THE ASIAN VEGETABLE RESEARCH AND DEVELOPMENT CENTER

AVRDC's laboratory building houses its library, scientists' offices and equipment for several of its departments. The staff housing area is in the background.

Left: A portion of the service building which houses facilities for the Center's supporting services, seed storage and plant drying.
Center: Greenhouse complex; the headhouse contains a workroom to service each greenhouse, a classroom for training, a photography area and greenhouse services.

GENERAL INFORMATION

BACKGROUND

May, 1973

Vegetable crops constitute man's richest source of vitamins, minerals and plant proteins. In tropical and subtropical Asia, where rice is the major staple food, vegetable production is entirely inadequate to meet nutritional requirements. In rural areas, and among low-income groups in the cities, specific vitamin and mineral deficiencies are evident.

Vegetable crops, being labour intensive and often in short supply, are especially suitable for increasing the income of the small farmer of Asia.

In spite of such potential advantages, the yield of vegetable crops in tropical Asia is less than one-third that of the same crops in Japan, America or Western Europe.

In consideration of such factors as those cited above, the Asian Vegetable Research and Development Center (AVRDC) has been established at Shanhua, Tainan County, the Republic of China (Taiwan)

The idea of creating an international research center for the study and improvement of vegetable crops originated with the United States Agency for International Development (USAID) in 1963. The Agency suggested to 12 of its missions in Asia that they explore the interest of their host countries in supporting a research institute designed to improve the diet of the Asian people by increased production of high protein and vitamin-rich vegetable foods.

In the ensuing years many discussions among governments and exploratory trips by consultants took place. The final result was that on May 22, 1971, representatives of seven interested participating countries and an officer of the Asian Development Bank met in Taiwan and organized the Asian Vegetable Research and Development Center. The participating countries, which provide the funds for the Center, are the Republic of China, Japan, Korea, the Philippines, Thailand, the United States of America and Vietnam. Each country named a representative to serve on the Board of Directors, which held its first meeting on May 24, 1971. At that time, the Charter for the AVRDC, and the Memorandum of Understanding for the establishment of the Center in Taiwan were accepted by the Board.

In January 1972, building construction got under way. In the summer of 1972 the Director and Associate Directors of the Center assumed their duties. Most of the research staff began arriving in November 1972, when the first phase of the building construction program had been completed.

The Center has 116 hectares of land, 102 of which consist of experimental fields. As of April 1973, the laboratory building (containing library, offices and laboratories for eight departments), the administration-office building, the service building (containing facilities for machinery storage and repair, for seed storage, and headquarters for the experimental farm and for the buildings and grounds department), and eight residences have been completed.

Now under construction are six more residences for senior staff, an apartment house to accommodate six research associates and their families, and a cafeteria-dormitory building (financed by the Kresge Foundation). This structure will be used primarily to house and feed the participants in the Center's training program.

GENERAL OBJECTIVES AND THE CURRENT RESEARCH PROGRAM

As with the International Rice Research Institute in the Philippines with respect to rice, the principal objective of the Asian Vegetable Research and Development Center is to increase the yield and quality of vegetable crops by conducting a first-class, intensive research and training program focused on the most important problems of the vegetable industry in the humid tropics and subtropics of Asia. More specifically, AVRDC aims to develop improved varieties and better cultural practices to increase the resistance of certain vegetable crops to insects and diseases and to the hot, humid climate during the monsoon season. It is evident that the low yields of many vegetable crops in the tropics and subtropics are due to the high incidence of diseases and insects and to the low adaptability of most vegetable crops to the high temperatures and humidity that prevail during the rainy season. The latter defect causes undesirable fluctuations in vegetable supply and price.

A further deterrent to high yields is antiquated cultural practices, including inadequate use of fertilizer and poor control of weeds, insects and diseases.

Authorities classify 107 crops as vegetables. An initial study preparatory to the formation of the AVRDC mentioned that 26 vegetables are of such importance in Asia as to merit the attention of the Center. Obviously, at a modestly supported research center, it would be impossible to work on that many crops and have a significant impact on any one of them.

When AVRDC launched its program, it was thought feasible to direct substantial attention to 12 vegetable crops. Later, however, when that number seemed to be excessive, it was decided to reduce the list to six; *viz,* mung beans (*Phaseolus aureus* Roxb.), soybeans (*Glycine max* L. Merr.),

tomatoes (*Lycopersicon esculentum* Mill.), sweet potatoes (*Ipomoea batatas* L.), Irish potatoes (*Solanum tuberosum* L.), and Chinese cabbage (*Brassica pekinensis* Rupr.). Naturally, there are specific reasons for choosing each of these crops, as will become evident in the following paragraphs where the research program is briefly described.

As mentioned earlier, research work was not started until late 1972; and some scientists will not arrive until mid-1973. Furthermore, some phases of the work (such as economics, post-harvest physiology, and the training program) are not scheduled to start until 1974-75. Consequently, the description here is brief. However, it does reflect the present status (as of May, 1973) of the research and the program objectives as now perceived by the staff and the Board of Directors.

Vegetable Breeding The work of this program includes both plant breeding, testing and selection. The crops to be improved by breeding research include the mung bean, the soybean, the tomato, the Chinese cabbage and the sweet potato. Initially, at least, the Irish potato will be studied primarily by testing worldwide collections of germ plasm to be obtained mainly from the large varietal and genetic line collections at the International Potato Center in Peru.

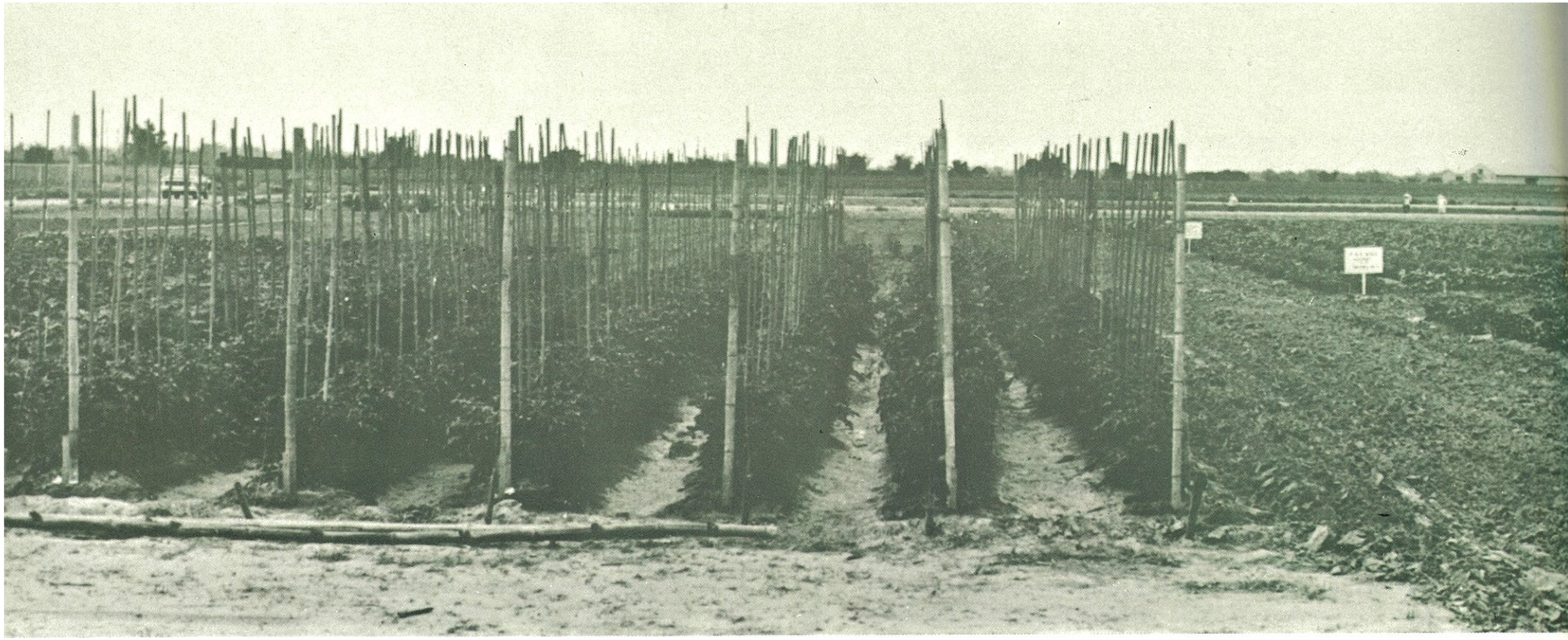
The mung bean is an ancient and established legume crop in Southeast Asia. When good yields are obtained, the income is considerably greater even than that which can be obtained from a high-yielding rice crop. However, the mung bean is susceptible to insect and disease attack, its protein content is less than that of the soybean, and its yield potential is too low. If these defects are eliminated or lessened through breeding, mung beans can well assume a much greater role in providing better nutrition and higher incomes in tropical Asia.

Already AVRDC has assembled over 2,000 varieties of mung beans and closely related species of the genus *Phaseolus*. This is by far the world's largest collection, and will be the basis for the most intensive mung bean breeding program that exists anywhere.

The soybean originated in Asia and is used there primarily as a vegetable crop. It is high in protein (25-35%). As is true for mung beans, its use in the tropics is limited by low yield and high susceptibility to insect and disease attack. Furthermore, many varieties are unsuitable for the tropics because of sensitivity to the short days and to the high temperatures. The breeding program at AVRDC (also based on an extensive varietal collection) will be to develop disease- and insect-resistant, high-protein, palatable varieties that yield well under the short-day and high-temperature conditions of the tropics and subtropics.

The tomato is grown throughout the tropics and subtropics. It is present in every vegetable market of Asia and is a source of cash income to many small farmers (as well as being, of course, a valuable source of vitamin C). Its production in the low-elevation tropics is severely limited by the high incidence of diseases, especially bacterial wilt, early and late blight, tobacco mosaic virus and septoria leaf spot. In addition, low fruit set under high temperature conditions appears to be a limiting factor with many varieties. The tomato breeding program at AVRDC is aimed toward the alleviation of these limiting factors. Already over 4,000 varieties have been collected, which will provide the largest breeding base for tomatoes that ever existed. By developing a series of locally bred and tested varieties to support the imported ones now being largely grown in tropical Asia, a decided improvement in the tropical tomato industry can be expected.

Chinese cabbage is a popular vegetable throughout tropical Asia, but because of a combination of temperature and length of day effects, it cannot be grown successfully in the lowland tropics except during the cooler winter months. During the summer months its cultivation has to be confined to the highlands. With intense cooperation between the



A crossing block for developing new varieties of tomatoes

plant physiology and vegetable breeding departments, AVRDC expects to develop a tropical Chinese cabbage that can be grown at lower elevations throughout the entire year.

The objectives of the Irish potato program, in cooperation with the Potato Center in Peru, will be to identify varieties that will form tubers and yield well under lowland tropical conditions. Like Chinese cabbage, Irish potato production in the tropics and subtropics is now confined either to the highlands, or to the lowlands only in the winter months. Thousands of crosses will be made in Peru and the progeny sent to AVRDC for widespread testing throughout tropical Asia.

AVRDC's interest in the sweet potato stems from the fact that more people can be fed from a hectare of sweet potatoes under minimum management than from almost any other tropical crop. The sweet potato is high in vitamin A and is much richer in minerals than is rice. Most Asians prefer a dry-cooking sweet potato, but the high carotene (vitaminA) varieties tend to be more moist. There is need to combine the characteristics of high carotene and dry cooking. Although the protein content of the sweet potato is low (around 3 per cent), a few lines with more than double this amount have been identified. One of AVRDC's objectives is to increase greatly the protein content of this crop. The sweet potato work will be carried out in close cooperation with that being done at IITA in Nigeria. In Asia, for some reason, sweet potatoes are generally considered a low-prestige food, compared with rice and wheat products. AVRDC through its training program and other extension activities (leaflets, films, etc) will attempt to point out the great advantages of

Workers weeding a mung bean plot

the sweet potato as a source of human food in an overpopulated world.

Plant Physiology During recent years, work at the other international agricultural research centers and elsewhere has firmly established the fact that studies of crop physiology can have a highly beneficial effect on yield potential. In fact none of the international centers is without a plant physiologist today.

AVRDC's physiology program is concerned initially with studying photoperiod and temperature effects on the soybean and Chinese cabbage, and in gaining an understanding of the possibilities for raising the yield potential of both mung beans and soybeans by improving plant type. Obviously, these studies will be closely connected with the breeding program.

Plant Pathology The principal function of this well-staffed department at AVRDC is to identify and thoroughly study the most common diseases affecting the six major crops included in the Center's program. In addition, this department will work closely with the vegetable breeders by inoculating the large germ plasm collection and, later, identifying the resistant varieties and lines that can be used in the breeding work.

Entomology The senior entomologist, who will arrive in July (1973), will have much to accomplish. Insect pests take a heavy toll of vegetable crops. As with plant pathology in regard to plant diseases, the entomology program will involve the identification and control of the major insects attacking the six crops. Both biological and chemical control methods will be worked on, with strong emphasis on the

former, which, of course, includes varietal resistance to insect attack.

Soil Science Soil fertility and water management are significant factors influencing the yield of vegetable crops. The senior soil scientist (who arrived in late March, 1973) first will characterize thoroughly the soil on AVRDC's 100-hectare experimental field. This will include the content of both major and minor elements and the physical characteristics connected with water movement and retention.

Later, the soil science department will be concerned with the soil fertility and soil water problems connected with tropical vegetable production in Asia.

Other Activities In addition to the above-described programs, AVRDC maintains a chemistry department to handle the analysis of vegetables for mineral, vitamin and protein contents and for the analysis of residues resulting from the application of pesticides, fungicides and herbicides.

In 1974 an agronomist-horticulturist will be added to the staff to study cultural practices for attaining maximum yields of the newly created vegetable varieties.

In 1974, AVRDC expects to add two agricultural economists to handle both production and marketing economics.

By late 1974 the Center also plans to start a training program to provide young scientists from Asian countries (and elsewhere) with the opportunity to study and do research under the guidance of the AVRDC's highly selected scientific staff.

By 1974 the Center expects to initiate fairly intensive outreach programs in several cooperating countries. Because Taiwan is too far north to have a truly tropical climate, it is necessary to establish cooperative testing work in countries located nearer the equator. Similarly, because Korea is

A cross being made between two mung bean breeding lines. Crop improvement requires the combining of the desirable characters from numerous plant sources into new improved varieties.

Plant pathologists identify and record the diseases which attack vegetables in the tropics. The pathology program emphasises disease control through chemical and biological methods and cooperation with breeders to develop resistant varieties.

completely non-tropical, a special cooperative program will be carried on there.

Starting in 1974, the Center will maintain an office of information services with editorial and visual aid facilities.

The library, located in the laboratory building, has a capacity of about 80,000 volumes. It promises to be a first-class source of reference materials and current literature in the field of agriculture and the supporting sciences.

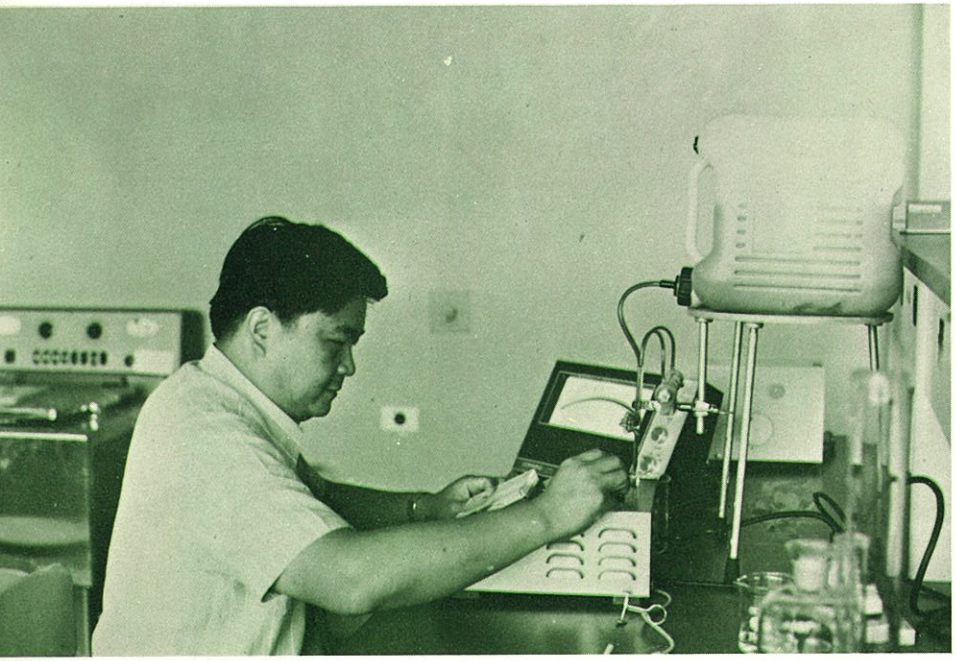
If financial support is available, the Center plans to inaugurate a postharvest physiology program by 1975.

Finances As mentioned earlier, the Center derived its initial support from seven nations and the Asian Development Bank.

The amounts of money received from various sources to finance the first phase of building construction, to purchase the initial furnishings and equipment, and to cover the operating costs until January 1, 1973, are listed below.

	U. S. Dollars
The Republic of China	1,362,500*
The United States of America	1,200,000
The Kingdom of Thailand	150,000
Japan	80,000
The Republic of the Philippines	20,000
The Republic of Vietnam	4,000
The Asian Development Bank	150,000
The Taiwan Canners' Association	250,000

* This amount does not include land purchase, valued at $750,000



A rapid procedure is used to determine the protein content of plant samples. Improved nutritional value of the Asian diet is one of the Center's basic objectives.

Preparing plot land on one of the experimental fields. AVRDC has a land area of 116 hectares of which 102 are devoted to fields for experimental work and seed increase.

During the calendar year of 1973, the Center either has already received, or has been promised (with full expectation of receiving) the following funds:

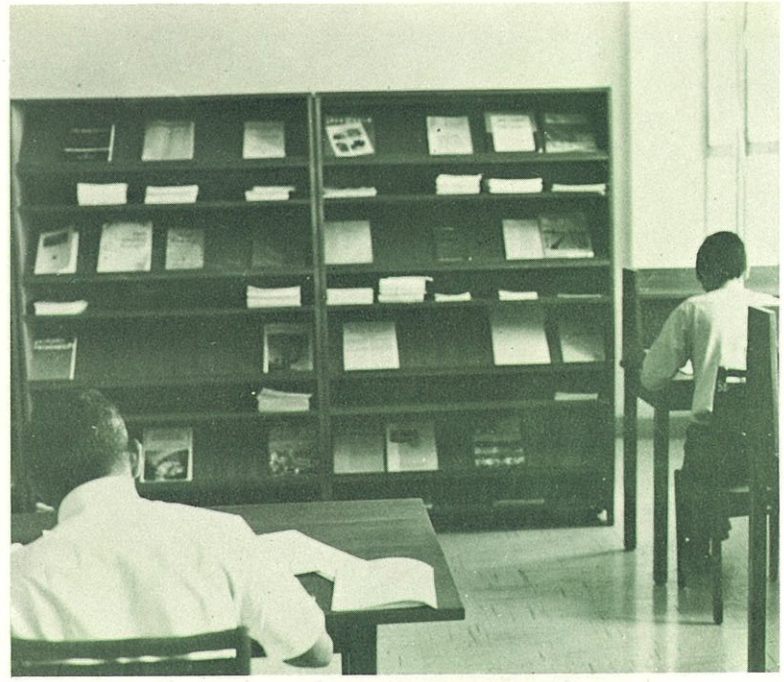
	U. S. Dollars
The Republic of China:	
Toward operating costs	300,000
Toward building costs	100,000
Toward soybean research (JCRR fund)	50,000
The United States of America	600,000
The Republic of the Philippines	278,571
The Kingdom of Thailand	75,000
Japan	75,000
The Republic of Korea	75,000
The Republic of Vietnam	2,000
The Asian Development Bank	150,000

Outside the member countries and the Asian Development Bank, the Center has received a grant in the amount of $300,000 from the Kresge Foundation toward the construction costs of the cafeteria-dormitory building. It has also received from the Rockefeller Foundation a 3-year grant of $75,000 toward mung bean research, of which $25,000 will be spent during the first year.

This brings the total expected usable income of the Center for 1973 to US$2,195,571. Of this, $1,335,571 will be spent for operating costs and for furnishing and equipping the new buildings, and $860,000 will be spent for construction costs only.

The construction work in 1973 consists of 6 new residences, 6 apartments for research associates and a cafeteria-dormitory building to accommodate the training program. The latter building will also contain facilities for guests.

The contractors voluntarily contributed a swimming pool for the Center, for which the latter bought the necessary filters and imported accessories. This facility was completed in May 1973.



Providing highly trained scientists with an excellent library is a necessary ingredient for a quality research and training program.

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AVRDC

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