## General Discussion

**Chairman: Kauffman, H.E.** (INTSOY): The purpose of the general discussion is to review and bring out some of the highlights of the presentations and to give the the opportunity to the participants to ask questions and consider in more detail particular aspects of the problems outlined in the reports. It appears that the group is primarily represented by scientists working in production. However some of the speakers presented data on the processing and utilization of soybean products. I believe that this area is extremely important. Indeed production and utilization are closely related and soybean scientists must understand the total aspect of the 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.

The discussion on the reports presented by the delegates of several countries and international organizations is now open. Emphasis will be placed on defining more precisely the future trends and policies of the respective countries with regard to soybean production.

I would like to ask Mr. Miranda what are the projections on future trends of soybean production in Brazil.

**de Miranda, M.A.C.** (Brazil): In Brazil plans are being made to further develop soybean cultivation in the tropical areas, in particular in the area presently under "cerrado" vegetation in making the best use of the technology available.

**Galal, S. Jr**. (Egypt): I would like to know how and where the 275 million metric tons of soybeans needed for the international market in the year 2000 will be produced in considering the current level of production which stands at 94 million metric tons. Also I wonder if it is wise for some countries to reduce the area under production in favor of more profitable crops.

**Kiihl, R. (Brazil)**: It appears as if the technology required to double the world soybean production is available. The use of the Brazilian "cerrado" soil would probably be the easiest solution. Indeed the "cerrado" area covers approximately 150 million hectares, of which 50 million hectares can be used presently and the total world soybean production could be doubled in a few years. However to bring the "cerrado" soil under production, lime and phosphorus application is necessary. I believe that the economical aspects will determine the future development of soybean production in the world. A new economic organization will be necessary because the cost of production is increasing and the price of the product must increase too. It appears as if the people who need food, in particular protein, cannot afford it and that the countries which have land and resources do not have the money to produce.

**Bhatnagar, P.S.** (India): In India there is a deficit of 2 million tons in the production of edible oil. The demand which is likely to increase further cannot be met by other crops but soybeans whose production should therefore increase. Ten years ago the area cultivated to soybeans covered less than 1,000 hectares while now it amounts to 200,000 hectares. The expansion of the area planted is likely to take place in the southern states such as Tamil Nadu.

**Wang, J.L.** (China): Brazil has a high potential to increase the production of soybeans because large areas still remain uncultivated. The main problem is related to the price of soybean in the world market. The cost of production of soybeans is fairly high in Brazil because of the high input of lime, phosphorus fertilizer and herbicides. The price of soybeans should be high enough to enable the Brazilian farmers to derive a profit from soybean cultivation. The soil erosion problem is also very important in the Brazilian soybean production and a stable cropping system will have to be developed.

As far as China is concerned, the increase in the area of soybean is limited. China has some potential for the increase of soybean production by increasing the yield per unit area.

**Sumarno** (Indonesia): It is interesting to note that the acreage of soybean in the tropics has tended to remain constant or has even decreased for the last 10 years, in spite of the attempts made to expand the production of soybean. What are the possible reasons ? Agronomic or economic ? I would also like to ask Dr. Kauffman whether any cultivars have been released or recommended by the countries participating in the programs since INTSOY was organized in 1973.

**Chairman: Kauffman, H.E.** (INTSOY): A large number of breeding materials have been released in the countries where they have been tested. About 40 countries have released or have grown under a certain scale of production materials from these trials. Moreover the materials have also been used as parents in breeding programs.

With regard to the first question of Dr. Sumarno, some of the reasons for the lack of increase or even for the decrease in soybean production observed in the tropics and subtropics may be related to agronomic or economic factors, as emphasized by Dr. Shanmugasundaram. Would any of the participants comment on these aspects ?

**Trikha, R.N.** (India): The area under soybean is definitely decreasing. Such a situation could be compensated by an increase in yield. However there is a wide gap between the potential yield and the actual yield. For example, in the experimental stations the yields are in the range of 3-4 ton/ha while in the farmers' fields they are less than 1 ton/ha. In India also we are facing the same situation. Therefore there is an need for a integrated approach. Scientists should establish a better working relationship with extension workers.

**Chairman: Sadikin, S.** (Indonesia): The lack of increase of the area under soybeans is often related to agronomic reasons. For example, the varieties are not well adapted to the tropical conditions. Also seed provision is difficult to realize in tropical countries. In Indonesia in farmers' fields, yield is hardly reaching 1 ton/ha. The seed rate should definitely be increased.

**Rahman, L.** (Bangladesh): It appears clearly that in some countries like Taiwan, Korea and Japan the acreage of soybean has considerably decreased with the increase in consumption. As a result these countries have increased imports from the USA where the price policy is in fact a controlling mechanism of this price. In many of these countries due to changes in the trend of labor, the cost of production has increased. Since the price is low in the world market each country favours imports and the farmers have no incentive to grow soybeans. However the yield needs to be increased but not at a high cost. Therefore the breeders should tackle this problem in developing high-yielding varieties (competitive with other crops) which tolerate low management practices. There should be a coordinated regional approach to share available technologies relating to variety development, germplasm exchange, promotion of training, expert assistance and development of an integrated system for utilization of techniques and methods.

**Galal, S. Jr.** (Egypt): Would it be possible to have a steady increase in production of about 11%/year until the year 2000 to be able to produce the needed amount of 275 million tons ? Also should soybean production depend only on a few countries and is it wise for other countries to increase production so as to cushion this dependence ?

**Al Jibouri, H.A.** (FAO): I believe that there is a great potential to increase the yield per unit area through plant breeding and genetic manipulation as in the case of rice or maize. In tropical Africa soybean is not a traditional crop and the technology has to be developed and adapted to introduce it into the African cropping systems. The fact that some countries such as Cuba, Mozambique, Zambia, Zaire, Sri Lanka and India are promoting soybean cultivation and are expanding the production of this commodity both horizontally and vertically is certainly a major achievement.

**Yap, T.C.** (Malaysia): I would suggest that soybean be produced as a source of protein for food rather than as an oil crop. Indeed compared with oil palm in which one hectare produces 3 tons of cooking oil, the yield of soybean is comparatively low.

**Garside, A.L.** (Australia): It appears to me that the real problem related to the decrease in soybean production is economic. In the countries with declining production, such as Korea and Taiwan alternative crops are more profitable to grow. If the demand is to increase, as has been suggested, the price will also increase and therefore encourage more production.

**Chairman: Kauffman, H.E.** (INTSOY): would like to ask each of the delegates who presented a country report to outline the projections for soybean production in the respective countries.

**Bhatnagar, P.S.** (India): The increasing demand and decreasing trend of soybean production in the world points to the conclusion that there is a need for more concerted efforts and active involvement of international organizations such as FAO, World Bank, etc. for reducing the gap between

experimental yields and farm yields and to increase both productivity and output of soybeans. The international organizations could help in undertaking in-depth studies and active research on development of disease resistant and high-yielding varieties, production technology and cropping pattern, consumer preference and comparative price structure of soybean products, marketing strategies based on the judicious mix of media and approaches.

As I mentioned before, in India there is a vast potential to increase the production of soybeans. It is anticipated that in the years 1983-1984, 1.4 million hectares will be planted to soybeans and in the years 1984-1985, 1.8 million hectares should be devoted to soybeans. Although the use of soybeans will mostly be for oil production, emphasis should be placed on the utilization of defatted soy flour for food and feed.

**Chairman: Sadikin, S.** (Indonesia): In Indonesia there are short-term and long-term programs relating to soybean production. For the short-term measures, there are three packages of techniques aiming at area expansion and intensification. The long-term programs will involve more research. The main constraints to increased production are seed provision, pests and diseases and adaptability of varieties. There is a need for the development of varieties with short maturity to meet the requirements of the cropping systems adopted in Indonesia.

**Arwooth Na Lampang** (Thailand): As mentioned previously by Dr. Shanmugasundaram, the farmers are usually motivated by income consideration when they grow a crop. Therefore, in Thailand farmers grow soybeans when they cannot grow mungbeans which fetch a higher price. In the early rainy season, when frequent rainfall will promote the sprouting of mungbean seed at the time of maturity, soybeans are being grown. Likewise in the winter when the temperature is too low for mungbean to germinate and causes injury to the plant, soybean will be grown.

**Howell, R.W.** (USA): The trend of soybean production 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 soybeans at planting time. Average yield increases of 1/2 to 2/3 bushel per acre will continue but year to year variations due to weather may obscure the increase trend in a single year.

**Gai, J.Y.** (China): Soybean acreage is likely to increase in the southern part of China. However the most important objective is to raise the unit acreage yield and the soybean breeders are now facing the challenge of matching the progress made in the breeding of other crops such as rice, wheat and corn. The target set presently is to achieve a yield of 3-4 ton/ha.

**Chairman: Kauffman, H.E.** (INTSOY): Since China has large collections of soybean germplasm, do you consider that some of the materials could be used to develop high-yielding varieties ?

**Gai, J.Y.** (China): It is unlikely since the germplasm consists of local cultivars and the potential is not promising unless genetic engineering is performed.

**Wang, J.L.** (China): Soil fertility is the most important problem to solve in China, particularly with regard to phosphorus availability and organic matter preservation.

**Shanmugasundaram, S.** (AVRDC): At IRRI a comparison was made of the yield and return per hectare and per kg between soybean and mungbean which are grown after rice during the 65- to 70-day interval between the two crops of rice in the rotation. It was observed that the yield of mungbean after 70-day cultivation was 1.2 ton/ha while that of soybean exceeded 2 ton/ha after 72-day cultivation. Since the unit price for mungbean is twice that for soybean, farmers are naturally motivated to grow mungbean rather than soybean.

**Konno, S.** (Japan): In Japan soybean production can increase only by enlarging the scale of operation or reducing the production cost.

**Chairman: Kauffman, H.E.** (INTSOY): Does any of the participants wish to make any comment on aspects pertaining to the application of biotechnology to promote soybean production ? Indeed it may be important to evaluate the potential of biotechnology for achieving higher soybean yields which has already been realized in other crops through standard breeding techniques.

**Galal, S. Jr.** (Egypt): I would like to propose that a tissue culture program for soybean breeding, particularly for the development of cultivars resistant to pests and diseases be financed. I have great

hopes in the potential of tissue culture since I visited Dr. Zapata's tissue culture laboratory at IRRI. I have seen there new cultivars produced from anther culture of rice which were resistant to the brown planthopper in the breeding plots. These results could be obtained in a six-month period compared with at least ten years with the conventional breeding methods.

**Chairman: Kauffman, H.E.** (INTSOY): I would like to add that in China very successful programs for anther culture of rice have been developed. Tissue culture of soybean appears to be more difficult but should draw a great deal of attention in future. Topics relating to soybean processing, food uses, dietary pattern could now be discussed.

I was very much impressed with the variety of soy foods that are being marketed in the Orient but have yet to be recognized in other parts of the world. There is a need for popularizing these products so as to promote their use worldwide.

**Dutt, A.K.** (India): The potential of soybean in West Bengal is quite high in rice fallows where soil moisture is adequate for the maturation of early-maturing varieties of soybean, especially in the coastal area and in the Sunderbans. Active programs of demonstration and preparation of soybean foods have promoted the consumption of soybean grains whose demand markedly increased in the cities and rural areas. Such programs are particularly important so as to motivate farmers to grow soybeans, as a source of protein for the people with low income.

**Chairman: Kauffman, H.E.** (INTSOY): I would like to ask Dr. Gotoh if he wishes to make a few comments about the symposium.

**Chairman: Gotoh, K**. (Japan): I would like to emphasize the three following points: 1. I believe that the local strains or land races which are well adapted to the conditions of a given area are important and should be preserved. 2. To increase the potential of the existing cultivars with regard to yield, a suitable system for supplying and increasing the seed samples should be developed. 3. Multi-line varieties should be developed and various kinds of seed samples should be mixed before they are allowed to grow under specific conditions. Types resistant to diseases, pests, etc. should be prepared prior to releasing them to the farmers.

**Chairman: Sadikin, S.** (Indonesia): In Indonesia, emphasis should be placed on the development of a stable system of seed provision, such as the seed flow system.

**Chairman: Kauffman,** H.E. (INTSOY): We have now reached the end of Session I which was focussed on the present situation of soybean production and the role of soybeans in tropical and subtropical agriculture.