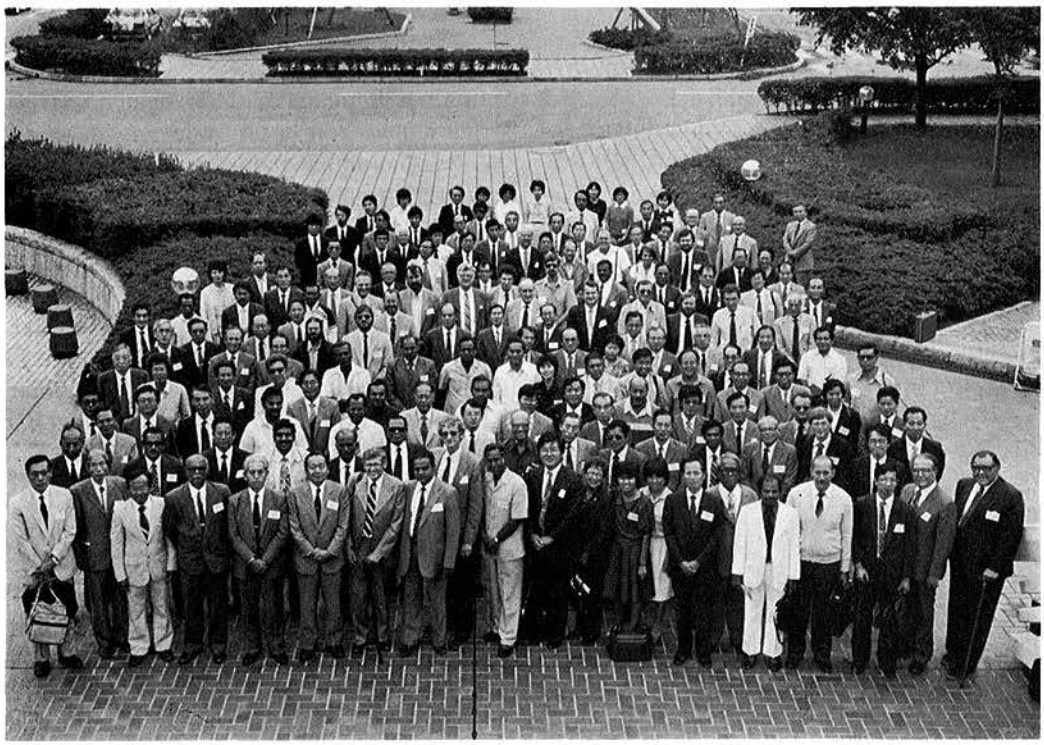
International Symposium on Soybean

Co-sponsored by
Tropical Agriculture Research Center, Ministry of Agriculture, Forestry and Fisheries
and
Asian Vegetable Research and Development Center
September 26 October 1, 1983, Tsukuba, Ibaraki



TARC convened the 17th International Symposium at Tsukuba Office of the Secretariat of Agriculture, Forestry and Fisheries Research Council, jointly with Asian Vegetable Research and Development Center, with the cooperation of the International Soybean Program and the International Rice Research Institute. The thema was "Soybean in the Tropics and Subtropics."

The objective of the symposium was to gain better understanding of present situation of soybean production in the tropics and subtropics by exchanging the latest information and to help coordinate future research on tropical soybean production.

The symposium was divided into two sessions. The first session, entitled "Present Situation of Soybean Production and Role of Soybean in Tropical and Subtropical Agriculture" was sponsored by TARC and included country reports and special research topics. The second session, "Soybean in Tropical and Subtropical Cropping Systems," sponsored by AVRDC, focused on the various production systems in which soybean is grown in developing countries.

Research scientists from Brazil, China, India, Indonesia and Thailand were invited by TARC to discuss the problems in present and future soybean production in respective countries. One hundred thirteen participants gathered from 24 foreign countries and total attendants reached about 230.

At the symposium 16 and 60 papers were

presented under the Session I and the Session II respectively.

The program of the symposium and the name of the speakers are listed as follows.

Inaugural Address

Shoichiro Nakagawa
Director General, Tropical Agriculture Research Center.

Keynote Address

G. W. Selleck
Director General, Asian Vegetable Research and Development Center.

Welcome Address

H. E. Kauffman
Director, INTSOY.

K. Yanagi (read by Mr. Mutai)
Director General, Economic Cooperation Bureau, Ministry of Foreign Affairs

S. Sekiya (read by Mr. Kurita)
Director General, Secretariat of the Agriculture, Forestry and Fisheries Research Council.

Session I Present Situation of Soybean Production and Role of Soybean in Tropical and Subtropical Agriculture

Country Reports

Soybean in Brazil
M.A.C. de Miranda, E. A. Bulisani and H.A.A. Mascarenhas (Brazil)

Soybean in India
P. S. Bhatnagar (India)

Soybean Development in Indonesia
Sadikin Somaatmadja (Indonesia)

Soybean Production in Thailand
Arwooth Na Lampang (Thailand)

Soybean Production and Research in Taiwan
Hsiung Wan (China)

Soybean Production and Research in China
Jian Yu-yu (China)

Soybean Cropping Systems in Southern China
Junyi Gai (China)

Soybean Production and Research in Korea
E. H. Hong, S. D. Kim and Y. H. Hwang (Korea)

Soybean Production in Japan
S. Konno (Japan)

The International Soybean Program (INTSOY)
H. E. Kauffman (U.S.A.)

Special Reports

Isolation, Culture, and Callus Formation of Soybean Protoplast
Jian Yu-yu (China)

Limited Popularity of Soybean Cultivation in South and Southeast Asia
S. Shanmugasundaram (AVRDC)

Contribution of Soybean to Agriculture in the USA
Robert W. Howell (U.S.A.)

Soybean Cultivation in Japan
K. Gotoh (Japan)

Soybean Processing for Food Use in Taiwan
W. L. Chen (China) (read by H. Imai)

Dietary Pattern and Soybean Processing in Japan
Kyoko Saio (Japan)

Session II Soybean in Tropical and Subtropical Cropping Systems

Section 1 Soybean and Cropping Systems

The FAO Soybean Development Program
H. A. Al-Jibouri (FAO)

Sole Cropping and Intercropping of Soybeans in Temperate and Subtropical Environments
D. Keith Whigham and Maheswar P. Bharati (U.S.A.)

Increasing Soybean Production through Improved Cropping Systems and Management in the Tropics
Djuber Pasaribu and Jerry L. McIntosh (Indonesia) (read by S. Arifin)

Soybean-based Cropping Systems in Korea
Y. H. Hwang, E. H. Hong, and S. D. Kim (Korea)

IRRI's Experience in Testing Soybean in Rice-Based Farming Systems
Virgilio R. Carangal (IRRI)

Soybean Response to Intercropping with Cassava
J. S. Tsay, S. Fukai, and G. L. Wilson

Harry C. Minor, and Zane Helsel (U.S.A.)
Weed Control in Soybean
A. Sajjapongse and M. H. Wu (AVRDC)
Influence of Planting Method and Mulching on Seed Yield of Soybean in the Dry Season Following Lowland Rice
T. Adisarwanto (Indonesia)
Effect of Water Stress on the Metabolism of Soybean
Yoshio Yamada and Yasuo Fukutoku (Japan)
Introduction of Soybean to the Mayan Indians in the Highland of Guatemala
A. Prashin (U.S.A.)

Section 5 Disease and Insect Management

Strategies of Soybean Disease Control in the Tropics and Subtropics
James B. Sinclair (U.S.A.)
Recent Advances in Soybean Rust Research
A. T. Tschanz and T. C. Wang (AVRDC)
Differential Reaction of *Phakopsora pachyrhizi* on Soybeans in Taiwan
Chung-chuan Yeh (China)
Soybean Plant Protection in South China
Wang Guo Xan (China)
Breeding and Prospects of Soybean for the Brazilian Tropics
R.A.S. Kiihl (Brazil)
Beanfly Pest Complex of Tropical Soybean
N. S. Talekar and B. S. Chen (AVRDC)
Tumor Induction on *Glycine* sp. by *Agrobacterium tumefaciens* and Gene Transfer
Wang Lianzheng, Yin Guangchu, Luo Jiaofen, Lei Bojun, Wang Jian, Yao Zhenchun, Li Xiulan, Shao Qiquan, Jiang Xingchun and Zhou Zeqi (China)
Status and Strategies for Insect and Nematode Resistance Breeding
Torao Ohba, and Shigeo Matsumoto (Japan)
The Search for Improved Soybean Cultivars in Tanzania
Andrew Doto (Tanzania)

Section 6 Nitrogen Fixation and Fertilization in Soybean

Quantifying N_2 Fixation in Field Soybean Using ^{15}N Isotope Dilution
R. J. Rennie (Canada)
Development of Soil Tests for Predicting Phosphorus and Potassium Requirements of Soybean
T. Dickson, P. W. Moody and G. F. Haydon (Australia)
Developing Cost Effective Rhizobium Technology for the Tropics and Subtropics
P. Singleton, J. C. Burton, F. Cady, R. Davis and J. Halliday (U.S.A.)
Response of Soybean Cultivars to Supplemental Nitrogen after Flowering
Iwao Watanabe, Kohsei Tabuchi and Hiroshi Nakano (Japan)
Nutrient Requirements of Soybean in the Southern Guinea Savanna of Nigeria
D. Shannon (read by K. Dashiell IITA)
Irrigated Soybean Production in Egypt: Past, Present, and Future Trends
A. M. Nassib, M. Sherbeeny, M. Zaki and K. G. Cassman (Egypt)
Breeding Soybean for Superior Seed Longevity and for Nodulation with Indigenous Rhizobia
Eric Kueneman and Kenton Dashiell (IITA)
Economical Fertilization of Nitrogen for Tropical Soybean
Ichiro Tanabe, Chin-hua Ma, and Chia-chen Chu (Japan, AVRDC)

Section 7 Socio-Economics of Soybean Production

Economics of Small and Large-Scale Soybean Production
Edwin C. Price and Thelma R. Paris (IRRI)
Soybean Cropping Systems in Thailand
Vichitr Benjasil and Arwooth Na Lampang (Thailand)
The Place of Soybean in Crop Rotations and the Farmer's Attitudes
Trikha Ravendra Nath (India)
The Economics of Soybean in Indonesia
Sultoni Arifin (Indonesia)
Intensifying Land and the Nutritive Equivalent Ratios through Intercropping Matching Pairs of Corn and Soybean Cultivars in Egypt

Sayed Galal, Jr., M.M.F. Abdalla and A. A. Metwally (Egypt)

Session I Present Situation of Soybean Production and Role of Soybean in Tropical and Subtropical Agriculture

Country Reports

Present situation and future of soybean production in each country were reported. Recognizing the potential of soybean as a member crop in cropping systems and as a source of protein and edible oil for human food as well as animal feed, each country is making efforts to increase soybean production. However, the area planted and average yield have not increased though soybean consumption is growing.

The possibility of increasing soybean area in "Cerrado" region was reported from Brazil. Soybean in "Cerrado" requires high input of lime, phosphorus, herbicides, etc., which causes an increased cost of production.

The gap in average soybean yield between experimental stations and farmers' fields was reported from almost all countries. The former is 3–4 t/ha while the latter less than 1 t/ha. Needs of breeding suitable varieties for various climatic and soil conditions, research on appropriate technology, economic incentives, efficient marketing and more effective extension efforts were emphasized.

The report from China on soybean cropping systems in southern China was very informative, because only a little had been known on soybean in China. The Chang-Jinan Valley was introduced to us, as an important area of soybean production in southern China.

Special Reports

Shanmgasundaram (AVRDC) analized the reasons for a limited popularity of soybean cultivation in South and Southeast Asian countries, and pointed out that the average yield is low even though the price is attractive in Indonesia and Thailand, while there is no sufficient price support to provide a good return compared with other crops in Taiwan and the Philipines. He also listed up factors which cause poor yield and hamper soybean cultivation.

History of soybean cultivation and contributions of the crop in U.S.A. and Japan were presented by Howell and Gotoh respectively. Howell outlined the progress of soybean production in U.S.A. showing many portraits of prominent scientists who contributed to the introduction and improvement of soybeans. He emphasized that the close cooperation among the groups involved in soybean research, production, and commercialization had brought about the development of soybean production in U.S.A.

Valuable suggestions were given by the reports on soybean processing from Taiwan and Japan for the future expansion of soybean production in many countries.

Processing methods and consumption patterns of historical, traditional and newly developed soybean foods were described by Chen and Saio. Particularly, Saio mentioned that the food consumption patterns in Japan are well balanced in nutrient components as compared with U.S.A. and India, because Japanese diets contain more soybean foods than in the other countries.

General Discussion

General discussion was co-presided by H. E. Kauffman (INTSOY, USA), Sadikin Somaatmadja (CRIFC, Indonesia) and Kanji Gotoh (Hokkaido University, Japan).

At first, the chairperson (Kauffman) stressed the importance of processing and utilization of soybeans. Production and utilization aer closely related, and soybean scientists must understand the whole picture of soybean industry so as to be able to make pertinent recommendations to the authorities concerned in the respective governments to establish, implement or expand programs. Then the following discussions were made, placing a forcus on the future trends and policies of soybean production in respective countries.

Brazil has a high potential of increasing production of soybeans because a large area

still remains uncultivated. The "cerrado" covers approximately 150 million ha of which 50 million ha can be used for soybeans. However, the "cerrado" soil requires lime and phosphorus application, which causes a high cost of production. Thus, the main problem is related to the price of soybeans in the world market. Soil erosion is also very important in the Brazilian soybean production.

In China continent, the increase in area of soybean is limited except for some areas in the southern part. The most important objective is to raise the yield per unit area. Soil fertility is the most-important problem to be solved, particularly phosphorus availability and organic matter preservation.

In Indonesia there are short-term and long-term programs of soybean production. Main constraints to production increase are seed provision, pests and diseases and adaptability of varieties.

The trend of soybean production in U.S.A. will essentially be governed by economic factors. Production area will likely remain rather constant with year to year variations largely reflecting relative prices of corn and soybean at planting time. Average yield increase of 34–45 kg/ha will continue though year to year variations may occur due to weather.

Mungbean is competing with soybeans in Thailand. Thai farmers grow soybeans when they cannot grow mungbeans which fetch a higher price.

Economic problems of soybean production in Japan, Korea and Taiwan were also discussed. In these countries the soybean area has decreased with the increase in consumption, due to increasing import of cheap soybean from U.S.A., which suppresses farmers' incentive to grow soybeans. Under this situation the necessity of increasing yield by developing high-yielding varieties, which can tolerate low management practices and reduce the yield gap between experimental stations and farmers' fields, and of reducing production cost by enlarging the scale of operation were emphasized.

To reduce the wide gap between potential yield and actual yield, technical problems including extension were discussed by the participants from international organizations, India, Indonesia and other countries.

Regarding utilization of soybeans, it was emphasized that a variety of soyfoods on the market in Asia should be introduced to other parts of the world to popularize them and to promote their use world wide.

Finally, 1) preservation and effective use of local strains for breeding, 2) establishment of suitable seed supplying system and 3) development of multiline varieties resistant to diseases and pests were stressed by co-chairperson Gotoh for the improvement of soybean production.

Session II Soybean in Tropical and Subtropical Cropping Systems

Section 1 Soybean and Cropping Systems

In Section 1, cropping types of soybeans *i.e.* sole cropping, strip intercropping and relay intercropping were compared and characterized. After that, experimental results and actual situation of intercropping with rice, barley, cassava, young rubber and oil palm, pigeonpea, groundnut, sorghum, cotton, etc. in several countries were reported and discussed on their technical and socio-economic problems.

Section 2 Breeding Soybean for Cropping Systems

Suitable traits of soybean cultivars for intercropping, for instance, shade tolerance, lodging resistance, early maturity to avoid moisture stress, small seed size for good germination, rapid rate of vegetative development, reduced sensitivity to photoperiod and temperature were discussed. Breeding of tolerant varieties and its basic studies were also reported.

Section 3 Environmental Management

Soil water condition, soil temperature and photo-thermal condition on soybean cultivation were discussed in Section 3.

Problems associated with wet season production include poor germination and stand

establishment, high disease incidence and poor seed quality. Dry season constraints include water stress which causes poor pod set and pod filling, and high soil temperature which adversely affects germination, emergence and nitrogen fixation.

Cultivation methods to overcome these problems, adaptation of soybeans to these environmental conditions and basic researches on the effects of soil water and photo-thermal conditions on soybean growth were reported and discussed.

Section 4 Cultural Management

Results of physiological researches and experiments on cultural practices of soybeans were presented in this section.

It was pointed out that N application confined to a single location of soil promotes N absorption by a portion of the root system and N_2 fixation in other portion of the root system, resulting in higher yield, and that water stress reduces translocation of soluble sugars and stimulates protein degradation.

As for cultural practices, following subjects were reported and discussed. Critical time for manual weeding, chemical control of weeds, seeding in or near rice stubbles and mulching with dry rice straw on paddy fileds after rice for increasing soybean yield, trial manufacture of manually operated simple soybean seeder to save labor, wheat-soybean double cropping, etc.

Section 5 Disease and Insect Management

Soybean disease control, relation between soybean rust and physiological age of soybean, soybean yield, precipitation, leaf wetness, temperature, races of *Phakopsora pachyrhizi* (soybean rust), beanfly control and breeding of insect resistant varieties were discussed.

Among them the use of good quality seeds, appropriate cultivars, recommended agronomic practices, fungicides and pesticides, if necessary, prompt harvesting, and good storage conditions were emphasized to prevent disease development above threshold level.

Section 6 Nitrogen Fixation and Fertilizer for Soybean

Quantifying nitrogen fixation using ^{15}N, predicting phosphorus and potassium requirement of soybeans, rhizobium inoculant production, and response of soybeans to supplemental application of nitrogen were presented.

Effectiveness of top dressing of nitrogen after flowering was described as activation of photosynthesis and increase in grain and protein yields.

Section 7 Socio-Economics of Soybean Production

Results of economic analyses of soybean farming in the Philippines, Thailand, India and Egypt were reported and discussed actively on their problems.

Excursion

Foreign participants visited the National Agriculture Research Center and National Institute of Agricultural Sciences, Tsukuba, and observed soybean plants growing in the fields of experiments and physiological researches.