

Agricultural Research in China.

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CHINA is a very big country with an area of 1,532,815 sq. m. and a population of 430 millions. Like India, the country is mainly agricultural and 80 per cent. of its population is directly dependent upon it. After it came into the hands of the Republican Government, the authorities are trying hard to put the National agriculture on a sound and scientific basis.

Since the rural depression in China (1931-32) a scientific study of the various branches of agricultural science is being conducted at several centres in China. Existing agricultural conditions are closely followed by a Crop Reporting Service and students of Farm Economics. Researches are also conducted on Land management to give the farmers the best returns by helping them to market their products. Plant pathology and entomology are studied side by side for the improvement of all crops and careful experiments are carried out on soils and fertilisers. Sericulture and animal husbandry are emphasised as important rural industries.

Rural credit and co-operative societies have been organised and developed. A net work of Government warehouses have been erected in the chief agricultural centres for the storage of farm products; their transportation is thereby facilitated.

At present, the work in agronomy is chiefly confined to crop improvement in regard to wheat, rice, cotton and potatoes. Attempts are being made to extend the work to other less important crops.

There are nine co-operative stations under the Wheat Improvement Project, sixteen under the Cotton Improvement Project and five under the Rice Improvement Project. The National Agricultural Research Bureau, at Shadingwei, Nanking, inaugurated in December 1931, is co-ordinating the work of these stations.

RESEARCH IN WHEAT.

The investigations are directed to—(1) study of important indigenous varieties, (2) collection of world wheats and (3) the improvement of wheat through selection and hybridisation.

The important wheat varieties in China are studied through large regional surveys. A number of stations are engaged in this work. The purpose of the survey is to find out the varieties the Chinese farmers are growing and the environmental conditions suitable for their cultivation. These studies have shown that certain varieties grown in the South will not do well when grown in the North or Central China and the same has been found to be true of the Northern varieties when planted in the South. The results of this research have made it possible to determine the zones, adapted for different varieties.

A number of American varieties of wheat have recently been introduced and field trials are being conducted to determine useful varieties. The results so far obtained show that while some of them yield fairly good results, they cannot be harvested early enough to fit into the rotation system practised by the Chinese farmer. Researches on breeding by selection is being conducted and a large number of wheat selections

has been made, which are being compared with standard types. Tests are also being carried on in the various zones to determine their environmental adaptability.

Hybridisation work has been begun by crossing different varieties paying special attention to such problems as earliness, disease-resistance (resistant to stinking smut, *Tilletia tritici* and loose smut, *Ustilago tritici*), shattering, stiffness of straw and the like.

Because of adverse weather conditions it is sometimes impossible for farmers in China to sow their wheat at the proper time. Furthermore winter-killing is a very serious problem in the North. The possibility of vernalisation is being examined to meet the problem. The process consists of germinating the seeds and keeping them chilled until sown. The results of the first year showed that the seed thus treated (planted on March 31) headed $4\frac{1}{2}$ months earlier than seed of the same varieties planted the preceding autumn without treatment. The varieties planted on March 31 without treatment did not head at all.

Experiments are also being conducted to study the method and time of planting on the yield of three common varieties of wheat grown in Nanking, paying special attention to the rate of germination, the number of tillers and the rate of growth of different varieties.

RESEARCHES ON RICE.

Regarding the rice improvement work researches were started in 1933, when technical experts were sent to Kiangsu, Chekiang, Anhwei, Kiangsi, Hupeh and Hunan Provinces to make a large number of selections from the fields. The rice work includes improvement through selection and hybridisation, varietal tests and study of factors influencing yield.

During the year 1934, the selections made in the previous year were sown (a total of 49 thousand rows were sown). Each row represented an individual head collected from a farmer's field. By continuing to select the best ones each year for planting in the following year, it is expected that new strains which will be better in yield and possibly in some other characters such as disease-resistance will be discovered.

The varietal trials consist in comparing under uniform conditions, a large number of varieties collected from different parts of China as well as from Japan, Philippines and the United States of America.

Regional tests are also being conducted at a number of stations to determine the soil and climatic factors suitable for different varieties. Researches in the hybridisation of the Chinese with foreign varieties of rice are being conducted and promising results have been obtained.

The study of the influence of period of illumination on flowering has shown that the length of day has a profound influence on the different varieties of rice. A shortening-day treatment will make the early, medium and late varieties to flower at the same time thus rendering intercrossing of these varieties possible. Similarly,

this treatment can be used to cross tropical varieties with the Northern varieties.

A comparative study of the different field layouts is being made to find out which of the three kinds of arrangements is being best for experimental work, *viz.*, the "advanced test", the "Latin square" and "randomized blocks". A difference of opinion exists among agronomists as to the best field arrangement for rice experiments.

WORK ON OTHER CROPS.

In the Cotton Improvement Project extensive regional tests have been made since 1933 by obtaining a large collection of Chinese and foreign varieties of cotton and testing them in a number of experimental stations.

Technical experts have been sent to seven cotton-growing provinces to select bolls from promising plants in the farmers' fields. More than thirteen thousand individual bolls have been selected. After a laboratory examination the poorer ones are discarded and the better ones preserved for planting. Varietal tests and work in hybridisation are also conducted in connection with cotton improvement.

Five improved varieties of Irish potatoes and nine improved varieties of sweet potatoes have been made available to the Chinese farmers. Experiments in hill selection, the length of row, shape and size of plot, are made in this connection.

DISEASES AND PESTS.

Intensive work in plant pathology and entomology was begun in 1933. Investigations are being conducted on rice borers, locusts, insect attack of stored grains, fruits and vegetables. Rice borers have been causing serious damage in China. The problem of locusts is receiving considerable attention. The damage done by the locusts to crops in 1933 is estimated at \$ 14,000,000.

A survey of the plant diseases prevalent in China is being made. Technical experts have been sent to study the diseases of field crops, vegetables, horticultural crops and the mulberry trees. The study of wheat smuts has assumed importance as the loss due to smuts has become enormous. Hot-water treatment has proved satisfactory in controlling the disease. The treatment is specially preferred as it involves little expense and obviates the use of chemicals. Diseases of summer crops, such as the downy mildew and the helminthosporiose of cereals and the leaf spot of the pea-nut are also being studied.

OTHER INVESTIGATIONS.

A study of farmyard as well as chemical fertilisers is being made in order to determine the type and combination of fertilisers most beneficial and economic under Chinese conditions.

A large number of researches bearing on Forestry are also being conducted in recent years. Studies on germination and storage of seeds are being systematically conducted and a searching enquiry is being made into the silvicultural methods. Seeds and seedlings of improved varieties of forest trees are distributed.

In order to develop better varieties of the silk worms a large collection of eggs has been made from different parts of the country as well as from abroad. So far 12 varieties giving high yield of silk per cocoon has been selected. In determining the quality, other features such as

the shell weight, tensile strength, elasticity, evenness of fibre and the percentage of silk obtained, have to be taken into consideration and these aspects are receiving attention. The diseases of the silk worms are also being studied. Thus copper sulphate and bleaching powder can be effectively employed in the control and eradication of certain diseases including muscardine, a serious disease of the silk worm.

The Department of Crop Reporting of the National Agricultural Research Bureau is engaged in the collection of statistics relating to the acreage and production of crops. The data collected is made available to the public. There are more than six thousand voluntary crop reporters among the twenty-two provinces of China.

The trend of farm prices of agricultural products are also studied. Problems pertaining to livestock, land tax, land value, rural credit, rural population and food consumption are investigated in order to ascertain the economic status of Chinese farmers. The marketing of agricultural products is also studied along with the economic conditions. The study of Farm Economics is very important as one of the causes of the last rural depression was the ignorance of the conditions of marketing as well as to the absence of transport facilities. In some centres large quantities of grains accumulated and in others there was total lack of grains.

Veterinary science has received the attention in connection with animal husbandry. Various kinds of sera and vaccines for the control of diseases are being developed.

Besides technical work for improvement of agriculture, a system of rural credit has been organised to relieve the impoverished farm population. The National Economic Council and the Ministry of Industry are co-operating with the banks and the provincial and the district government authorities in this work. The farmers are assisted to form co-operative societies by the Government who direct the organisation. Every village is to have one such society and a group of villages is to form a union of co-operative societies. In a *hsien* (something like our Union Board) there is to be a local rural co-operative bank which is linked with the provincial rural co-operative bank and then to the Central Government Co-operative Bank. The Government finances such co-operative banks whose primary function is to advance loans to village co-operative societies and co-operative unions. They also absorb deposits and transact ordinary banking business such as transfers and remittances.

Another scheme to help the Chinese farmers is the construction of a network of warehouses. These are of four kinds:—(1) the warehouse in the producing centre, (2) the warehouse for goods transmit, (3) the warehouse at the destination or the market, and (4) the warehouse for storing. The warehouses in the producing centre are equipped with packing machinery and occupy an area just large enough to allow temporary storage of the grains only. The warehouse for goods in transit is of a still more temporary nature.

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