short cut often actually happened and seen on the ground in the succession. The real irregular trends, which may have happened but not seen are not shown in the diagram.


Populus tremula
Larix dahurica association
Larix dahurica
Pinus sibirica association most
Betula ermanii
Association
Betula
Association
Betula
Association
Betula

411. Characteristics of Forest Tree Seed.

This study is to discover the chacteristics of forest tree seed to be used in reforestation work in China.

Seed Gradient Test of Cedrela Sinensis

Common (for all)	The date of seeding - March 21, 1925 No. of seed tested (100 S X 36 R) - 3,600 Size of bed in sq. ft. used - 100.8 Collected locally.	
Special (for each)	Using larger seeds (about twice as large as the other)	Using smaller seeds (about half the size of the other)
No. of seedling in the fall	496	38
Tree per cent.	14.00	1.06
Average height	13.10"	14.97"
Remarks		

Seed Source Test - Cunninghamia chinensis

Common (for all)	Date of seeding - No. of seed tested - Size of seed bed used, in sq. ft.	March 21, 1925 6,000 96.0
Special (for each)	Seeds from Wenchow, Chekiang. ( )	Local seeds used.
No. of seedling in the fall	92	77
Tree per cent.	1.53	1.18
Average height	2.68"	2.49
Remarks		

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Cunnamomum Camphora

Common (for all)	Date of seeding -	March 21, 1925
	No. of seed tested -	1,500
	Size of seed bed used, in sq. ft. -	96.0
Special (for each)	Seeds from Wenchow, Chekiang ( )	Seeds from Kiangsi
No. of seedling in the fall	309	240
Tree per cent.	20.6	16.00
Average height	11.14	10.16
Remarks		

A number of tests of tree seed have been carried on in addition to the foregoing, such as tests by pure weight, germination tests in greenhouse, etc.

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423. Shading of Nursery Seedling

This study is to determine for coniferous and other species whether shading or what degree of shading produces the best plants for outplanting.

Preliminary test in year 1925:

Species tested	Unshaded tree percent.	av.ht.	Shaded (2/3) tree percent	av.ht.
Cunninghamia chinensis	.66	2.66"	none	0
Pinus masson	5.22	2.51"	1.00	2.00"
Pinus thunbergii	21.26	1.98"	14.90	2.07"
Cinnamomum camphora	20.22	8.98"	8.44	5.79"

Test in year 1926 - Soil Temperature:

Soil temperature was recorded by current standard thermometer which was buried in the nursery bed with a surface cover of about 1-2 minimeter. One thermometer in each of three testing beds.

Monthly average temperature of surface soil:

Taken at 2 P. M.	Exposed bed	Half-shaded bed	2/3 shaded bed
May	38.7	28.2	26.8
June	38.7	27.5	26.8
July*	33.5	25.0	24.9

*only six days' average.

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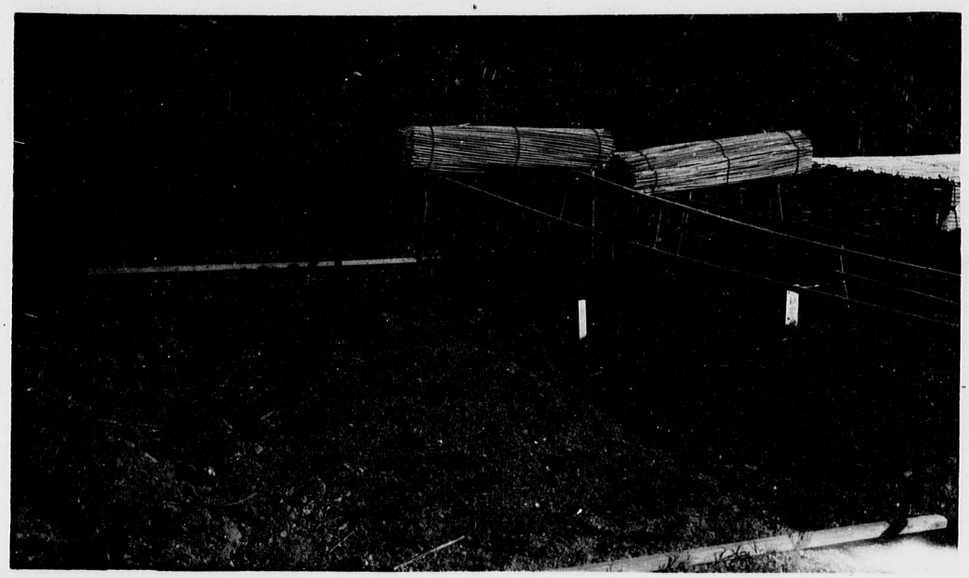

424. Soil Mosture

The shaded beds are kept constantly moist by watering, but in the exposed beds the soil becomes dry in spite of the fact that it is watered about the same number of times as other beds. The surface soil often shows cracks. This is due to higher evaporation in the exposed beds.

Due to the difference in temperature and moisture condition between shaded and unshaded beds, germination in shaded beds is much higher than in the others and loss of seedlings in unshaded beds is much greater than in the former.

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425. Root Development and Pruning

The object of this study is to determine the best type of root for outplanting and to work out practical means of developing this type of root system for tree plants.

Sixty one-year seedlings of the following species were selected for testing. One-half of the roots of thirty seedlings were cut before the first transplanting. No cut was made in the second transplanting. The survival in the first and second transplantings were recorded as follows:

Species	Treatment of root	Survival in first trans-planting	Survival in second trans-planting	Percent of survival of second trans-planting to number of seedling planted
Ginkgo biloba	Cut	27	18	60%
	Uncut	25	12	40%
Sofera japonica	Cut	29	26	86.6%
	Uncut	30	25	83.3%
Cedrela sinensis	Cut	24	19	63.3%
	Uncut	26	17	56.6%
Cinnamomum camphora	Cut	20	14	46.6%
	Uncut	22	8	26.6%

434. Method of Direct Sowing

The object of this study is to determine the proclicability and if so the best methods of direct sowing of tree seed.

Experiments in direct sowing were carried out in the Yihsien (Shantung) experimental area as well as in Ching Fong Shan. Seeds sown in two places germinated very well, but the loss due to exceeding dryness in Yihsien and displacement of vigorous growth of grass in Ching Fong Shan were heavy. The project is still under study.

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439. Planting with Cuttings

The aim of this project is to test the reproduction of certain tree species by cuttings. Cuttings offer for some species the quickest and surest method of reproduction. The willow is an example. Populus tomentosa does not reproduce from seed satisfactorily, nor does it reproduce by cuttings easily. Hence it should be tested.

1. In the spring of 1923, a hundred cuttings, made from branchlets of a grown tree, were planted in different ways and average survival percentage, five weeks after planting, was fifty-one, but none of them could stand the hot summer.

In the spring of 1926, cuttings were made from one-year shootings, sprouts, or root suckers. About a hundred cuttings were planted March 22 and thirty-six of them were found to have survived on May 27. In the fall, after passing through a very dry growing season, twelve of them were still living in a very good condition. Their average height was ~~50~~ 59 inches.

The vitability in one-year shooting sprouts or root suckers is much richer than that in the branchlets of grown trees. This may be the cause which ~~determined the last two~~ made the result of the last two that were tested different.

In the year 1927, the cuttings made of one-year shootings or root suckers, prepared both in winter and spring, were used for testing. The results were as follows:

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	No. of cuttings planted in March	No. survived in May	Survival percent	No. of plants in fall	Tree percent
Cuttings prepared in winter	630	492	79.78	285	45.33
Cuttings prepared in spring	162	65	39.63	16	9.88

The roots of winter-prepared cuttings, with their buds in dormant stage, are given same time to develop as that given to their buds. Only in this way are the roots able to supply water and food for continuous development of the buds.

Photo by T. I. Li

Figure No. 24

Seedlings of populus tomentosa propagated by cuttings of one-year shoots and root suckers prepared in winter. Fall, 1927.

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510. Natural Reproduction and Restocking

The aim of this project is to determine the possibilities and desirability of reforesting various sites from natural reproduction.

A. Purple Mountain

A milaw survey of the vegetation and surface conditions of the soil was made in Bailie Valley, Purple Mountain, during the spring of 1924 by eight forestry students of the classes of 1926 and 1927. It indicated that 35.5% or a little over one-third of the area had been naturally stocked. However, the production of forests may be brought about by suitable protection of the growth already existing on the slopes, but it takes time to do so. In the first place, the soil is rather shallow so that it cannot absorb and conserve an adequate amount of moisture, which is necessary for the germination of seed under natural conditions, as well as for the development of young growth. Most of the seeds do start to germinate but very few can struggle with the grass for moisture and survive. In the second place, grass cutters still have a right to cut grass and wild young tree growth freely for fuel, so it is impossible to suddenly deprive them of the privilege of cutting any natural regeneration, except those planted recantly, and as there is only 35.5% of milaws naturally stocked, it is still uncertain whether they will be entirely regenerated by nature alone within a certain period. So the most satisfactory way of producing forests in Bailie Valley is to allow the potential natural cover to grow up

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under suitable protection, and at the same time supplement with planting as well as self-seeding on scattered cultivated squares on those blank spots. Within ten years Baile Valley would possibly be covered nicely with a dense forest.

B. 512 Natural Reproduction Studies in Tung Tsa

Although many evidences, such as rainfall and temperature, indicate that the region of Tung Tsa is suited to forest growth, yet none is so clear and direct as the natural reproduction itself. There is little difference in density between artificial planting with a spacing of 4 x 4 ft. and natural reproduction here. In the southwest portion of Siao Si Go, Tung Tsa, Shansi, three hundred mow of land have grown up to dense natural reproduction. But this desirable result is only obtainable on a good site. Even if the site is comparatively poor but not completely destroyed, it is possible to be recovered by natural reproduction.

It is to be noted that the usual number of trees planted per mow rarely ever exceeds 300, whereas the number of natural trees found in one case amounted to 960, and in another 1,080 per mow. Thus natural restocking in these regions where conditions are favourable is three times as great as can be planted economically. Yet no expense is needed to secure natural trees. They come up without any attention if the forest soil is not destroyed. The seed generally comes from the trees which are being cut. As a safeguard a few seed trees, which also act as border trees, need to be left to seed spots otherwise barren of trees.

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Planting is not necessary to maintain forests in such regions. Preservation of the forest soil, however, is absolutely necessary to insure natural reproduction.

The regions at the head waters of the Fen Ho are favorable for natural reproduction.

A dense natural stand of larch and spruce in Siao Si Go, near Contrast Valley, Tung Tsa, Shansi.
Summer, 1924.

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580. Farm Wood Lots

Object: To determine the practicability and advantages of farm wood lots and to manage and develop a forest cover on certain areas as farm wood lots.

581. Farm Wood Lots - Kianglinghsien (Nanking)

The result of three years' carefull study of farm wood lots in Kianglinghsien area proves the practicability and profit of these in comparison with grass production. The system of coppice (oak) with standard (pine) is commonly practised.

582. Woodlot Management - Ching Fong Shan

Ching Fong Shan area, about 90 mow outside of Shen Tsan Gate, Nanking, has been managed as a demonstration farm wood lot in the Kianglinghsien area. Twenty compartments have been arranged under careful individual management. A number of common species have been tried out but only oak, pine, and populus tomentosa will be dominant.

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590. Communal Forests

Object: To study the origin and managemant of communal and clan forests. They play a large part in the solution of the forest problems of China.

As China is at present still in the state of confusion forestry on a large scale cannot be carried out. But there is a very strong and stable local government in each village, therefore the communal forest has been chosen in order to survey its advantages and management.

A bulletin (No. 34) was published in March, 1927, giving details of the advantages and management of three kinds of communal forests in Tsingyuanhsien, Shansi - (1) belonging to a group of villages, (2) belonging to a single village, and (3) belonging to a clan. Recently a new organization has been formed in Kiangsu province, based on the principles of the bulletin.

It is necessary for us to start some experiments along this line with the local leaders in order to make a demonstration so that the practice will gradually spread over the whole of China.

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610. Volume, Growth, and Yield

Object: To determine the volume, growth, and yield of timber stands under varied sites.

For the growth rate of timber species we have studied the height, growth, stump analysis, stand table and yield table.

Height growth of pines: All kinds of pines have a very clear indication of their age in the number of whorls of branches. Thus the height for each year, from one to fifteen years, can be measured when the natural thinning is not so severe as to keep off the branches. About 500 trees from various sites were measured and most of them have been analyzed. A good many formulas were observed, the most interesting being the varied growth of different ages as an indicator of a good site.

Stump analysis: In order to know the general age of a stand and to secure a rough estimate of diameter growth, stump analysis is one of the most feasible methods. Many stands were measured and some were analyzed, from which it was found that the curves indicated the relation between thickness of bark in inches to all kinds of diameter outside of the bark in inches. It was then found how the corresponding age of all kinds of diameter inside the bark may be known from the curve.

Stand and yield tables: Many sample plots were measured in order to show the general productivity of various sites.

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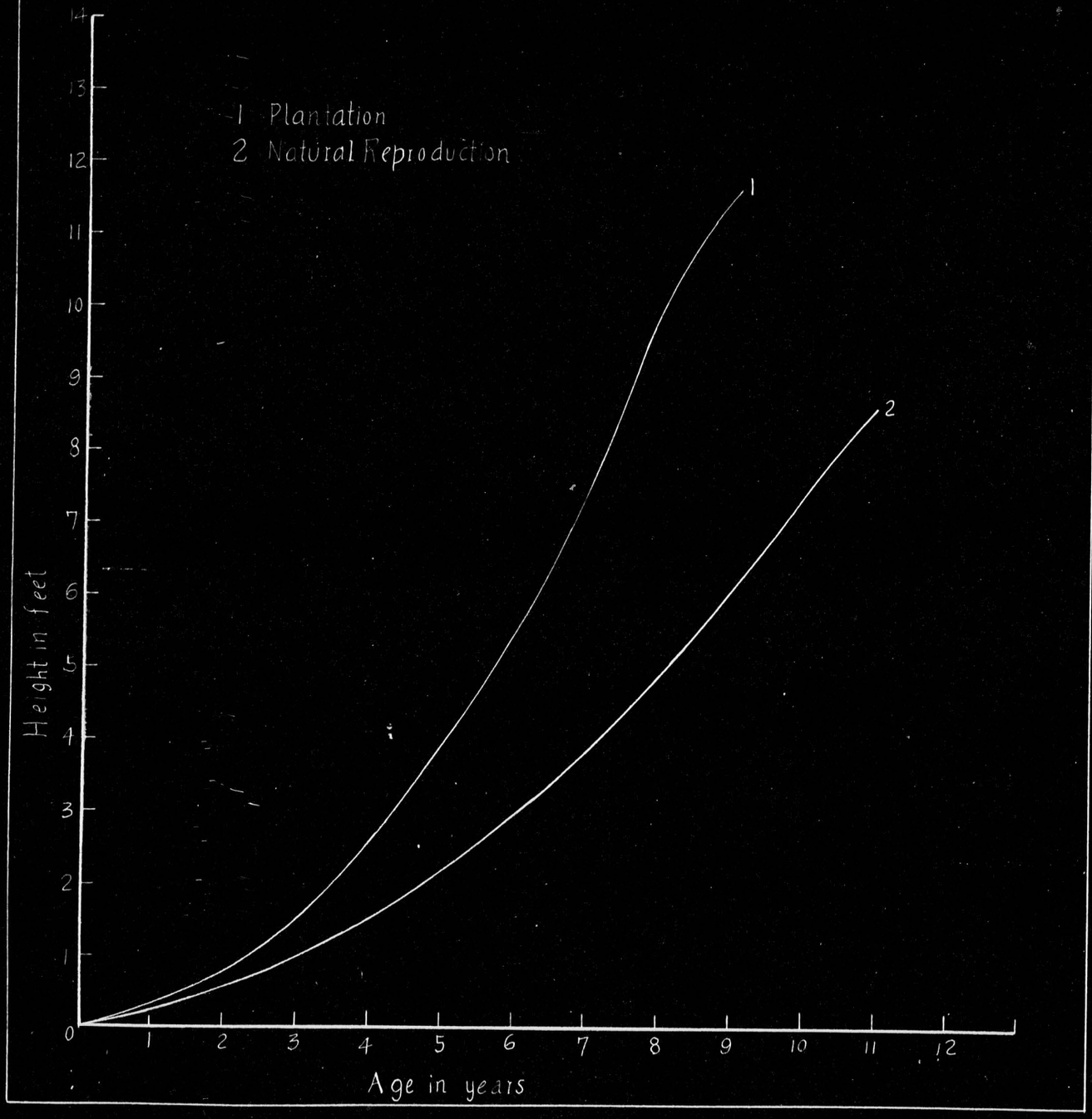
Fig 1

Comparison of Height Growth between Plantation & Natural Reproduction Pinus Massoniana In the Vicinity of Nanking



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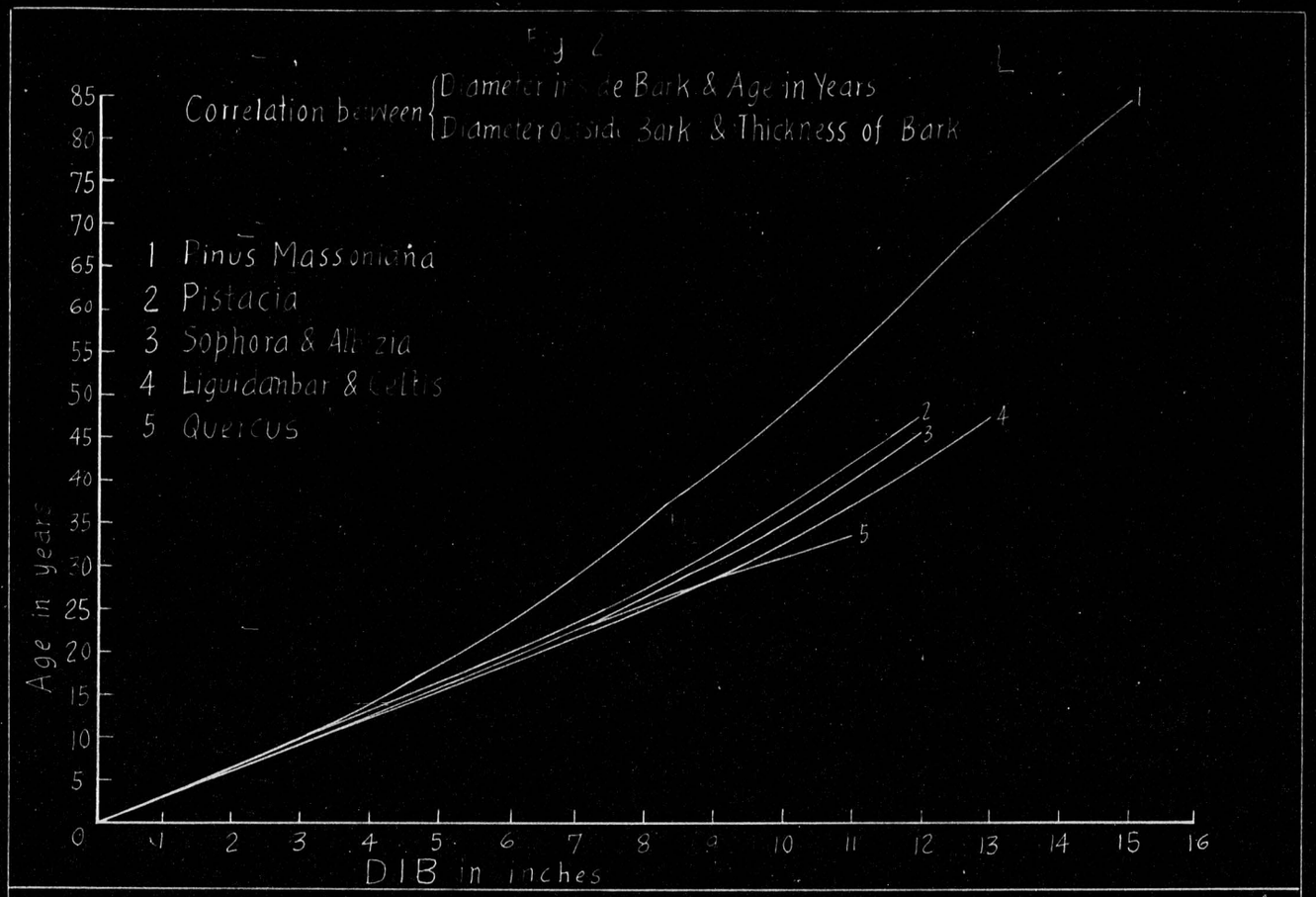
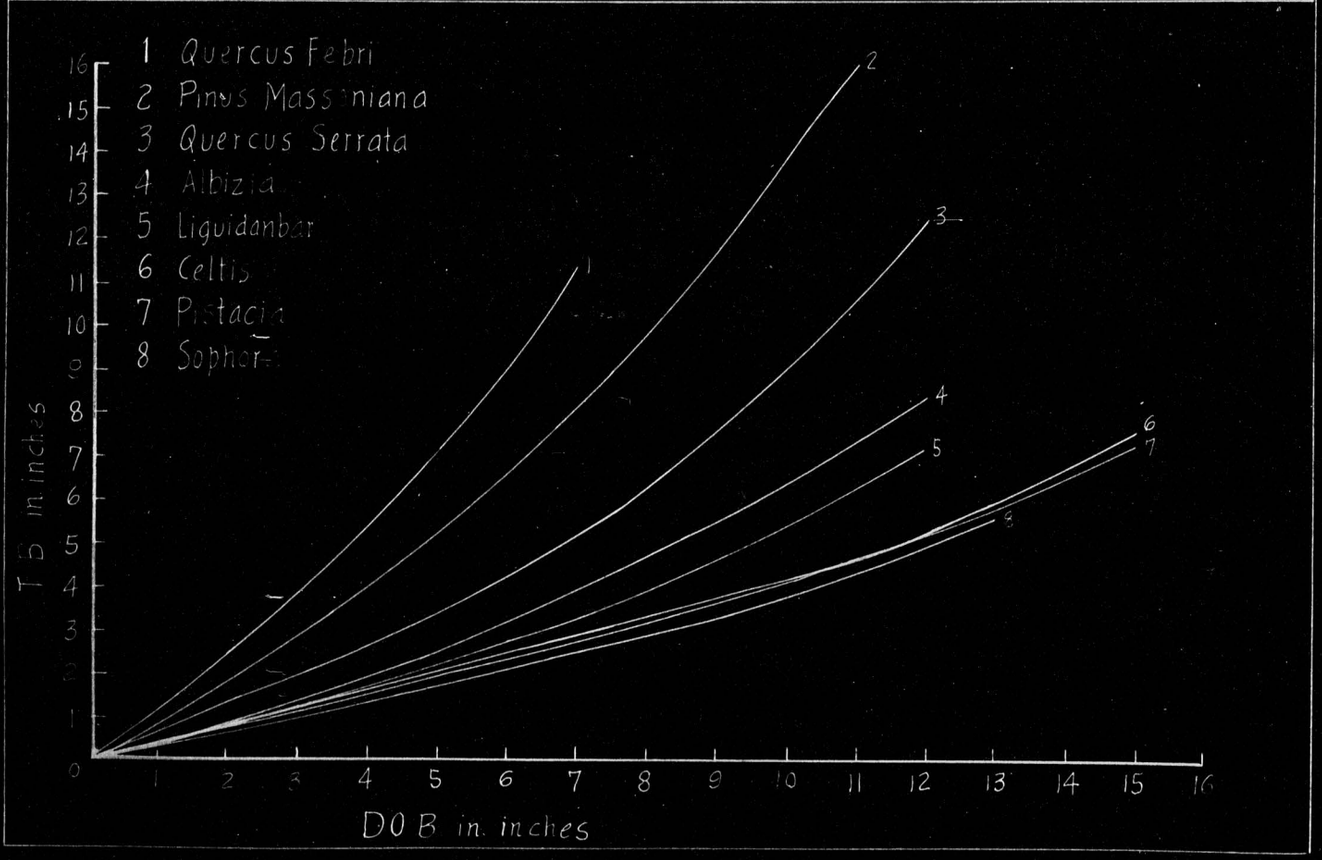

Correlation between {Diameter inside Bark & Age in Years
Diameter outside Bark & Thickness of Bark
1 Pinus Massoniana
2 Pistacia
3 Sophora & Albizia
4 Liguidanbar & Celtis
5 Quercus
Age in years
DIB in inches


1 Quercus Febri
2 Pinus Massoniana
3 Quercus Serrata
4 Albizia
5 Liguidanbar
6 Celtis
7 Pistacia
8 Sophora
TB in inches
DOB in inches

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620. Volume Tables

Object: To construct volume tables for various economic timber and wood species.

As we know, the best way to make a volume table for any economic timber species is to follow the cutters to measure each section of the stem as the stem analysis required. At the present time in China, however, real forests are rather hard to find. Much travelling is necessary, and a greater amount of money, in order to secure such data.

A table has been made for Pinus massoniana in the province of Shansi, wherein thirty individual trees in the forests were measured by following the cutters. Each section, including the stump, was measured at the small end, counted in decades and measured in inches. After the trees have been measured according to the stem analysis, each tree may be considered as ten individual trees, in general. The result is thus the same as though we had measured 300 trees. The volume of each tree is calculated. Then the diameter and height are classified according to volume and so the mean volume of each class is secured. The mean volume of each class is then harmonized by cross section paper. Finally the volume table produced was as follows:

(For other timber species not sufficient data could be secured for a final analysis, but some of them were measured.)

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VOLUME TABLE OF PINUS MASSONIANA, TSINGYUAN HSIEN, SHANSI

D. B. H. in Inches	Height in Feet								
	10	15	20	25	30	35	40	45	50
	Volume in Cubic Feet								
1	.20	.20	.20						
2	.22	.36	.40	.50					
3	.42	.69	.70	.80	.84				
4	.81	1.00	1.10	1.23	1.60				
5		1.60	1.80	1.83	2.40				
6			2.60	2.70	3.30	3.90	4.50		
7				3.76	4.34	5.20	6.00		
8				5.08	5.60	6.80	7.60	10.10	
9					7.00	8.60	9.40	12.10	13.60
10					8.60	10.60	11.50	14.30	15.70
11.					10.70	13.30	14.00	16.80	18.60
12					13.40	16.10	17.00	19.40	20.60
13					17.60	19.00	21.00	22.40	23.60

830. Timber and Fuel Prices

Object: To bring together reliable data on the price of timber, both raw timber, lumber and fuel, to serve as a basis for study in comparing the profitablemess of forestry with other uses of land, to determine the highest use to which land may be put and the kind of crop to be grown, or, if a forest, the type of trees to be grown.

The study so far has led to two classifications of timber prices. In North China, including the Yellow River watershed and Manchuria, the timber prices are classified according to a definite system, depending upon whether it is in log form or board form. Each year the timber companies meet once to determine a fixed price for each form. So far as is known, timber prices in the mountains vary very little within the last ten years, but the prices charged in the plains vary very much. This is a very important fact. The increased price is due to the cost of transportation, distance from the source of supply, which is now much greater because of the great destruction of forests in regions of easy communication.

In Central China, including the Yangtze River watershed and the Hwai River watershed, timber prices are classified according to a rule called "moe ma." This gives the value for all degrees of circumference, the larger the circumference, the higher the value. Value points are fixed forever, but the price for each 100 value points vary annually. This rule is applied only to conifers, such as cunninghamia and cryptomeria. For the hardwood species the price is determined by weight.

Fuel prices in both North and Central China are determined mostly by weight.

The data collected has been analyzed and kept on file for later publication.

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901. Wood Sample Collection

Object: To collect samples of representative woods of Asia and to make a key for identification.

Up to the present 345 species of wood specimens from China have been collected. Of these, ~~50~~ 51 species of Shantung woods were presented by Mr. Li Tai-fang, a graduate of the Forestry Department; 31 species of Manchurian woods, from Dr. George D. Wilder of the American Board Mission, Tunghsien, Chihli, under the direction of Mr. Joseph Bailie; 100 species of Kwangtung woods from Canton Christian College; 48 species from Northern China, from the Lunghai Railway; and the rest were collected from Nanking and vicinity. Besides, 166 species of Philippine woods were collected. A valuable collection from Java, comprising 74 species of tropical commercial woods, was presented by the Java Forestry Bureau through the interest of Mr. Kan Han, a graduate of the Forestry Department. We are now searching for some new collections.

A key for the identification of important woods of Nanking and vicinity has been worked out. A microscopic study has been made of 70 species and will be published in due time.

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1120. Utilization of Waste Land by Reforestation at Yihsien

An experiment in reclaiming waste land in the Shantung mountains is being carried out in cooperation with the South Shantung Industrial School. The area comprises over 100 mow of land suitable for reclamation and reforestation work. The results of spot seeding in the early part of the rainy season of 1924 with Ailanthus and Media justify the continuation of this method, when the long dry and warm spring months make planting unsuccessful. Souring of seeds of pistacia, ailanthus, etc., in a pit has been tried in the year 1925.

Figure No.

Seed spotting by students of the Industrial School, Yihsien, Shantung.

Experimental Area,
Yihsian, Shantung.

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Figure No.

Experimental area for reclamation of the dry and denuded land, Yihsien, Shantung.

View of the sowing of ailanthus and melia seed in the dry and denuded land before the rains.

May, 1925.

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931. Wood Distillation.

Object: To determine the amount of commercial chemical products to be derived from various Chinese trees and to determine the practicability of combining wood distillation with the present charcoal industry of China.

Under the experimental phase of the project, nineteen tests have been run through a retort(specially prepared with the cooperation of the Department of Chemistry of the University) under controlled conditions. Determinations have been made for

(1) the percent of charcoal by weight

(2) the percent of calcium acitate by weight

(3) the percent of methyl alcohol by weight.

The results are to be found in the accompanying table and may be used as a scientific basis for practical application of capturing volatile products of charcoal burning under present practices in the locality. The latter are under study.

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TABLE

YIELD IN PERCENTAGE

SPECIES OF WOOD	CHARCOAL PER CENT	DIS-TILLATE PER CENT	GAS and ERROR PERCENT	DISTILLATE		
				TAR PER CENT	CALCIUM ACT PERCENT	ALCOHOL PER CENT
1. Salix babylonica	31.00	60.20	8.80			
2. Quercus serrata	36.00	59.00	5.00			
3. Liquidambar formosana	42.00	46.40	9.60			1.40
4. Euonymus bungeana	32.00	57.90	10.10			1.70
5. Ailanthus glandulosa	34.00	56.50	9.50			1.90
6. Ulmus pumila	35.90	60.80	3.30		3.01	2.10
7. Morus alba	38.50	55.00	6.50	6.03	3.00	1.60
8. Robinia pseudoacacia	40.10	54.10	5,80	8.80	5.60	.79
9. Braussonetia popyfifera	41.10	55.20	3.70	10.40	4.06	1.01
10. Acer trofodi	36.00	60.40	3.60	11.10	4,80	1,80
11. Thuja orientalis	40.20	52.30	7.50	11.00	4.00	1.10
12. Pterocarua stenoptera	36.19	48.68	15.13	7.27	2.08	1.59
13. Quercus serrata	34.96	54.94	10.10	8.97	2.42	1.80
14. Dalbergia hupeana	37.90	53.67	8.43	8.61	2.69	2.17
15. Celtis sinensis	39.02	53.36	7.62	8.55	3.16	1.41
16. Castanea mollissima	37.60	44.95	17.45	7.46	2.44	1.86
17. Populus tomentosa	32.39	60.36	7.25	6.70	2.85	1.43
18. Pinus massoniana	38.62	51.02	10.34	10.15	2.09	1.38
Average	36.86	54.82	8.32	8.752	3.247	1.565

1005

Dike Plantation

Object: To determine the most profitable production of fuel and timeber on the dikes of the Yellow River.

For this project, the first important problem to be solved is whether dike plantation is favorable to dike protection or not. Opinion is divided on this point. A few engineers think that dikes usually are weakened by dike plantation, but most foresters approve strongly of this method of protection. From observations made so far, both opinions seem to be correct under certain conditions. In the region under observation the planting of trees on dikes was not only of little avail but was apt to be a source of danger. Dike walls need protection from the washing action of flood currents and from the undermining action of waves. Such protection is more effectively secured by planting groves of trees on the berm before the dike. The flood waters break their force on the stems of many trees and the waves are stilled by this multitude of stems. In ancient literature, also, dike plantation is mentions as a very good agency for dike protection.

In regard to the choice of species, method of plantation and its proper management, these were also considered. However, more observation is necessary before any practicable and reasonable scheme of dike protection can be suggested.

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Pages 145 & 146

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PLANT DISEASE CONTROL

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PLANT DISEASE CONTROL

REPORT OF THE DIVISION OF PLANT PATHOLOGY

The report herewith submitted is a summary of the results of four year's experiments conducted by the Division of Plant Pathology. Details of them will be reported separately late on when completed.

In order to meet the need of the farmers and to develop the science of plant pathology in China, a general program of work has been prepared. All the experiments and projects so far being conducted have followed the program which is as follows:

1. Plant diseases survey in East China.
2. Collection and classification of Fungous Flora in China.
3. Studies of the cause and nature of new or little known diseases of plant.
4. Development of control measures applicable to Chinese Conditions.
   a. Seed treatments.
   b. Development of disease resistant varieties of crops.
5. Extension among farmers of methods which can be used by farmers.

(1) The surveys of plant diseases in East China have been made every year since 1924. The major part of it has been however made in the vicinity of Nanking. However other places have been also covered. Most of the important crops especially the cereals are included in the surveys. These are wheat, barley, corn, millet, Kaoliang, Soybean, broadbean, cowpea, field pea, cotton and many vegetables and fruits.

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The time and place where these surveys were made are given in the following tables.

Year	Place
1923-24	Nanking and its vicinity; Ku; Nanhsuchow, Anhwei.
1924-25	Nanking and its vicinity, Ku; Nanhsuchow, Anhwei; Kuikiang, Ki; Yiehsien and Weihsien, Shantung; Kaifeng, Honan; Yu-yao, Hanchow, Tinhai, Chekiang.
1925-26	Nanking, Ku; Nanhsuchow, Anhwei; Yiehsien and Weihsien, Shantung; Kaifeng, Honan.
1926-27	Nanking and its vicinity, Ku.
1927-28	Nanking, Chinkiang, Tanyang, Changchow, Wu-sieh, Soochow and Nan-tsang, Ku.

The plant disease survey made by Mr. R. H. Porter in 1925-26 has been published in 'The Plant Disease Reporter, Supplement No. 46, by the Bureau of Plant Industry, U. S. D. A.

Plant disease survey with special attention to the covered smut of barley was made in May, 1928 along the Nanking and Shanghai Railway line. About 800 barley heads were selected from the barley infected fields for the experiment with the cover smut resistance test in the fall of 1928.

(2) Collection and Classification of Fungous Flora in East China.

Due to a heavy load of field experiments, our herbarium has progressed rather slowly. At the present, more than 200 species of parasitic fungi, 62 sp. of lichens and 39 sp. of woody fungi have been indentified and indexed. The determination of fungi were either made by Dr. J. C. Gilman of Iowa State College, Ames Iowa, or U. S. Department of Agriculture; and that of lichens was made by Dr. E. Vannis. There are more than 300 numbers of fungi have been sent to U. S. D. A. for determinations. Most of the collections were made from Ku., Ki., Chekiang and Northern China.

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(3) Studies on Specific Diseases.

Important and destructive plant diseases have been carefully studied by the members of the Division. There are as follows:

a. Gymnosporium rusts of pomacious fruits. (Almost completed) This rust caused by memgoreorieous sp of gymnosporium has responsible for a heavy loss of fruit crop such as pear, apple, etc. over the fruit growing regions in East China. The host relation of the causal organisms and the methods of control of the disease are emphasized.

b. Anthracnose leaf spot of Kaoliang (Almost completed) Kaoliang, an important cereal crop in North China, is generally affected by the anthracnome organism. Studies have been made of its life history and methods of controls which are little known to us.

c. Helminthosporium leaf spot of corn (Almost completed) Life histories, mode of infection and methods of control of the disease were studied.

d. Broad bean root rot: A very destructive diseases of broadbean in Ku. and Chekiang. Both the cause and nature of the disease is unknown. Studies are in progress.

e. Cercopsora leaf spot of Kaoliang. Another important leaf disease of Kaoliang. Studies are in progress.

(4) Development of Control measures applicable to Chinese Condition.

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(a) Seed treatment.

Smuts and rusts have been responsible for a heavy annual loss on wheat and barley in East part of China. The plant disease survey made in 1926 indicated that the losses from barley and wheat by these diseases are as follows:

	Loss %
Barley	
Loose smut	3.6 %
Covered smut	4.3 "
Black stem rust	Trace
Dwarf leaf rust	Trace
Wheat	
Leaf rust	4 %
Stem rust	Trace
Stripe rust	Severe
Loss smut	5.6
Flag smut	6.5
Millet	
Kernel smut	8 %
Leaf rust	5 "
Kaoliang	
Loose kernel smut	4 %
Head smut	3 %
Corn	
Smut	4 %

Since many of the smuts can be satisfactory controlled by means of seed treatment, the following experiments on smut control have been therefore, conducted.

1. Wheat flag smut
   loose smut
2. Barley covered smut
   strip disease
3. Millet kernel smut
4. Kaoliang Kernal smut
5. Oat kernal smut

Thru the results of the numerous experiments conducted since 1925, enable us to conclude that copper carbonate and a few other

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seed disinfectants such as uspulun and Trokenbeize are quite effective in controlling the covered smut of barley and kernel smut of millet. The results obtained in 1926-27 on barley and in 1926 on millet will support this statement.

Seed treatment experiments on Covered Smut of Barley 1926-27.

Treatment	Exp. I			Exp. II			Exp. III		
	% of smutted heads	% of smutted heads incks	% of smutted heads reduced by treatment	% of smutted heads	% of smutted heads incks	% of smutted heads reduced by treatment	% of smutted heads	% of smutted heads incks	
$CuSO_4$ dry	3.4	6.2	45.2%	0.77	4.44	77.4%	2.8	3.1	9.6%
Tillantin Dry	0.9	6.0	85	.85	5.47	84.1	1.3	3.8	65.8
$CuSO_4$ dry	0.0	6.0	100	0.03	5.47	98.7	0.7	3.8	81.6
Uspulum Dry	0.0	5.8	1.00	0.00	4.31	100.0	0.6	3.0	30.0

Exp. 1 Nanking Hulless Barley
2 Nanhsuchow " "
3 Kaifeng " "

Seed treatment experiment on Millet Kernel Smut 1926

Treatment	Yield for treated rows	Av.yield for check	Gain Bu per acre	Av.%smut for treated rows	Av.% smut for check
Selected heads	20.0	14.7	5.4	4.7	30.9
Formaldehyde 1.320	19.1	15.0	4.1	3.3	21.4
Uspulum solution.3%	16.4	15.0	1.4	15.2	21.4
Uspulun dry	18.6	15.0	3.6	3.0	30.1
Copper carbonate	18.1	15.0	3.1	4.1	30.1
Tillantin dry	19.9	15.3	4.6	2.7	27.1
		avr.15.0		avr.	26.8%

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By comparing the treatments with their own checks, the effectiveness of the seed disinfectant on smuts very obvious. Furthermore it is interesting to note on the millet smut experiment that seeds from selected heads gave the highest increase in yield.

Detail results of the above experiments are ready for publication.

Besides controlling covered smut of barley and kernel smut of millet, ($CuCO_3$) Copper carbonate is also partial effective in controlling flag smut of wheat.

Experiments with Kernel smut of Kaoliang and Covered smut of oats are in progress. Although promising results have been obtained in controlling the stripe disease of barley and loose smut of wheat by seed treatment, but further experimental work is needed for the final conclusions.

B. Development of Disease resistance varieties.

No control measures of plant disease is effective, practical and economical other than the development of resistant varieties. Many plant disease such as wheat rust, bean anthracnose, etc. could hardly be controlled by other means, are possible to be eliminated by the growing of resistance varieties. Satisfactory results have been already obtained by Western countries. With this idea in mind, attempts have been made to develop strain or varieties of our crop plants which are resistance to certain diseases. At present, the following experiments have being carried out by the Division of Plant Pathology in cooperation with the Division of Agronomy.

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1. Wheat varieties resistant to flag smut
2. " " " " leaf rust
3. " " " " strip rust
4. Earley " " " covered smut
5. " " " " loose smut
6. " " " " strip disease
7. Millet " " " kernel smut
8. Kaoliang " " " " "
9. Broad bean" " " roots rot.

Summary of the experiments on the development of disease resistant varieties.
1925 - 1928.

Name of crop	Name of disease	1925-26 Total varieties	1925-26 Total No. of varieties did not show up disease	1926-27 Total No. of varieties	1926-27 Total No. of varieties did not show up disease	1927-28 Total No.	1927-28 Total No. of varieties did not show up disease
Wheat	flag smut	311*	157	582*	546	582*	457
				892	724	694	480
Wheat	stripe rust	482*	216	639*	342	587*	511
						76	10
Wheat	leaf rust	482*	448	639*	365	587*	483
Barley	covered smut	340*	317	338*	214	311*	193
		1088	788	402	205	194	59
"	loose smut	340*	339	339*	337	328*	325*
"	stripe			322*	311	365*	341
Millet	covered smut	625	25	57	34		
Kaoliang	kernel smut	1300	195	167	62		
		81*	74	78	47		
Broad bean	root rot	361	284	128	117		

* foreign varieties.

There are many strains or varieties which did not show up the sign of diseases through 2 or 3 years' tests. Those which have been free from the attack of disease, will be tested again for next few years. Judging the results of the experiments, the development

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ANIMAL DISEASE CONTROL

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DIVISION OF BACTERIOLOGY - STUDIES IN ANIMAL DISEASES

by Chen Ken.

The work of animal diseases during these years has been mainly concentrated on three lines, namely, Rinderpest Control, Poultry disease control and Silkworm disease control. Many important conclusions, of practical value, were made in the course of these investigations as indicated by the reports and other papers published by this Division.

Rinderpest Control

A greater part of this work was done in the years 1923-1924 in cooperation with the Agriculture Department of Baptist College, Kaifeng. It is during this year that the farmers in the privinces north of the Yellow River suffered wide spread epidemics of rinderpest of cattle. The effectiveness and length of immunity conferred by simultaneous inocculation methods was studied. We found the mortality of cows treated by simultaneous methods was high, ranging from 10 to 15 per cent. This was discouraging to the farmers who were not accustomed to foreign methods of treatment. To remove the objection of this otherwise good method, a combined method was devised by Dr. Gibbs and used successfully for the treatment during the latter part of the work. By a combined method is meant that the cattle were given first a preliminary inoculation of anti-rinderpest serum five days or a week previous to administration of both virus blood and anti-rinderpest serum (simulta neous method). We found this method reduced the rate of mortality.

The fact that virus blood must be secured from rinderpest cattle not complicated by other diseases and that the virus loses it vitality after not more than 24 hours, made the work very difficult, especially in the field where the laboratory facilities were not adequate. Dr. Gibbs later found that he was able to keep the virus blood in active

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state from five to eight days by adding three-fourths of its volume of glycerinated bile. This discovery enabled us to work over a much larger radius from Kaifeng. Nevertheless, it did not lessen the cost of the material for the treatment, which proved an obstacle very difficult to overcome.

Efforts were made, during the year of 1924-1925, to make a sort of vaccine by concentrating the serum to dryness. This vaccine was used with success at Nanhsuchow. Due to the political unrest in the north, this work was necessarily discontinued.

In the year 1925-1926, a rinderpest hospital and serum laboratory was erected near the University Sericulture Building. This will make it possible for us to manufacture our own produce and us it more advantageously in the field.

Poultry Disease Control

With the cooperation of Midland Packing Company during 1923-1924 Dr. Gibbs was able to make observations and studies of poulty diseases in China. He found the important maladies of domesticated birds, namely, chicken cholera, chicken pox and vermin parasites. Chicken cholera was found to do more damage than any other disease. Since most of the birds were bought in the North, Dr. Gibbs made a trip to Tenghsien in the southern part of Shantung province. There, he observed that chicken diphtheria and coccidiosis were also very prevalent.

Most of these diseases could be eradicated or greatly decreased by killing off the exposed birds and disinfecting the premises.

Silk Disease Control

Flacherie and Grasserie: These are frequently observed in the rearing rooms of the University Sericultural Building. They rank as high as pebrine as far as damage is concerned. A number of diseased worms were brought to the laboratory and a thorough study was made on

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the etiology of these two diseases. A new organism, which we named Micrococcus bombycis, was isolated from practically all of these worms. We also found that this particular organism could be isolated from every stage of the metamorphosis of diseased silkworms. In other words, they seemed to be transmitted from generation to generation. While no single method was discovered for the control of these diseases, yet the rat of mortaility could be materially cut down by giving more attention to the details of the rearing rooms, feeding with fresh leaves, and destroying the diseased worms before they had been allowed to crawl into the botton of the tray or into the straw.

Pebrine: Biability of Pebrine corpuscles was studied in the year 1924-1925 and we found that they are hard to sterilize. They are very resistant to dry heat and even to moist heat, except the burning heat of the naked flame. Boiling water, however, was found to be a very good medium for the washing of slides, cover glasses, cups and pestles used in microscopic examination of moths. Boiling water has solvent action of the fats that fix the corpuscles on the slide causing much confusion and unreliability of the tests.

During the year 1925-1926, important experiments were conducted on the basis of a paper by Dr. L. R. Cleveland "Toxicity of Oxygen in Vivo and Vitro, Animals Defaunated without Injury." published in the Biological Bulletin, June 1925. This work is still being continued. A great deal of light was thrown upon the subject during the course of the experiment. We have reason to believe that it is possible to control Pebrine, the most dreaded disease of silkworms, by orygenation methods. The detail of the experiment will be given in a separate report to be published by this division.

Investigation of Infectious Abortion of Cattle in China.

During the years 1923-1924 and 1925-1926, 128 foreign cattle and 25 native cattle were tested by microscopic agglutination test.

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Of all the foreign cattle tested, 28 or 29.6 per cent gave distinct positive reactions, 88 or 69.1 per cent did not react and 2 or 1.3 per cent gave doubtful reactions. of the Native cattle, 23 or 92% were non-reactors, and 2 or 8 per cent gave definite positive reactions. Whether or not the infectious abortion in native cattle was transmitted from foreign sources, remains for further investigation.

Control of Stomack Worms in Goats:

Some experimental study was made of drugs used in the control of stomach worms of goats. We found that nicotine-sulphate mixed was very effective for this purpose and less poisonous to the goats. Six goats were treated by this mixture and show no eggs or larvae after two months treatment.

Soil Bacteriology:

Eighty-four soil samples were brought by farmers and members of the college and were studied with special emphasis on the activity of legume bacteria. Pure cultures were isolated and sent to places where the growing of legumes were not successful.

Experiments on the relation of native natural fertilizers to the infectiousness of legume bacteria were made. Our results indicate that the fertilized pots gave more and large nodules than the non-fertilzed pots. We therefore advocate that bean fields should be fertilized just the same as others especially by gypsum which gave the highest result in this experiment.

Pure Culture Collection:

We have now over a hundred pure cultures of bacteria, yeast and mold, collected mostly from Chinese sources. Exchange relationships were made with the American Type Culture Collection, John McCormick Institute for Infectious Diseases during the last few years.

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Publications and reports:

Observation and Experiments on Rinderpest
Charles S. Gibbs - The China Journal of Science and Arts
Vol. III No. 7, July 1925. pp.399-409.

Flacherie or "Wilt Disease" of Silkworms
Charles S. Gibbs and Chen Ken - The China Journal of Science and Arts, Vol. V No. 2 August 1926, pp. 83-87

The Intrdermal Test for the Virulence of Diphtheria Cultures.
Charles S. Gibbs and Chen Ken - Journal of Immunology Vo. XIV No. 2, August 1927.

The Control of Stomach Worm in Goats
Sheo Piao and Charles S. Biggs - The Lingnaam Agricultural Review, Vol. 4, No. 1.

Chntagious Abortion of Cattle in China
Charles S. Bibbs, Chen Ken and Sheo Piao - Lingnaam Agriculture Review, Vol 4, No. 1.

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RURAL EDUCATION

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DEPARTMENT OF RURAL EDUCATION

Personnel

J. B. Griffing, Founder of the Rural Education Work of the University, Head of the Department of Rural Education, 1923-1926 and Sept.1927-March 1927. C. W. Chang, Acting-head June 1,1925 to April 20,1926 and Y. W. Chang, Acting-head, April 30,1926 to Sept. 25,1926 and March 1927 to June 1928. Swen Fang, Li Ying Hwei, Associates. Li Chia-chiai, Wang Ching Yu, Li Tsing-ho, Chen Sheo-ang, Chiang Liang-pih, Chang Peh-an and Tso Ming-chi assistants.

Purpose of the Department

The work of this department in the orignal plans was for the purpose of training rural workers and creating education material and literature for the training of such workers and for use in general rural education. Besides teaching rural education subjects in the summer schools of the University and other institutions, two courses have been given in the Community Center. The first course had in mind the training of selected workers of junior middle school standard, with the idea of training 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. This course is planned to prepare them for positions such as experiment station managers, rural school superintendents, teachers of agriculture in the higher primary and lower middle scholls, etc. Three rural schools have been organized under different rural conditions to serve as demonstrations of the type of rural education we are trying to teach.

Rural Normal School.

With the erection of the Rural Normal School buildings which include dormitory, dining and social rooms, class rooms and laboratories located in a rural center west of the University, facilities were given which made possible the work. The physical plant is quite adequate at this time for the needs and is placed in a rural envirnoment where there are plenty of children for the practice school and where there are many opportunities for community service along rural lines.

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Fig. 1. Plowing - work done by the students.

fig. 2. Collecting specimens at Purple Mountain.

Fig. 3. Collecting botanical speciments.

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The distinctive feature of the Rural Normal School is the training of rural teachers for practical forms of community service in addition to the regular tasks in the school room. During the year, each student aided in making a rural community survey, took part in extension work and distribution of pure seed, had practice in teaching night school, education and entertainment of the community through plays and exhibits and daily field work in the school garden and nursery, together with field work in the growing of improved crops.

Four classes of Normal School students have graduated and been given certificates, with a total number of seventy-one. They have secured positions that are scattered over twelve provinces, as far north as Fengtien, south to Fukien and west to Szechuen (See Table I) Thirty-nine of these graduates or 56% are at the present time running and teaching in rural schools (See Table II) The schools are largely supported by the government or the missions but a number are entirely or partly self-supporting with the earnings from the cultivation of land by the students , or by sharing the profits from cooperative societies organized by the teacher.

We receive frequent reports from the graduates as to the progress of their work and of their problems. One of our 1926 graduates Tien Sih-ken, a native of Kwan Dien, Fengtien, has reported that he was asked by the men of the village to carry on crop experiments in addition to his work of running the school. In another letter he told us that he has been asked also to take charge of a cooperative society with a capital of more than ten thousand dollars. This shows clearly that the rural school should be the center for all kinds of rural improvements for the community, and the rural school teacher should be an agriculturalist and at the same time able to organize the farmers in order to render service to them -

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otherwise the school is of little value. It is impossible to have a successful rural school unless the connections are made with the society of the community.

There is another 1926 graduate, Chien Hsiang-chi, a native of Hsen Hwa, which is only forty li southeast of Nanking. After his graduation he decided to return to serve his home village. The name of the village is Sung Shuh and consists of about three hundred families. For two years he held his school in a deserted temple and then the farmers became interested in his work. With the help of the farmers and other friends he was able to build a school house with a straw roof and earthern walls for two hundred dollars. Under his direction the pupils with some help from the farmers in the village the building was constructed. He has now secured land for his work and in cooperation with the farmers has planted trees on the surrounding hills. His school is self supporting.

Table I. Distribution of Rural Normal School Graduates by Provinces

Class	Ku.	Anh.	Chek.	Fuk.	Hup.	Chih.	Sung.	Feng.	Ki.	Ho.	Sze.	Tung.	
1924	5	2	1	2	1	2				2	2		17
1925	8	1							1		1		11
1926	10	5		2		1	3	1				1	23
1927	11	5	1		1	1	1						20
Total	34	13	2	4	2	4	4	1	1	2	3	1	71

Table II. Distribution of Rural Normal School Graduates by Occupation

Class	Running Rural Schools Govt. & Private Schools	Mission Schools	Agri. work	Religious work.	Public or military	Further Study	No record	Total
1924	4	3	2	3	1	2	2	17
1925	5	3	2			1		11
1926	12	4	3	1	2		1	23
1927	6	2	1	3	3	3	2	20
Total	27	12	8	7	6	6	5	71

Special One Year Cour in Agriculture

The object of the Course was "Primarily to train rural, agricultural workers so that they will be able to meet the particular problems in rural communities." Special emphasis was placed on gaining skill in practice by arranging all class room work in the forenoon and requiring during the afternoon, field, garden or nursery operations cor

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responding to the morning lessons. All courses which covered a fairly wide range were given in Chinese. Besides the regular work, men interested in sericulture, crop growing and teaching were given special work in these lines.

Dormitory and class rooms for this course were formerly in the University gardens buildings, but it was decided to incorporate the special course with the normal course at the Normal School center, which was a better center and in a rural environment thus giving mutual aid to the two courses. In order to give sufficient time for special work along different lines, and in accordance with the experience of the past few years, it has been decided to make this course into a two year course.

Table III shows the distribution of the graduates by localities. Five classes with a total of 188 have gone to localities over fifteen provinces, practically throughout the whole country. One hundred and one or 55% of the graduates are now engaged in agricultural and rural work. Forty-three of these are in government and private agricultural institutions. Thirty-two are in mission institutions. Twentysix have returned to their home communities. Forty-five are teaching and of these, 26 are in government and pricate schools with 19 in mission schools. A mare detailed analysis of these statistics will be found in Table IV.

Table III. Distribution of Special One Year Course Grad. by Provinces

Class	Ku.	An.	Tung.	Hun.	Sung.	Sze.	She.	Chi.	Hon.	Che.	Fu.	Ki.	Sha.	Hup.	Feng.	Total
1923	13	5	2	5	5	5	3	1	1		2					42
1924	12	2	2	3		6	3		2	3	1	1				35
1925	3	9	1	3	3	8	1		2	1			1	3		35
1926	12	5		5	5		1	2	3	3	1	1	1	1	3	43
1927	9	3			5	1		3	3	2	3		3		1	33
Total	49	24	5	16	18	20	8	6	11	9	7	2	5	4	4	188

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Fig. 4. Wukiang Rural School.

Fig. 5. Tai Ping Meng Rural School.

Fig. 6. Kuleo Rural school - on a field trip.

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Class	Rural Improvement				Teaching Agr.			Further study.				
	Gov. and Private Inst.	Mission Inst.	Home community	Govt. & Private	Mission Inst.	Agri. Business	Public or Military	China	Abroad	Died	No record	
1923	8	7	6	6	5	3	3				4	42
1924	9	5	4	5	3	4	2	1			2	35
1925	7	6	5	4	3	2	4	1	1		2	35
1926	12	9	5	7	6		3				1	43
1927	7	5	6	4	2	3	4	1		1		33
Total	43	32	26	26	19	12	16	3	1	1	9	188

Rural demonstration Schools

It has been our plan to have the rural school the centers of the rural communities with all sorts of rural services, In order to have practice centers for our Normal School students as well as for the extension of rural education, three demonstration schools have been maintained. The school at Wukiang, Anhwei has been conducted by Mr. Li Chi-chiai, a graduate of our one year short course in agriculture, who also manages our improved cotton demonstration farm situated along one of the main roads from the country into the city and has charge of a cotton cooperative selling society. The school was started with fifteen pupils and at present there are forty-five. We have one school situated at Tai Ping Men - outside the city of Nanking, and carried on in connection with the experiment station of the University. This school has an average attendance of thirty pupils. Our third school is at the Normal School and the pupils have been limited to sixty. The original school house proved inadequate so we have re-built the building making a larger class room and with a small room for the teacher, a guest room and a room to be used for the shop.

Part of the work of the rural schools is to have a school garden for the pupils to use for practice in gardening, crop cultivation and a nursery. Special emphasis has been put on the method of having the pupils

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School gardens of Kuleo Rural School.

Fig. 7. Cultivating cabbage.

Fig. 8. Cultivating cucumber.

Fig. 9. Harvesting wheat by the 5th Grade.

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learn to do useful work based on "learning by doing."

Social, Extension and other activities at various Rural Community centers of the department:

With the help of the Departments of Extension and Rural Economics and Sociology we were able to undertake the following types of activities of which we believe to be the most important part of our work.

(a) The Night School At each of the centers of the department there is a night school. The special Course students used to carry a night school at the University Gardens for the laborers in the gardents, while at the Normal School and Rural Schools, night schools are offered for the neighboring farmers. The night school at the Normal School and the one in Wukiang have proved to be very propserous lately.

The absence and gradual decrease in number of students in the night schools after the opening is a common difficulty among all night schools. To solve this problem the following methods were used:

(1) To devote one evening each week to social activities with games, jokes, simple plays, moving pictures, etc. to keep their interest

(2) Each evening to take part of the time for current events and story telling. Stories are told to a most interesting point, making the farmers very anxious to return and hear the rest of the stody the next day.

(3) Writing current daily farm operations as additional material for them to read.

(b) Social Meetings and Exhibits. Besides the regular social meetings, a number of special gatherings were held at different plades during the year, plays were given at Christmas, at important Chinese Festivals and on special occasions like idol processions and country fairs. The plays were always instructive rather than simply for amusement. Frequently some of the well known farmers were asked to take

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Fig. 10. Games at Kuleo Rural School.

Fig. 11. Games at TaiPingMeng Rural School.

Fig. 12. Pulling rope - played by the farmers when on a picnic at the Normal School Community Center.

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part.

After harvest exhibits of the produce of the school gardens and that of the surrounding farmers were held at different rural schools in order to gather the farmers together and to encourage the production of better crops by giving prizes to those who produced the best ones. Plowing and other kinds of demonstrations are usually given at the same time as the exhibits.

(c) Rural Recreation. One of the most important phases of activity that is lacking the rural communities in China is the right kind of recreation, and as a result the majority of the farmers work on their farms the year around, living miserable lives without any kind of recreation. Some of them who are tired of the deadly routine of farm work either go to gamble or else engage in some superstitious activities, which always bring harm to the rural districts.

During the last few years, rural recreation has been greatly promoted by various sections of the department. In the special course and the Rural Normal School a course in rural recreation has been added. Games which are adapted to rural conditions are selected and additional ones made. These games are played without equipment, or with the simplest equipment available like bean bags, trig of trees, etc. which can be very easily made as the materials are always avail able. Students and teachers play together daily trying to improve the games and make them ore interesting to the farmers. Students of the peoples schools and the neighboring farmers are occasionaly gathered together in order to teach them the games. Very simple games are taught to the rural school pupils.

At the Rural Normal School center and at Wukiang equipment for games, both out doors and indoors, were provided. Farmers were always welcome and large numbers of them ~~of~~ come in the evenings. Mr. J. B. Griffing secured contributions amounting to $42.51 for a set of

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Fig. 13. Music Club at Wukiang Rural School.

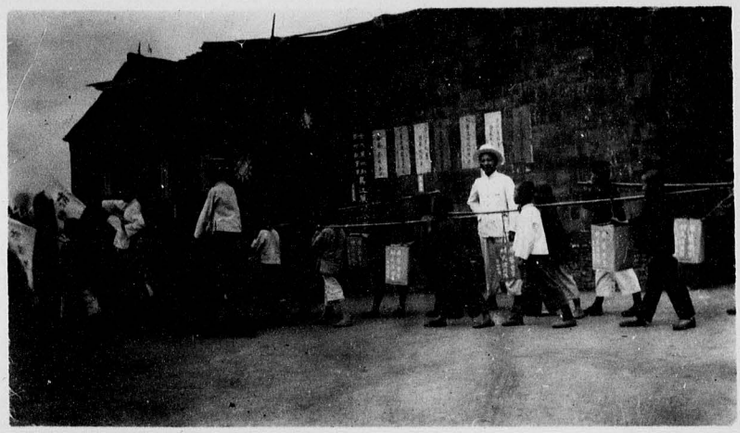

Fig. 14. "Fire" Club at Wukiang Rural School.

Fig. 15. Baby Welfare Club at Kuleo Community Center

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Chinese musical instruments and a phonograph with records was purchased for the Wukiang School. Farmers have participated in securing these gifts and a great deal of interest has been aroused. We have similar equipment at the Normal School Center.

(d) Rural Hygiene and Sanitation. Among the many rural problems the health of the rural people and the sanitary conditions in the rural districts seem to us to be of great importance. If this kind of service is neglected, rural improvement of all kinds will be greatly handicapped. Vaccination against small pox and medical treatment of the common diseases has been part of the Wukiang service for years. Recently we were able to secure Mr. Chang Peh-ang, a well trained and experienced nurse, to be our medical director and teacher of hygiene and sanitation. The has organized a clinic room at the Normal School center and we are able to do more work along this line. During two and a half months 285 vaccinations were made at the several centers in addition to those done at Wukiang by Mr. Li Chi-chiai. Two hundred and fifty treatments of common ailments like trichomo, scalded heads, etc. were made. Fees at cost price are usually collected.

Because of the great ignorance of the farm women in caring for their babies a Baby Welfare Club was organized. Mr. Chang taught the mothers the best way to care for their babies and offered prizes for the best cared for baby. Mr. Chang visits the homes frequently and calls a meeting of the club whenever he feels it is necessary. About fifteen to twenty women have joined the club.

Demonstration lectures on the question of health and sanitation were given both to the rural school pupils and to the neighboring farmers. Besides the battles fought by the pupils against flies and mosquitoes, pupils and teachers go together to the neighboring farms on Saturday afternoons with brooms and shovels to clean the surroundings of the farm hourse, special attention being paid to clean the sewage. Farmers finally became ashamed and began to do the work them

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SATURDAY AFTERNOON CLEANING GROUPS AT KULEO RURAL SCHOOL.

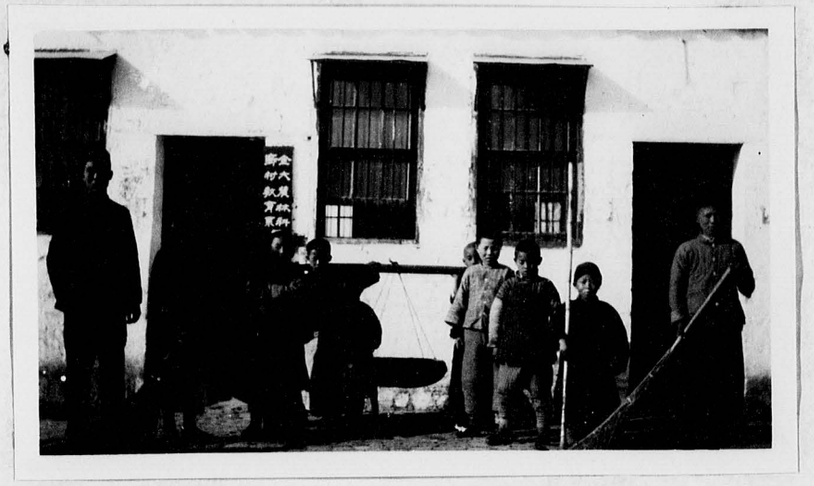

Fig. 16. Organized and ready to start from the school.

Fig. 17. Cleaning at one of the neighboring farms in the Kaleo Rural district.

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selves.

(e) Rural Organizations. In connection with each of the rural schools, children's associations were organized, the object being for the children to grow certain crops in competition and particularly the children not in school. At Wukiang a cotton club was organized, at TaiPingMen a Corn club and at the Normal School corn and Spinach clubs were organized. One of the pictures shows the children of the Spinach Club with the best piece of spinach in the foreground. The aim of the club was to interest the children in growing crops, to teach them the right methods, to read leaflets in relation to soils and the crops and the introduction of pure or good seeds. At the Normal school rural center, an association of the gardners was organized. The association consists of about ten men who meet frequently to discuss the technique of the cultivation of vegetables. Some of their experiences are very valuable. With the application of the principle of science we wrote the method of growing certain kinds of vegetables and had the information put into leaflet form. They were written in simple language and in the language used by the farmers, and serve as excellent material for the night schools.

On the 15th of the second moon, it is the custom of the farmers around the Normal School center to go to Mao Shan to burn incense. We did not stop them but organized them to gether for a picnic. National flags and Chinese brass musical instruments were the prominent features in the group while going over the mountain. Group games and mucis were the recreation used at the foot of the mountain and the farmers seemed to feel they had enjoyed a very happy day.

There are a number of other organizations and there are some still in the process of being organized. Cotton cooperative marketing association has been organized at Wukiang and plans are being made for wheat and egg cooperations. Cooperative selling of vegetables has been practiced at the Normal School center. Other associations like

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Fig. 18. The Spinach Club showing crop in the foreground.

Fig. 19. Hotbed for vegetable seedings at Normal School Center - seedlings are distributed to neighboring farmers.

Fig. 20. 40 farmers have a picnic at MaoShan.

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cooperating in buying and fire companies are to be organized.

(f) Other activities. The women's club for the farmers' wives used to be at the Normal School and is not replaced by a half day school for women in cooperation with the "New Heart Association" organized by a group of students in the University. Besides games, storeis, etc. given at the social hour, regular class work has been offered. For the social hour the number is about forty but the attendance for daily class work is about twenty.

Much effort has been made to have connection with the nearby farmers. At the Normal School center a social room with a number of games is provided. The reading room which contains newspapers and simple books is also open to the farmers. Farmers are coming in closer and closer contact with us. They come very frequently, especially in the evening. When the new rural school building was completed, the neighboring farmers presented scrolls, fire crackers, etc. offering their congratulations and helping to celebrate. This shows their interest and appreication of our work in their community.

Publications

(A)Rural text books The promotion of rural education along practical limes has been handicapped by the lack of suitable text books and teachers' guides. To remdy 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 taken up according to the project method. The subject matter is arranged according tothe 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 emphasize learning by doing rather than the old fashioned process of memorizing 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 teach-

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ing the various projects. Both texts and manuals are illustrated with original drawings prepared by Chinese artists. Mr. J. B. Griffing wrote the English text which was translated into Chinese by Mr. Shao Teh-hsing.

Owing to the ease with which the project work can be adopted, these texts and teachers' manuals are suitable for the 5th and 6th year of the higher primary schools, or in case no agriculture has been given, for the first and second years of the junior middle school. This series is being published by Edward Evans & Sons, Shanghai. The first and second volumes of text books as well as the teachers' manual are already issued.

(b) Lecture notes and leaflets. As all the subjects in the Special Course and Normal School are given in Chinese, lecture notes are prepared by teachers and mimeographed. These notes were writeen by the absorption of the principles of western books and with reference to Chinese literature, but the most essential thing was that they must be practical under Chinese conditions. Mr. Chang Chi-wen's notes on cotton culture has been published at the Commercial Press, Shanghai.

For the use of rural and night schools leaflets on agriculture and nature study in simple language have been written. They are all mimeographed and tested before they are published.

Summer Schools and Farmers Week.

During the past five years, three summer schools and two farmers weeks have been held at the College of Agriculture and Forestry and this department has taken an active part in them. Courses in rural education, ethods of teaching agriculture, general agriculture, etc. were given by the department. In cooperation with other schools and mission centers similar subjects were taught by our men at their summer schools.

Projects under Investigation.

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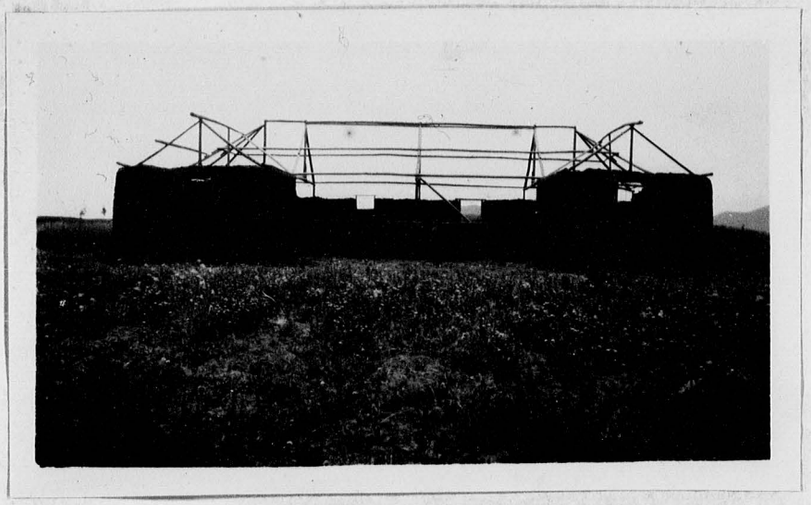

Fig. 21. Building the rural school at SungShuh. The prinicpal of this school was instrumental in having his students build the school house - all the work being done by the pupils.

Fig. 22. Showing Short Course students harvesting Wheat.

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Experiments on the growing of Chinese Vegetables.

In contact with the local gardeners we are admired by some of their experiences in vegetable growing. The thing that they lack is the knowledge of science. They know how to do certain things but they do not know ehy they should do it in that way. They have many questions and it is our duty to make experiemtns for them and to introduce to them good seeds as well as new knowledge. We use their experiences in wirting leaflets and bulletins which prove not only useful as reading material in rural or night schools but act as a guide in the work of schools and home gardens.

Home Industries. During the winter, farmers and farmers' wives waste a great deal of their time as well as money as they can find no work to do. Thus home industry of some kind is of utmost importance to rural improvement. Recently, at the Normal School center investigations have been made in in relation to making simple objects out of straw, bamboo or similiar materials. We are trying to make objects that are useful on the farms so that this kind of work can be easily extended. This forms part of the lessons in the rural and people schools.

-- Chang Yuen-wei.

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THE RESEARCH LIBRARY

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Pages 180, 181. 182

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culture and Forestry. It has been established since the fall of 1923 under the Famine Prevention Work program; but its origin goes back two years before that date to the cooperative work with the United States Department of Agriculture. The staff has been enlarged from three members at the beginning to six since September 1926.

The aim of the Research Library is to make known and available Chinese literature on agriculture and famine, and related subjects, especially in old writings. Its work beginning with the indexing of old Chinese books, till recently includes the following three main lines: (1) collecting of books, (2) compilation of "Agricultural Encyclopedia Sinica" and (3) compilation of "Agricultural Index", each of which covers some side issues. Besides, the Research Library has tried to aid faculty members, students and others in locating material in Chinese literature bearing on particular problems. Special researches have been made in the history of famines in China.

II.Collecting of Chinese Books

Emphasis is placed on the collecting of old Chinese books on agriculture, famine and related subjects. Not only books dealing specially with agriculture, but also those containing material on agriculture as a part are to be collected. The nature and extent of this collection may be better shown by the following statistics:

Books on	June 1923 Sets	vol.	June 1924 sets	vol.	June 1925 sets	vol.	June 1926 sets	vol.	June 1927 sets	vol.	May 1928 sets	vol.
Agri.	17	243	58	1602	106	1768	136	1870	141	1991	166	2032
Famine	3	3	29	85	39	121	41	126	41	126	41	126
Geograph ical wks.	8	199	450	5340	1012	11226	1223	13615	1396	15214	1596	16914
Lei Shu(old encycloped eas)	19	2685	41	3476	47	4089	64	4727	67	4963	77	5219
Ts'ung Shu(collectana)	27	5183	71	8482	112	11699	224	15479	238	15933	258	16807
Others	4	162	46	1819	51	1856	52	1896	52	1896	76	2237
Total	77	8475	694	20804	1367	30759	1740	37713	1935	40123	2214	43335

Besides books, efforts have also been made in collecting agricultural periodicals, bulletins, reports, and especially recent publications on farmers' movements in China.

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III. Catalogue of Chinese Geographical Books;

As geographical works, especially offical gazatteers or regional geography of different parts of China, constitutes a large part of our collection and are becoming difficult to collect, a catalogue of these books up to the end of October, 1926, was mimeographed. Since then, a considerable addition has been made, and we are planning to have this catalogue brought up to date and printed after the end of June, 1928. That part of our collection is made up of the following kinds and numbers of volumes:

	October 1926		May 1928	
	Sets	Volumes	Sets	Volumes
Geography, general works	15	266	15	266
China, general works	7	36	8	37
national	47	551	52	607
local (official gasatteers)	867	11,606	1055	13,424
special	261	1,620	314	1,813
travel and guide bks	23	53	26	56
World	46	264	56	283
Maps	73	241	75	244
Total	1339	14,637	1603	16,780

In addition, there are 138 and 184 sheets of maps in October 1926 and in May 1928 respectively.

IV. Bibliography of Chinese Literature on Agriculture.

In order to make known the extent of old Chinese literature on agriculture, a bibliography was prepared and published in June 1924. Investigations were made in the libraries of Nanking and of neighboring cities in Kiangsu Privince and various catalogues. The extent of this first list is quite surprising to us. Over 2000 titles were listed and classified under 21 divisions.

As the above bibliography is little more than a mere list, further effort has been made to compile an exhaustive annotated bibliography of special agricultural books with notes to the authors, the contents, the kind of edition, the date and place of publication, trueness or falseness of the text, whether existing or lost, extent of completeness if existing, etc. Already a considerable part has been accomplished.

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V. Indexing of Old Chinese Books on Agriculture:

This project extended back to the cooperative work with the United States Department of Agriculture. About eight books were indexed during that time, though most of them only those parts which relate to agriculture were indexed and only the index of one book was nearly carried to a finished form. By the finished form, we mean an index in book form and two sets of card indexes, one filed according to Chinese characters, and the other filed by English translations. After the organization of the Research Library, this project was continued, and extended to cover books on famine, until substituted by a new project evolved from it. On the whole more than twenty different books on agriculture and famine have been indexed, and six of those carried to the final step. Special effort has been made in the appropriate English translations of Chinese terms and the scientific names of plants.

VI. "Agricultural Encyclopedia Sinica."

The compilation of "Agricultural Encyclopedia Sinica" is a new project grown out of the problems which have arisen in connection with the indexing of the old Chinese writings on agriculture. In indexing these books it was found that many of them contained reprints of and quotations from earlier works; that there was a very large amount of duplication and that a great deal of time would be saved, and in fact the only satisfactory way of arriving at a careful index would be, by bringing together the original works into one related whole. Moreover, old books are difficult to obtain and their contents are in the nature of mineral ore, full of valuable material, but often lacking good arrangement and mixed with unnecessary or inferior accounts. By compiling scholarly this entire literature into one book it will not only enable the agricultural students to know, to buy, and to research a good deal easier than otherwise would be possible, but also will make much valuable material known.

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This project was suggested in December 1925, and was soon approved. Some preliminary work has been done in the spring semester 1926, and it was carried on at full spped since the following semester. Its work is now largely restricted to the collecting of material, either by copying or by cutting up copies. Careful proof-reading was made in comparison with good editions. The materials so far collected and filed include or were taken from nearly three hundred different works, containing more than ten million characters, and used up about 25,000 sheets of draft paper. More systematic editing will be required. The indexing of the material in the Encylopedia will follow the methods which we have been using so that the indexing accomplshed in the past will find immediate application and use.

VII. Reprinting of some important Old Chinese Books on Agriculture:

In proof-reading of old books connected with the compilation of the Encyclopedia, it was found that there are considerable errors in the common editions of some important agricultural writings. As different works will be melted into one pot in the Encyclopedia, it will not be unwise to reprint some of the most important old Chinese books on agriculture according to what we have proof-read, so as to preserve their original feature. Arrangement has already been made with the Commercial Press, Shanghai for this undertaking.

VIII. Indexing of Periodicals.

This important project beginning with November 1924 has been given access for the use of students and teachers to the numerous and valuable articles that have been published principally in China in both the native and the English languages, for the last 70 years, bearing on agriculture and related subjects. The following is a list of the more important of the periodicals which have been indexed. Unfortunately in many cases our files are not altogether complete, but an attempt is being made to complete them as rapidly as possible. The total number of index cards on May 31,1928 was approximately 10,500 (5,500 in Chinese and 5,000 in

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English) which in itself is a good indication of the amount of material thuse made available.

A list of the Periodicals Indexed

1. China Christian Advocate. Vol. 10 No.9-10; vol.11-14 No.3; complete October 1923 to March 1927.

2. China Joural of Science and Arts. Vol. 1-8 No. 5; complete Jan.1923 to May 1928.

3. China Review (Publisher:"China Mail"office,Hongkong). Vol. 3-17, 20-23, 25 practically complete. 1874-1901.

4. China Review (Publisher; China Trade Bureau New York). Vol. 3 No. 5 -Vol 6 No. 6: practically complete. Nov.1922 to Sept. 1924.

5. China Weekly Review (including Millards' Review of the Far East). Vol. 1-44 No. 13; complete. June 19,1917 to May 26,1928.

6. The Chinese Economic Bulletin. Vol. 1 No. 4 - Vol. 12 No. 21; complete. Mar. 7, 1921 to May 26, 1928

7. The Chinese Economic Journal. Vol. 1 No. 1 - Vol. 2 No. 5 complete. Jan. 1927 to May 1928.

8. The Chinese Economic Monthly. Vol. 1 - Vol. 3 complete. Oct. 1923 to Dec. 1926.

9. Chinese Recorder. Vol. 32-Vol.59 No. 5 practically complete. Jan. 1901 to May 1928.

10. Chinese Social and Political Science Review. Vol. 7012 No. 2; complete except Vol. 7 No. 4. Jan. 1923 to Apr. 1928.

11. Chinese Students' Monthly. Vol. 9-Vol.23 No. 6 practically complete beginning with Vol. 13 but very incompete for back numbers. Nov. 1913 to April 1928.

12. Educational Review. Vol. 9-Vol.20 No. 2; practically complete. Jan 1917 to Apr. 1928.

13. Far Eastern Republic. Vol. 1-Vol. 3 No. 1: complete. October 1919 to Oct. 1920.

14. Far Eastern Review. Vol. 13-19, 21-24 No. 5; practically complete. 1917 to May 1928.

15. Journal of the North China Branch of the Royal Asiatic Society. Old Series Vol. 1; New Series, Vol. 1,2,5,8-14,17-19,21-22,24-31,33-58; practically complete. 1858-1927.

16. Lingnaan Agricultural Review. Vol. 1-Vol 4 complete. Dec. 1922 to July 1927.

17. North-China Herald. Vol. 145, 150-3,155-167; practically complete Oct. 7,1922 to May 26,1928.

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18. The Oriental Engineer (including Journal of the Association of Chinese and American Engineers). Vol. 1-Vol.8 No. 5; practically complete. Sept. 1920 to May.1927.

19. 森林 (Journal of Forestry) Vol. 1-Vol. 2 No. 3 complete. March 1921 to Sept. 1922.

20. 中華農學會叢刊 (The Journal of the Agricultural Association of China) No. 1-58 complete. Dec. 1918 to Dec. 1927.

21. 中外經濟週刊 (The Chinese Weekly Economic Bulletin) No. 1-161 complete. Mar. 10,1923 to May 8,1926.

22. 農社旬刊 No. 1-2 complete. 1924-1925.

23. 農事雙月刊 (原名農事月刊) Vol. 1 - Vol. 5 No. 6 complete. July 1922 to May 1927.

24. 農林新報 (Nung Lin Sin Bao) No. 1-135 complete. Jan.1,1924 to May 21,1928.

25. 農業叢刊 Volume one complete. Jan.1921 to Dec. 1921.

26. 農商公報 (The Journal of the Ministry of Agriculture and Commerce). Vol. 8 No. 6 - Vol. 12 No. 7 complete. Jan. 1922 to Fev. 1926.

27. 農智季刊 (No. 1-5 complete) spring 1924 to spring 1925.

28. 農智月刊 No. 1-16 complete. Oct. 1922 to Jan. 1924.

29. 農學 (The Agricultural Science) Vol. 1-Vol.3 No.6 complete. Feb. 1923 to Oct. 1927.

30. 新農業季刊 No. 1-5 complete. Mar. 1924 to Mar. 1925.

31. 河南林務公報 Vol. 1 No. 1-12 complete. Jan.1924 to June 1925.

32. 湖北商農會報 Vol. 1 - Vol. 5 No. 6 practically complete. Jan. 1920 to June 1924.

33. 金陵光 (University of Nanking magazine) Vol. 1-Vol.16 No. 1 practically complete. 1909 to 1927.

IX. "Agricultural Index"

As the subject index to periodicals has been accumulated in considerable quantity and is very useful to agriculturists, it has long been planned to have it published to extend its usefulness. Finally, it was decided in January 1928, to have the index to periodicals within 1922-1927 inclusive, with the addition of pamphlets and books appeared in the same period, published under the title "Agricultural Index" after the mode of "Agricultural Index" by H. W. Wilson Company, U.S.A. in the earliest possible time. The material prior to 1922 will be prepared afterward and published in one volume, while those after 1927 will be indexed as time goes on and published biannually.

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X. Review of Chinese Agricultural Publications.

"Agricultural Encyclopedia Sinica" is compiled to close the account of agricultural knowledge of the past, while "Agricultural Index" is aiming to record or systematize the recent publications on agriculture in China. In doing these, the material worked upon, that is, the books, periodicals and pamphlets themselves, have to be carefully surveyed above and evalued. The annotated bibliography of old writings as indicated above is in preparation for this purpose. Likewise, individual reviews for new books, periodicals, institution publications, etc., will be made. Some of these reviews have already published and will continue to be contributed regularly in the "Agriculture and Forestry newspaper". In addition, three special issues on a general survey of different aspects of Chinese Agricultural publications are planned for the newspaper and one of which has already been circulated on May 1, 1928.

--June 2, 1928.

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COOPERATIVE EXTENSION WORK

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COOPERATIVE EXTENSION WORK

When the ten-year program was approved in 1923 cooperative arrangements were made with a number of organizations and institutions interested in the development of agricultural work. The list was as follows:-

Kaifeng Baptist School, Kaifeng, Honan.

Nanhsuchow Station, Presbyterian Mission, North, Nanhsuchow, Anhwei.

Weihsien Station, Presbyterian Mission, North, Weihsien, Shantung.

Central China Teachers College, Wuchang, Hupeh.

Shantung Agricultural and Industrial School, Yihsien, Shantung.

During recent years the arrangement has been extended to the following two institutions:-

London Missionary Society, Tsangchow, Hopei.

American Board Mission, Tunghsien, Hopei.

In addition to the above organizations to which annual appropriations are made, the following organizations are on the same basis of cooperation except that no funds are appropriated:

Kiangsu Agricultural Experiment Station, Hsuchowfu, Kiangsu.

Kiangsu Second Agricultural School, Soochow, Kiangsu.

Wusih Wheat Experiment Station, Wusih, Kiangsu.

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Help is extended to them in the same way by the various units of the college and visits to these stations have beem made from time to time.

The success of the work at the cooperative stations has varied. At several it has been exceptionally good. Those units that are investing the most money with their agricultural work and are provided with more highly trained personnel are securing by far the best results. Lack of local personnel sufficiently highly trained has been even a more limiting factor in securing results than has the limitations of funds expended on the project.

Crop improvement work has been stressed at all of the cooperating centers. At Tunghsien and Tsangchow in Hopei province the crop improvement work is just getting under way. These stations are valuable to our general crop improvement program in that they provide rather wide differences in location and an opportunity to develop improved crops suitable for these particular localities, all of which are important from the standpoint of occurrences of famines.

As a matter of fact, the college is facing a serious problem in connection with its institutional cooperative program. We are embarrassed by the number of requests that come to us from many parts of China asking us to establish some cooperative work at these institutions. If our personnel and financial resources were larger our cooperative program should be extended. It is a question now, however, whether or not we may not be somewhat over extended and that a better policy

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might be to attempt cooperation with still fewer, certainly no more, organizations, and undertake to bring the principal cooperating institutions into a higher state of efficiency.

The results at the cooperating stations would be different had not the recent political disturbances taken place. Furloughs and ill health and non-return of local agricultural missionaries has been a very serious handicap in making the station work more effective. However, a special ~~att~~ recognition must likewise be given to the loyalty and enthusiasm and interest of those who have been carrying on at some of the stations, such as at Yihsien in Southern Shantung, under most adverse and trying conditions. These stations are valuable outposts for the work of the college and while insufficient time has elapsed to get definite results that can be translated immediately to the benefit of a large group of farmers, it is confidently expected that all of them will show definite results in a reasonable length of time.

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PUBLICATIONS

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PUBLICATIONS

The following list indicates in a brief way the number and type of publications that have been issued by the College of Agriculture and Forestry during the past five years. It is very difficult to say exactly what publications should be classified under famine prevention program and what others under the other work of the College of Agriculture and Forestry. Overlapping is inevitable. The main value of the list, however, will be to provide an idea of the type and extent of the material that is published.

The lists do not mention the Agriculture and Forestry newspaper which has been published since 1924, first every two weeks, and for the last three years, every ten days. In as much as a great many of the leading articles are contributed by members of the faculty of the college, the Agriculture and Forestry newspaper must be given serious consideration in attempting to evolvuate the work of publication by the college.

Publications are both in English and Chinese, but the great majority are in Chinese:-

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Bulletins in English

(1923 - 1927)

Number

1. School Nurseries. February, 1920, By J.H.Reisner.

2. Roguing of Cotton. August, 1920. By J.B.Griffing.

3. Cotton Culture. December, 1920. By J.B.Griffing.

4. The Control of Plant Diseases and Insects. February,1921. By G.E.Ritchey.

5. A Study of Weeds. May, 1922. By G.E.Ritchey.

6-I Report of Three Years' Cotton Improvement Work, September, 1923. By J.B.Griffing.

6-II Observations on the Behavior of Cotton Plants, especially during Acclimatization. September,1923. By J.B.Griffing

7. An Economic and Social Survey of 102 Farms near Wuhu,(Part I and Part II)-Part I,December,1923. Part II,July,1924. By J.L.Buck.

8. Summary of Meteorological Records, University of Nanking,1895-1923. March, 1924. By W.C.Lowdermilk and H.L.Shen.

9. Famine Prevention Program of the College of Agriculture and Forestry as approved by the China Famine Fund Committee. May, 1924.

10. Weather Records at Cooperative Stations. May,1925. By W.C.Lowdermilk.

11. Forest Destruction and Slope Denudation in the Province of Shansi. March, 1926. By W.C.Lowdermilk.

12. Report of the Conference of Christian Rural Leaders. February,1926. By F.W.Price and J.H.Reisner.

13. An Economic and Social Survey of 150 Farms, Yenshan County, Chihli Province,China. June,1926. By J.L.Buck.

14. Flacherie or "Wilt Disease" of Silkworms. August, 1926. By C.S.Gibbs and Chen Ken.

15. A Glimpse at Rural Needs and the Rural Church in China. November, 1926. By F. W. Price.

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Circulars in English

(1923 - 1927)

Number

1. Saved Again. September, 1924. By J.B.Griffing.
2. Annual Report of the Department of Sericulture. October,1924.
3. A Christian School with a Rural Message. December, 1924. By J.B.Griffing.
4. Mapping the Rural Community. December,1924. By Chiao Chi-ming.
5. One of the Least. February, 1925. By J.B.Griffing.
6. Cultivation of the Foreign Potato in China. April, 1925. By R.H.Porter.
7. Revaluating the Rural Church. April,1926. By J.H.Reisner.
8. Kernel Smut of Kaoliang and Its Control. April, 1926. By R.H.Porter.
9. Plant Lice and Methods of Control. April,1926. By R.H.Porter.
10. Rediscovering the Rural Folk. March, 1926. By J.W.Decker.
11. The Nematode Disease of Wheat and Its Control. September, 1926. By R.H.Porter.
12. Planting the Church in our Land. September, 1926.
13. Notes on Rose Culture. November, 1926. By M.L.Hancock.
14. Kernel Smut of Millet and Its Control. February, 1927. By R.H.Porter.

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Daily Meteorological Records in English

(1923 - 1927)

Number 1, October, November, December, 1923.

Number 2, January, February, March, 1924.

Number 3, April, May, June, 1924.

Number 4, July, August, September, 1924.

Number 5, October, November, December, 1924.

Number 6, January, February, March, 1925.

Number 7, April, May, June, 1925.

Number 8, July, August, September, 1925.

Number 9, October, November, December, 1925.

Number 10, January, February, March, 1926.

Number 11, April, May, June, 1926.

Number 12, July, August, September, 1926.

Number 13, October, November, December, 1926.

Number 14, January, February, March, 1927.

Number 15, April, May, June, 1927.

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Reprints in English

Lao Wang, the Farmer, Chinese Recorder. April, 1926. Shao Teh-hsing, and Pearl S. Buck.

Annual Report, Department of Sericulture, 1924-1925. Eleventh Annual Report.

Wool Balls in Kid-Goats. The China Journal of Science and Arts, Vol. IV, No.4, April, 1926. By Charles S. Gibbs.

Observations and Experiments on Rinderpest. The China Journal of Science and Arts, Vol.III, No. 7, July,1925. By Charles S.Gibbs.

Factors Affecting Reproduction of Engelmann Spruce. The Journal of Agriculture Research, Vol.XXX, No.11, June 2, 1925. By W.C. Lowdermilk.

Price, Changes in China. Journal of the American Statistical Association. June, 1925. By J. Lossing Buck.

The Preparation and Tending of a Forest Nursery. Journal of the Association of Chinese and American Engineers. Vol.VI,No.2,1925. By W.C.Lowdermilk.

Some Practical Possibilities in Forestry for China. Journal of the Association of Chinese and American Engineers. Vol.VI, No. 4, 1923. By W.C.Lowdermilk.

Examples of Rural Minded Christian Leaders. China Christian Advocate, December,1925. By J.H. Reisner.

A Trip to Hwang Shan. China Journal of Science and Arts,Vol.III, No.2, February, 1925. By Albert N. Steward.

Some Plant Pathological Problems on China. The China Journal of Science and Arts. Vol.V, No.1, July, 1926, By R.H.Porter.

The Changing Evaporation-Precipitation Cycle of North China, March 23, 1926. By W. C. Lowdermilk.

Our Rural Symposium. The Chinese Recorder, December, 1924. By J. H. Reisner.

An Improvised Autoclave for Hospital Laboratories. The China Medical Journal, November, 1924. By C.S.Gibbs.

Improved Chinese Cotton. North China Daily News. By J.B.Griffing.

The Chinese Church and Country Life. The Chinese Recorder. June, 1923, By J. Lossing Buck.

Canada Thistle and Quack Grass Eradication. Iowa State College, Extension Service, Bul. No. 113, April, 1923. By R.H.Porter.

The Church in Rural Work. The Chinese Recorder, December, 1924. By J.H.Reisner.

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Books Published by Members of the Faculty

Chang Chi-wen, Cotton. Commercial Press. March,1926. (In Chinese)

Griffing, J.B. and Shao Teh-hsing. Elementary Agricultural Readers for Primary Schools. Volumes I and II. Edward Evans & Sons. (In Chinese).

Griffing, J.B. and Shao Teh-hsing. Teacher's Manual to accompany Elementary Readers for Primary Schools. Vol. I. (In English)

Illick, J.T. A Laboratory Manual for College Biology. Edward Evans & Sons. September, 1925. (In English).

Wan Kwoh-ting. Agriculture. A textbook for the New System Higher Primary School. Vol. IV. Commercial Press, June, 1925. (In Chinese).

---Agriculture. A Teacher's Manual. Vol. III, May, 1925; Vol.IV, August, 1925. Commercial Press. (In Chinese).

---Library of Useful Knowledge for Juveniles. In twenty volumes. Commercial Press. (In Chinese).

--- Book of Wonder, three volumes, January, 1925.

--- Book of Famous Books, two volumes, June, 1925.

--- Book of Familiar things, one volume, July, 1925.

--- Book of All Countries, three volumes, July, 1925.

--- Remaining volumes in press.

Agriculture and Forestry Notes (In English)

No. 1, November, 1923.
No. 2, December, 1923.
No. 3, January, 1924.
No. 4, February, 1924.
No. 5, March, 1924.
No. 6, April, 1924.
No. 7, May, 1924.
No. 8, June, July, Aug., Sept.
No. 9, October, 1924.
No.10, November, 1924.
No. 11,December, 1924.
No.12, January, 1925.
No.13, February-March, 1925.
No. 14, April, 1925.
No. 15, May, 1925.
No. 16, July, 1925.
No. 17, October, 1925.
No. 18, November, 1925.
No. 19, December, 1925.
No. 20. January, 1926.
No. 21, February, March, 1926.
No. 22, April-May, 1926.
No. 23, September-October, 1926.
No. 24, November-December, 1926.
No. 25, January-February, 1927.

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In Chinese

Bulletin of the College of Agriculture and Forestry

No. 1 Flood and its remedy, by Mr. D. Y. Ling.

No. 2 School Nursery, Printed February, 1920 by Mr. Li Tai-fang

No. 3 Cotton Improvement in China. Printed March, 1920 by Mr. J.H.Reisner, and translated by Mr. Chao Chung Ting.

No. 4 Possibilities concerning the introduction of American cotton into China. Printed July, 1920 by Mr. J.B. Griffing.

No. 5 Suggestion for the expansion of Chinese sericulture. Printed September, 1920 by Mr. Tsien Tien-ho.

No. 6 The Silkworm Diseases. Printed September, 1920 by Mr. Tsien Tien-ho.

No. 7 Forestry and Drought. Printed October, 1920 by Mr. D.Y.Ling

No. 8 Roguing of Cotton. Printed October, 1920 by Mr. J. B. Griffing.

No. 9 Selection of Cotton Plants. Printed October, 1920 by Dr. Cook.

No.10 The Control of Insects and Plant Diseases. Printed April, 1921 by Mr. G. E. Ritchey.

No.11 Cotton Culture. Printed April, 1921 by Mr. J.B.Griffing, translated by Mr. T. H. Shao and Dr. Feng Rui.

No.12. Cyetosis, a disorder of cotton plants in China. Printed February, 1922 by Dr. Cook.

No.13 The Danger of Cotton Seed Introduction and Distribution and Its Control. Printed April, 1921 by Mr. J.H. Reisner and translated by Mr. T. H. Shao.

No. 14 The Silk Moth Egg laying box. Printed May 1921 by Mr. Tsien Tien-ho.

No. 15 Cotton Improvement on Community Basis. Printed July, 1921 by Dr. Cook.

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In Chinese

Bulletin of the College of Agriculture and Forestry

No. 16 The function and duty of the Raw-silk Testing House. Printed October, 1921 by Mr. Tsien Tien-ho.

No. 17 Cotton Insect Problems in China. Printed October, 1921 By Mr. J. B. Griffing, and translated by Mr. T. H. Shao.

No. 18 The Study of Weeds. Printed July, 1922 by Mr. G. E. Ritchey and translated by Mr. K. L. Sie.

No. 19 The Acclimatization of American Cotton in China. Printed July, 1922 by Mr. J. B. Griffing and translated by Mr. T. H. Shao.

No. 20 Methods of improving the silkworm eggs. Printed September 1922 by Mr. Tsien Tien-ho.

No. 21 The study of the art of egg-production. Printed December, 1923 by Mr. Kuh Yin.

No. 22 The outline of school nursery. Printed January, 1924 by Mr. J. H. Reisner and translated by Mr. H. Kan.

No. 23 Forestry and Human Life. Printed May, 1924 by Mr. Ling Kan

No. 24a Community Survey Blank (First Edition). Printed 1922 by Mr. J. L. Buck and translated by Mr. Hsu Chen.

No. 24b Community Survey Blank (Revised Edition). Printed August, 1924 by Mr. J. L. Buck and translated by Mr. Hsu Chen

No. 25 An Economic and Social Survey of 102 Farms, near Wuhu, Anhwei, China. Printed March, 1925, by Mr. J. L. Buck and translated by Mr. Hsu Chen.

No. 26 Farm implements adapted to Chinese conditions. Printed June, 1923.

No. 27 Weather Records at Cooperative Stations. Printed September 1925 by Mr. W. C. Lowdermilk and translated by Mr. Shen Hsioh-li.

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Bulletin of the College of Agriculture and Forestry

No. 28 General suggestions for the methods of selection and testing to be followed in plant improvement work by the Department of Agronomy and cooperating organizations. Printed April, 1926, by Dr. H. H. Love and translated by Mr. T. S. Kuo.

No. 29 The outline of school nursery, by Mr. J. H. Reisner and translated by Mr. Kang Han. Reprinted April, 1926.

No. 30 A study of farm tenancy at Quinsan and Nantung of Kiangsu and Suhsien of Anhwei. Printed May, 1926 by Mr. Chiao Chi-ming.

No. 31 Method of locating the Rural Community. Printed May, 1926 by Mr. Chiao Chi-ming.

No. 32 Practical Farm Bookkeeping. Printed July 1926 by Mr. Swen Wen-yu.

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In Chinese

Farmer's Bulletins.

No. 1 Nursery Management. Printed February, 1920.

No. 2 Deeper Plowing. Printed January,1921 by Mr. Shao Teh-hsing

No. 3 American Cotton. Printed March, 1922 by Mr. J.B.Griffing

No. 4 American Cotton in simple language. Printed March, 1925 by Mr. J. B. Griffing.

No. 5 Silkworm rearing methods. Printed March,1923 by Mr. Kuh Yin

No. 6 Comparison Between Two Villages. Printed May, 1924 by Mr. Hsu Chen.

No. 7 Saved Again. Printed September, 1924 by Mr. J.B.Griffing

No. 8 One of the least. Printed April, 1925 by Mr. J.B.Griffing

No. 9 Cultivation of the Foreign Potato in China. Printed May 1925 by Porter.

No.10. The advantage of leaving trees during the grass cutting. Printed January, 1926, by Mr. Ren Chen-tung.

No.11 Deep plowing. Printed January, 1926, by Mr. T.H.Shao

No.12 American Cotton in simple language. Reprinted January, 1926, by Mr. J.B. Griffing and Mr. T.H.Shao.

No.13 The Typical Farmer, Printed April, 1926 by Mr. G.E.Ritchey, and Mr. Wang Sheo.

No.14 Kernel smut of kaoliang and its control. Printed May,1926 by Mr. Porter and Mr. Yu Tai-peo.

No.15 Plant Lice and Methods of Control by R.H.Porter and translated by Yu Ta-fu. Printed May 1926.

No.16 Raising Silkworm in this way for the greatest benefit by Ku Ying Printed Nov. 1926.

No.17 Simple methods of controlling rice borer, by T. S. Kuo, printed January 1927

No. 18 Kernel Smut of Kaoliang and Its Control, by R.H.Porter and translated by Yu Ta-fu. Printed March 1927.

No.19 The Nematode Disease of wheat and its control, by R.H. Porter and translated by Yu Ta-fu. Printed May 1927.

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Circulars

No. 1 Catalogue of the Forestry Department of the College of Agriculture and Forestry.

No. 2 Catalogue of Summer School of the College of Agriculture and Forestry.

No. 3 The Announcement of Summer School of the College of Agriculture and Forestry.

No. 4 Catalogue of the correspondence school of the Forestry Department.

No. 5 Catalogue of the College of Agriculture and Forestry.

No. 6 Catalogue of the Summer School of the College of Agriculture and Forestry. Printed April, 1926.

No. 7 Catalogue of the College of Agriculture and Forestry and Short Course. Printed April, 1926.

No. 8 Catalogue of the Rural Normal School. Printed April, 1926.

No. 9 Catalogue of the correspondence school of the Forestry Department.

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CHINESE OPINIONS OF THE COLLEGE

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CHINESE OPINIONS OF THE COLLEGE

The following pages indicate the attitude of some leading Chinese toward the College of Agriculture and Forestry. They were brought together in the fall of 1928 by the late Mr. Kuo. The last letter of the series is by an American Scientist with many years of experience in American institutions and was written after his spending a year in China. His opinion of the College is therefore of special value.

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UNIVERSITY OF NANKING

Nanking, China

The following letters of commendation for the work of the COLLEGE OF AGRICULTURE AND FORESTRY have recently been received from high officials in the National Government of China, and well known Chinese business men and educators. They speak for themselves. The College of Agriculture and Forestry was the first missionary college to be registered (1922) by the former Chinese government at Peking, and as part of the University of Nanking has been the first Christian institution to be registered by the present National Government at Nanking.

T. S. Kuo

J. H. Reisner, Co-Deans

College of Agriculture and Forestry

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Pages 206-212

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By Mr. Y. C. Niu

Chairman of the Committee of the Provincial

Government of Kiangsu

China is founded on agriculture and the abundance of its agricultural produce finds no competition in the whole world. But simply because of lack of scientific knowledge and because of our habit of following our ancestors' steps, things like improvement in farming, study of soil, prevention of insect pests and drought and flood, have been almost overlooked and have received practically no attention in the past. As a result, our richness is buried in the soil, and our people are getting poor and our country falls behind other countries in its industry. Certainly it is a shame!

China is an agricultural country and if we want her to become a rich and strong country, we must first improve her agriculture. It seems to me that the College of Agriculture and Forestry of the University of Nanking has seen this point and so aside from the matter of educating technical men it also pays much attention to research and extension work. In the matter of forestry survey, farm crops improvement, and prevention of insect pests and diseases, they have made a splendid achievement. Since February of the thirteenth year of the Republic, their extension work has reached nine provinces and the participating farmers are numbered at more than one hundred thousand. This is a marvellous work. But even with this they are not content. They want to go further in order to improve farm villages, to better the living conditions of the farmers, and actually to bring about agricultural improvement on a larger scale. Their enthusiasm and good spirit we ought to praise.

Very few of the people of our country have ever paid attention to agriculture and still very few have ever made any actual achievement. But the College of Agriculture and Forestry has already existed for more than ten years and should therefore be accounted as the very first one in its establishment. Its record is so splendid that it beats all other agricultural schools. The college is still making progress and extension. This is not merely to the fame of the college but it is a blessing to the people and to the country.

Now the union of our country is restored. We ought to turn our attention to constructive work. The late Dr. Sun said, "The very first of our constructive work about the people's living, should be the development of our agriculture in order to get enough food for the people." So the improvement of agriculture is a thing of great importance. I very much hope that the college with its history of more than ten years and its already attained splendid achievements will continue to radiate light and to extend its work so that it sets a good example to our country and solves the problem of"living."

Nanking, China.

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By Yeh Pei-chi

Minister of Agriculture and Mining

National Government of China

Professor Bailie inaugurated the College of Agriculture and Forestry in the University of Nanking about fifteen years ago and it has had very good results. Now since the work of our national revolution has been finished and the constructive work is about to begin, we hope the college can enlarge its sphere of good work and influence and consequently improve our agriculture on a larger scale. For this Mr. Reisner went back to America trying to raise funds, and for this we should thank him for his good spirit and enthusiasm and are glad to see he can succeed.

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CORNELL UNIVERSITY
NEW YORK STATE COLLEGE OF AGRICULTURE
ITHACA, NEW YORK
Albert R. Mann, Dean

Department of Entomology.

Memorandum, concerning the work I saw in the Agricultural Colleges in China.

In the spring of 1928 I visited six of them. In all of them there is some good work being done. In most of them there is too much copying of western methods without much regard for local conditions. In a few of them this has resulted in some waste of money and efforts with little benefit to China.

The best work I saw was that at the University of Nanking, where the teachers seemed to be thoroly devoted to the interests of Chinese farmers, well acquainted with local rural conditions and skillful in adapting their methods to actual needs, and where the farmers seemed appreciative, ready to cooperate and eager to participate in plans for better crops and for better living.

(Signed) JAMES G. NEEDHAM

November 22, 1928.

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North China Daily News 1/17/33

THE NORTH

UNIVERSITY OF NANKING

Famine Fund Balance To Be Administered

SPECIAL TRAINING IN CROP IMPROVEMENT

The first semester at the University of Nanking closes January 18. The term has been a most successful one with uninterrupted studies and a capacity enrolment of students.

Word has just been received of the formal decision by the China Famine Fund Committee to turn over to the University of Nanking the remaining principal and interest of the famine funds for continuing the work in famine prevention. The University of Nanking has been co-operating with Yenching University for the past ten years in expenditures from this fund. The balance of approximately U.S. $600,000 is now being assigned to the University of Nanking and will be held by the Board of Founders of the University.

A number of distinguished visitors have come to the University during the closing days of the term and there have been important meetings and conferences.

Distinguished Visitors

Dr. J. C. Ferguson has been visiting the University and a dinner was given for him by President Chen. Dr. Ferguson was the first president of the original Nanking University. He is a connoisseur in Chinese art and is planning to donate his valuable collection of Chinese paintings, porcelains and bronzes to the University. During his visit, he conferred with President Chen and others in regard to a building to house this collection.

Dean K. S. Sie, of the College of Agriculture, entertained at luncheon Signor Dragoni and Mr. Okenski, specialists in land tenure and highway construction, appointed by the League of Nations to co-operate with the National Government.

Colonel G. C. Stroebe, of the Yangtze Conservancy Commission, returned for the holidays from a trip with the representatives of the National Flood Relief Commission which has been inspecting dykes along the Yangtze river. Colonel Stroebe left last week to go to Hankow to co-operate with the National Government in a project for rehabilitation in the flooded districts near Hankow. A study and survey of the flood and flood relief, called "The 1931 Flood in China," has been published by the University, written by Professor J. Lossing Buck, head of the Department of Agricultural Economics of the College of Agriculture.

Dr. R. E. Park, formerly professor of sociology at the University of Chicago, visited the University and gave a lecture during the closing days of the semester.

A Christmas operetta, for which the words were written by Miss R. Mackenzie and Miss A. Hoffsommer and the music, in part, by Miss Sutherland, of the faculty of Ginling College, was given by students and members of the faculty on Christmas eve, and the performance was repeated on January 7.

Crop Improvement

The Second Winter Institute for special training in crop improvement, conducted under the auspices of the Ministry of Industries with the co-operation of the Provincial Governments of Kiangsu and Chekiang, was held at Nanking from November 28, 1932, to January 15, 1933. This Institute was planned to give an opportunity for special advanced training in the fundamentals of crop improvement and related subjects to the staff members of agricultural experiment stations and other agricultural institutions who may not have had an opportunity for special advanced work but who can leave their stations for a few weeks of intensive training. There were 54 students registered for the course, representing ten different provinces. The College of Agriculture of the University of Nanking, the College of Agriculture of Central University at Nanking, and the National Geological Survey co-operated in the Institute. Courses were given by members of the faculties of the College of Agriculture of the two universities and the Institute was also addressed by Director C. H. Tien of the National Agricultural Research Bureau, Dean Y. H. Tsou of the College of Agriculture of Central University and Mr. O. L. Dawson, United States Agricultural Commissioner. Dr. H. H. Love, who is at the University of Nanking on special leave from Cornell University and is in Nanking at the joint invitation of the Ministry of Industries of the National Government, the Bureau of Agriculture of the Kiangsu Provincial Government, and the Bureau of Agriculture and Forestry of the Provincial Government of Chekiang, and also of the University of Nanking, directed the organisation of the Institute.

The soccer football team of the University, coached by Mr. Tsu Shao-wu, University Director of Athletics, tied for first place in a series of intra-city games. The soccer team of the University Middle School won the middle school championship in East China.

A Christmas gathering was held at the University on Christmas eve under the direction of the University Y.M.C.A.

The enrolment for the term was: College of Arts, 205; College of Science, 172; College of Agriculture, 205; Rural Leaders' Training School, 73; Senior Middle School, 207; Junior Middle School, 1,361.

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College of Agriculture and Forestry

December 1932

SUMMARY REPORT
NANKING COOPERATIVE CROP IMPROVEMENT PROJECT

CORNELL UNIVERSITY
UNIVERSITY OF NANKING
INTERNATIONAL EDUCATION BOARD

Nanking

INDEXED

Sent with Mr. Reisner's letter of December 6, 1932

Statement of Project

The Nanking Crop Improvement Project, undertaken cooperatively by the New York State College of Agriculture of Cornell University, the College of Agriculture and Forestry of the University of Nanking, Nanking, China, and the International Education Board, began in 1925. The two main objectives were (1) to reorganize and develop the crop improvement work of the University of Nanking and cooperating stations, and (2) to provide special training for men engaged in plant breeding work in China.

Under the terms of the agreement Cornell University sent out one professor from the Department of Plant Breeding each year for a minimum period of five years; the International Education Board provided salary for the time the Cornell professors were away from the University and not covered by Cornell University rulings with respect to sabbatical leaves and vacations; the University of Nanking provided travel from Ithaca to Nanking and return, and travel and maintenance while in China and all expenses in connection with maintenance of all plant breeding work at Nanking, and part of expenses at the cooperating stations.

Professors H. H. Love, C. H. Myers and R. G. Wiggans, members of the Department of Plant Breeding of the New York State College of Agriculture of Cornell Univefsity, have each spent two growing seasons at Nanking. Each period covered about eight months. In 1927, due to political disturbances and difficulties of internal travel, it was deemed inadvisable to spend the usual amount of time in China. The crop improvement program,

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was carried on by the Chinese members of the staff without interruption, political interference or loss.

The following is a summary statement of the results of the above undertaking. A detailed report of the six years' work is in preparation and will be published by the College of Agriculture and Forestry of the University of Nanking. Copies of the report will be available upon request.

I. In the Practical Field of Crop Improvement -

1. Reorganized the plant breeding work in the College of Agriculture and Forestry of the University of Nanking and correlated with it, as well as with each other, the crop improvement work of twelve cooperating stations in Central, East, and North China. The Department of Agriculture of Yenching University was reorganized in 1931 about a comprehensive program of crop improvement and placed under the direction of the University of Nanking. The Crop Improvement Station at Yenching University has now become the main substation of Nanking, at which the improvement of North China crops is concentrated.

2. Even in the short time covered by the formal cooperative arrangement a number of improved strains, or varieties, of crops have been developed. At Nanking five strains of wheat were produced which yielded from 30% to 49.8% increase over the check which, in turn, was an improved variety developed at Nanking which has been distributed widely in the Yangtze Valley. One soy bean variety has been produced which, over a five-year period, has averaged 45.1% greater production than the best local variety used as a check.

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Progress is also being made in the improvement of corn, cotton, rice, and barley.

At Nanhsuchow, located in the Hwai River Valley, two varieties of wheat and three of kaoliang have shown large increases over the check varieties. One of the varieties of wheat has already been widely distributed, and one variety of kaoliang is being increased for distribution. At Kaifeng and in the Yellow River Valley, one improved variety of wheat and one of millet are being increased for distribution. Considerable progress has also been made in the improvement of kaoliang and barley. At Yihsien, in southern Shantung, two varieties of wheat and three of kaoliang show marked increase in production, and one each of these two important grains will be selected for increase and distribution to the farmers. At Weihsien, two varieties of kaoliang show marked increased production over many varieties tested; and one of these will be used shortly for increase and distribution to farmers.

In the case of all the above superior strains, regional tests are being carried on looking to wide distribution after their local adaptations have been indicated.

Satisfactory progress has been made at the other cooperating stations with but one or two exceptions, though results are not yet so apparent due to the fact that sufficient time has not elapsed to obtain conclusive data. These may be expected within the next two or three years.

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3. Methods of breeding and testing soy beans, kaoliang, millet and rice have been studied with reference to their application to Chinese conditions. These studies have already contributed to plant breeding technique.

4. The work of distribution will increase very rapidly from now on and offers a joint problem of production and distribution, the solution of which will require much effort and further training for personnel engaged in the work. A member of the Department of Agronomy of the University of Nanking, with many years' experience in China, is at the present time in the United States studying methods of increase and distribution of pure seed in the United States and Canada.

II. <u>In the Field of Training Students in China</u> -

5. Summer Institute of Crop Improvement in 1926, at University of Nanking, under the direction of Professor C. H. Myers - with 23 students and plant breeders registered and 16 visitors representing the major plant improvement organizations in Central and East China.

6. Summer Institute of Crop Improvement in 1929, at University of Nanking, under the direction of Professor H. H. Love - with 52 registered students (average attendance 65), with similar representation as under 5.

7. Summer Institute of Crop Improvement in 1930, at Yenching University, under the direction of Professor R. G. Wiggans - with 20

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students, representing the major plant improvement organizations in North China.

8. Summer Institute of Crop Improvement in 1931, at the University of Nanking, under the direction of Professors C. H. Myers and H. H. Love - with 91 students, representing the major plant improvement organizations in China, with large enrollments from the University of Nanking and the National Central University as well as a number of men from government departments in Nanking.

9. Special emphasis on plant breeding courses with field practice at the University of Nanking for regular college students. Closely allied courses in Biometry and Taxonomy given by specialists in these subjects.

10. Personal conferences with workers from the other institutions (Government and Mission) on special problems of plant improvement.

11. Detailed plans for small grain and kaoliang breeding and testing have been prepared and made available in Chinese.

12. Organization of a variety registration association, to provide for orderly introduction of new varieties of crops after proper testing, thereby avoiding the waste and confusion brought about by the introduction of untried and inferior varieties.

III. Training of Students in the United States, at Cornell -

13. Resulting chiefly from the contacts made with Cornell professors in China, twelve Chinese students have taken graduate major work

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in plant breeding at Cornell during the years 1927-1932.

IV. Significance of the Cornell-Nanking Project in the Field of International Education -

14. As an experiment in International Education, the results to date must be considered highly significant and satisfactory. Expert professional advice and instruction in an important field of applied science has been made available to a large number of students and experiment station workers engaged in plant breeding in China. On this background of China experience and training, a significant group (See item 13 above) has already come to Cornell for further specialized training.

15. The Cornell professors state that their work in China has broadened their own training and experience in the field of Plant Breeding.

16. The wide experience of the Cornell professors in the field of agricultural education and administration has also resulted in incidental but very important contributions to other departments of the University of Nanking.

V. Government Interest in Plant Breeding has been greatly stimulated.

17. A program for Crop Improvement similar to that developed by the University of Nanking has been adopted by Government Agencies and a Cornell professor, Dr. H. H. Love, has been invited to become Chief Adviser to the project. The Central Government's Ministry of Agriculture and Mining, the Provincial Government of Kiangsu through its Bureau of Agriculture and Forestry, jointly, have

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extended the above invitation. Dr. Love has been in China since March, 1931.

VI. The University of Nanking made Center for Training of Plant Breeding Specialists by Government Agencies cooperating in V-17 above.

18. The Government Agencies represented in V-17, in addition to the Government Central University and the University of Nanking, have entered into an agreement whereby the University of Nanking, through its College of Agriculture and Forestry, becomes responsible for the technical training of plant breeding experts, who will be used in the extensive government crop improvement programs.

19. University of Nanking graduates, with special training in Plant Breeding, occupy many important positions in other agricultural institutions and experiment stations in China. It is no exaggeration to say the plant breeding work in China has been greatly influenced by this cooperative undertaking.

New York, N. Y.
December, 1932.

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