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SCIENCE BULLETIN

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Criteria for Priorities in Sino-US Program

The National Science Council, executive agency of the Sino-American science cooperation agreement at the Chinese end, and its American counterpart, the National Science Foundation, have jointly worked out a set of criteria for priorities in the binational cooperative program.

The basic guidelines emerged at a NSC/NSF meeting held in Taipei July 13. Participants in the meeting are Dr. Wu Ta-you, chairman of NSC; Dr. Yen Chen-hsin, vice chairman; Dr. Y. S. Tsiang, convenor of NSC Liaison Group; Mr. Wang Chi-wu, NSC liaison officer; Dr. Arthur S. Roe, head of Office of International Science Activities of NSF; Dr. Herman Chinn, deputy director of Office of International Science and Technology, State Department; and Dr. Walter Hodge, NSF resident representative in Tokyo.

Exchange of scientists is given top priority during the initial stage of the Sino-US program. In this connection, emphasis will be given to longer term exchanges with appointments extending up to six months or longer. Short-term appointments are to be made only when consultation for specific project is needed, or when traveling expenses are drastically reduced because the appointee will travel to the vicinity of his point of destination on other business.

Dr. Harry C. Kelly, dean of faculty, North Carolina State University; Dr. Stanley H. Bennett, professor of anatomy and biophysics and dean of Division of Biological Sciences, University of Chicago; and Dr. John M. Ide, director of the Division of Engineering, National Science Foundation, arrived in Taiwan last month as the first group of U.S. exchange scientists to come under the Sino-American science cooperation agreement. They had attended a US-Japan science conference in Tokyo prior to their arrival in Taiwan. L-R: NSC Chairman Dr. Ta-you Wu, Dr. Ide, Dr. Kelly, Dr. Bennett, Dr. Wang Shih-chieh, president of Academia Sinica, and Dr. Yen Chen-hsin, NSC vice chairman.

Personnel Exchange

American exchange scientists, as a rule and particularly in the initial stage, are expected to provide leadership in promoting advanced research in the Republic of China, with a view to improving the training of Chinese scientists and scholars on the post-graduate level. Ten to 12 such exchange scientists a year from the U.S. to Taiwan may be considered as an immediate goal. In the appointment of U.S. scientists, some preference may be accorded to scientists of Chinese origin because of their bilingual capability.

On the Chinese side, the six research centers and other graduate institutions should each year select at least twice as many junior faculty members and science workers to be sent by the National Science Council to the U.S. for advanced training.

The exchange program should cover certain disciplines, such as sinology, where Chinese scientists and scholars could substantially assist U.S. research efforts.

Cooperative Research

Next on the list is cooperative research. The conferees proposed emphasis on mutual interest and mutual benefit in the selection of project proposals.

Indigenous features of Taiwan's geography, climate, and socio-economic structure should be fully utilized in cooperative research undertakings. In this connection, oceanography, geology, seismology, meteorology, botany, zoology, tropical diseases, anthropology etc., will be fields which may readily attract the interest of U.S. scientists.

Long-range research projects shall gradually be undertaken under the

program, with a view to the progressive development of institutional cooperation on the department-to-department level.

Mindful of Taiwan's limited science manpower resources, binational science seminars, symposiums etc. will not be emphasized in the initial stage.

Instead, efforts shall be made to take advantage of the many U.S.-Japan science seminars to be held in Japan. Chinese scientists may be sent to such meetings as observers, and U.S. scientists may be invited to visit Taiwan either before or after the meeting in Japan.

Implementation Plan

Another concrete achievement of the NSC-NSF meeting is the adoption of an Implementation Plan for the Sino-US cooperation program based on a tentative agreement reached last April during the visit of Dr. Hodge. In addition to the points covered in the Criteria for Priorities, the Implementation Plan features the following highlights:

Liaison Structure. At the initial stage, the NSC and NSF will each have at least one man to act on its behalf in the home country of the other. The headquarters of NSC and NSF will each designate an officer (or a liaison group) to work with the representative of its counterpart agency. It is agreed that, in due course, a Joint Executive Committee be set up by NSC and NSF to maintain close and frequent contact. The Committee will hold consultation meetings either in Taipei or in Washington once each year, or whenever needed.

Project Proposals

NSC will also maintain close contact with NSF/Tokyo, the nearest NSF regional office to Taipei. Consultation on at least a quarterly basis should be arranged. It is understood that, within NSF budgetary limits, more frequent consultations may be arranged for the initial period. Besides securing assistance in program development, the major objective of liaison with NSF/Tokyo is to take advantage of U.S. science activities in Japan. NSF/Tokyo will be requested to, among other things, make efforts to arrange to have Chinese scientists and scholars participate in U.S.-Japanese seminars as observers and to have Japan-bound U.S. scientists and scholars visit Taiwan.

NSC will make information on opportunities under the U.S.-China science program available not only to research institutions but also to individual scientists and scholars in the Republic of China. Chinese institutions as well as individual scientists and scholars (through their affiliated institutions) wishing to participate in the program may address a letter of inquiry to the NSC Liaison Group. The letter should include a brief, specific description of the project, as well as some discussion of the elements of cooperation with the United States. Budget information need not but may be included in this first letter.

The NSC Liaison Group will handle preliminary screening of the letters of inquiry. It may refer such letters to the NSF for identification of the elements of cooperation with the United States. When elements of cooperation are identified, screening will be made simultaneously by NSC and NSF. A formal proposal will be requested by NSC if appropriate. On the part of NSC, review of the formal proposal will be made by its relevant Special Committee and approved by its Standing Committee. It is understood that NSF will adopt similar or compatible procedure for submission and screening of project proposals originated by United States scientists and their institutions. When approved by both NSC and NSF, project proposals will be exchanged to signify an agreement of joint undertaking.

Funding

It is agreed that NSC and NSF shall each allocate appropriate funds in its respective budget, earmarked for the implementation of the U.S.-China science program. However. it is understood that this amount does not represent the ceiling of program funding. For FY1970, NSC will earmark NT$10,000,000 (the equivalent of US$250,000) as a grant for this purpose. This grant will be used primarily for personnel exchange programs and other contingent project expenditure.

Normally NSC and NSF will each pay for the expenses of personnel under its appointment and epipment under its authorization in all cooperative activities under the U.S.-China science program.

News Roundup

The National Science Council has appointed 18 visiting professors and 53 visiting associate professors for academic year 1969-70. More appointments will be made later on.

Among the new appointees, 27 visiting scholars are incumbents working here for the second or third year. Sixty-seven other incumbents are leaving for their old posts after serving their tenure at local institutions.

Meanwhile, NSC has just allocated NT$12,500,000 for the procurement of books and research facilities for 10 public universities and colleges in the coming year. Procurement for biological sciences will account for NT$3,510,000. The remaining funds will be distributed for mathematics and physical sciences (NT$2,500,000), engineering sciences (NT$2,458,450), and humanities and social sciences (NT$1,946,840).

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The National Taiwan University will inaugurate three more graduate departments this fall, bringing the total number of its graduate departments to 37.

To start enrollment in the fall semester will be an oceanography center, a research institute on animal husbandry, and a research institute on agricultural promotion.

Nine of the graduate departments offer courses leading to a doctoral degree, while the other departments confer master's degrees.

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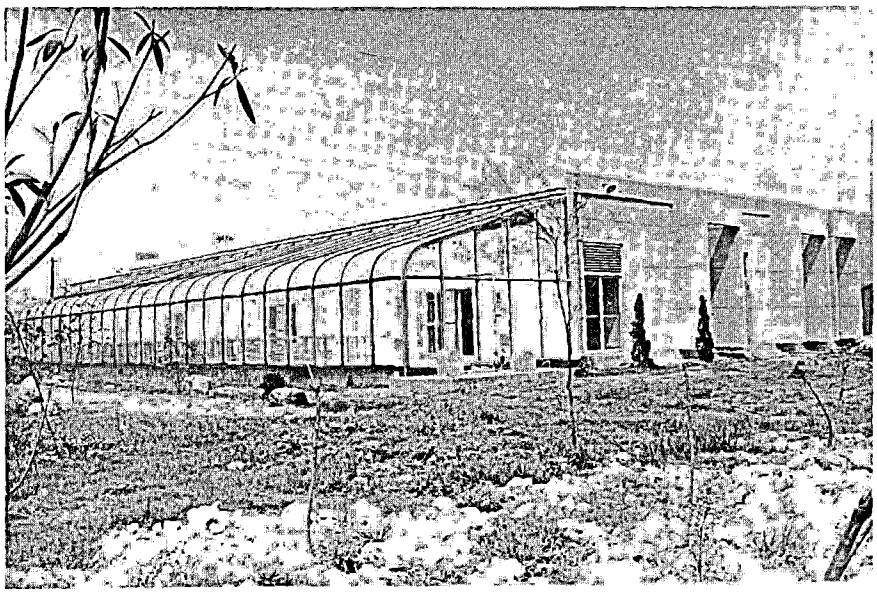
The newly completed Electronics Engineering Building of the National Taiwan University was dedicated June 11. Two more buildings, one for the Institute of Economics, and the other for the Institute of Botany, are scheduled for completion before the end of this year.

R & D in Agriculture Promises Rich Harvests

Agriculturally Taiwan is one of the most highly developed areas in the Far East. Until now the island has been able to produce enough food for domestic consumption with a sizeable amount of surplus for export. Nonetheless, Taiwan has a problem: its limited arable land is being increasingly encroached upon by mushrooming industrial plants and urban development projects while the population keeps growing at a fast pace. The only solution, therefore, lies in wresting the most from the shrinking planting acreage by means of research and development.

It is against this backdrop that the Taiwan Agricultural Research Center came into being in September of 1965 with the National Science Council and the Joint Commission on Rural Reconstruction underwriting the expenses incurred. The Center is jointly formed by the National Taiwan University, the Provincial Chunghsing University and the Provincial Agricultural Experiment Station. Its job is to introduce high-yielding crop varieties and new agricultural knowhow, and to find answers to other relevant farming problems. During the past three years the Center has tackled over 400 projects in such diverse fields as rice, dryland crops, exportable horticultural crops, genetics and plant breeding, physiology and culture, soil and fertilizers, plant pathology and entomology.

Although the fund earmarked for the wide-ranging research activities adds up only to NT$8,000,000, the Center has already made a rousing start. The following is a summary report on some of the major research items and the results achieved so far.



Exterior view of the Center's Phytotron, inside which climate is artificially controlled for experimental purpose.

Genetic and Cytogenetic Studies of Rice

1. Races of rice blast and the sources of resistance:

Thirty physiological races of rice blast fungus have since indentified in Taiwan. However, only four independent dominant resistant genes, Pi_4, Pi_{12} Pi_{22} and Pi_{25}, controlling different races of rice blast were found. Breeding of the resistant multiple-line of variety rice is now underway in order to develop such variety for the purpose of reducing the loss from blast.

2. Genetic studies of earliness in rice:

An earliness gene, E, which shortens the growth period by 10 days, has been incorporated into Taichung 65. Unfortunately, two independent modifiers M_1 and m_2, and possibly another m_3 which change growth rate and duration, size of organs under different conditions are associated with earliness character. Further studies to eliminate these modifiers are required before the earliness gene can practically be used.

3. The use of hybrid vigor in rice:

In self-pollinated crop, the use of hybrid vigor is feasible if male sterile line and pollen fertility restoring line are available. However, these conditions are not met in rice at present. Thus, efforts have since been made to use hybrid vigor expressed by F_2 and F_3 populations. The results indicated that the manifestation of hybrid vigor in F_2 was observed in some crosses, but it was not significant enough for practical use. Further exploration for higher F_3 vigor must be made so as to offset the decreasing vigor in advanced generations.

4. Studies on the methods of selection:

The effectiveness of selection in a segregating population varied with environmental conditions. It was found that bunch planting was more favourable than single plant planting for individual plant selection. On the other hand, the results of heritability estimates on panicle weight, plant height, panicle number under different conditions showed that the highest heritability was obtained in normal spacing and heavy nitrogen application. The effects of nitrogen seemed to be more significant than that of spacing.

5. Mapping of rice chromosome:

By way of using reciprocal translocation, the 13 translocation homozygotes were analyzed. Five of the chromosomes from Taichung 65 and nine from Kissin variety were involved. The gene, long extra glume (lng) was located in the chromosome No. 5 or No. 3 of Kissin. The recombination value between *lng* and semi-sterility was about 18%. Twelve trisomics of rice were obtained from triploid x diploid. The morphology of these trisomics were analyzed under the genetic background of Kotzu, an indica rice variety.

A set of 12 alien chromosome addition lines (from *O australiensis* to *O. sativa*) was made available to the rice scientists through the research supported by the Center. These 12 alien addition lines were morpholo-

gically distinguishable. However, only the lines No. 5 and No. 10 were more vigrous, erect, lodging resistant, prolific tillering and productive than normal Taichung 65. This fact suggests that some genes on the additional alien chromosome could be very useful in the breeding program if the alien chromosome could be fractionated by irradiation and incorporated into cultivated varieties.

Breeding Potentiality Evaluation

An attempt was made to evaluate the potentiality in early generations of the hybrid materials of rice.

Weight of 1,000 grains, number of panicles per plant, panicle weight, number of grains per panicle, and plant height are very significantly correlated with yield. The correlation coefficient between panicle length and yield was also significant in less degree.

In analysing bulk yield of dallel crosses F1 and F2, it was found that weight of 1,000 grains, number of panicles per plant, number of grains per panicle, plant height have simple additive gene system and show complete dominance. The panicle length and panicle weight have also simple additive gene system and show partial dominance. The number of grains per panicle having simple additive gene system shows over dominance.

Drought Resistance of Rice Varieties

The research project was undertaken by Professor Wen-tong Tang and Mr. Wen-fu Tsai, National Taiwan University. They found:

1. Testing the drought damages in each growing stage among rice varieties. Water shortage reduced the rice yield seriously in tillering stage, panicle formation stage, and heading stage, but little unfavorable effects in the other stages.

The order of resistance of the varieties from high to low is as follows: upland rice, Taiwan Native rice, Taiwan Ponlai rice.

2. Methods for testing the drought resistance among rice varieties.

The followoing two methods were used to test the drought resistance:

A. The resistance to potassium chlorate toxicity,

B. Water absorption power of germinated seeds in D-manitol solution. Results indicated that the second method was more reliable than the first.

3. Change in the moisture and sugar contents of seedling during drought treatment among rice varieties.

Drought treatment induced the interconversion of sugar content in plant body. When the seedling wilted, the reducing sugar and total sugar content increased, but the moisture content decreased. Such changes were more significant in indica varieties than japonica varieties. When the wilted seedlinge were reirrigated, the moisture and sugar content mostly recovered the nomal state, but still a little of which cannot be restored.

Pod and Seed Development and Their Changes in Protein Oil Contents of Soybean

The research was done by Professor Wen-tong Tang and Mr. Won-fu Tsai, NTU. The result can be summarized as follows:

Pod and seed development of soybean including their changes in length, moisture content, fresh and dry weight, protein and oil contents were investigated and analyzed at five-day interval after flowering. The following conclusions are drawn:

1. The development of pod was very rapid and reached its maximum length about 20 days after flowering, and then decreased very slowly.

2. Moisture content of pod and seed decreased throughout the period of maturity. After complete maturity, moisture content dropped very quickly in a short period.

3. Fresh weight of pod and seed increased rapidly in the early stage of maturity. It approached maximum weight about 32-37 days after flowering, and then decreased rapidly, Dry weight increased slowly in the very early stage but quickly about 10-15 days after flowering. In the very late stage, it increassed very slowly.

4. Nitrogen content in percentage of pod and seed was high in the early stage, but decreased throughout the growth period. A very significant negative correlation was observed between nitrogen content and percent oil.

Both nitrogen and oil contents in weight increased slowly in the early stage, but rapidly about 20 days after flowering. The changes were in agreement with the changes in the dry matter accumulation.

Studies on the Chemical Control of Citrus Insects in Taiwan

The preliminary results of field test and demonstration showed that some water soluble and emulsive systemic insecticides were very effective in controlling citrus insects in nursery and on young trees. Azodrin 60% WSC diluted in equal volume of water and painted on trunk in stripes could control citrus aphids (*Toxopers citricida,* Kirkaldy; *Aphis spiraecola,* Patch) citrus leaf miner (*Phyllocnistis citrella,* Stainton), citrus jumping plant lice (*Diaphorina citri,* Kuwayama), Florida red scale (*Chrysomphalus* ficus, Ashmead) and citrus rust mite (*Phyllocoptruta oleivora,* Ashmead).

The first painting should be made at the time of flushing, next painting made two weeks later in order to protect the new foliage. However, the vigor and uniformity of flushing varied with climate conditions, varieties, age of trees, soils and fertilizers so that the proper time for first painting must be carefully determined.

Because the insecticide was painted in a limited area on the trunk, it did no harm to the activity of natural enemies in the grove. It was also observed that the painting of insecticides on the trunk of cirtrus would effectively keep the red mite population under the level that may cause severe damage on the tree so that no miticide application was needed. Another advantage of this painting method was labor and water saving, particularly when citrus was grown on steep slope land where water was often a problem. It is also suggested that the nest of ants be destroyed when or after painting. This practice will increase the effectiveness of systemic insecticides because ants are the forters of honey producing insects such as aphids, jamping plant lice, soft scales, white flies, etc. In addition, releasing of *Trichogramma* to control citrus dogs in painting treated citrus grove will make the control even more effective.

The water soluble CS 6858-6E and kilval 40% including emulsive dimethoate and formathion were inferior than Azodrin because of their short residual effect.