

Global Extension and Diversification of Fresh and Frozen Vegetable Soybean

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Introduction

Vegetable soybeans (*Glycine max* (L.) Merrill) were consumed as early as the second century BC in China. It was recognized for its nutritional and medicinal value (for a review see Lumpkin and Konozki 1991). Vegetable soybeans are common in China, Japan, Korea and Taiwan. The manner in which vegetable soybeans were used in the past has also been reviewed by the above authors. The pods of grain soybean varieties attached to the stem were boiled and marketed for more than 100 years in Thailand. Similarly in Nepal, green pods detached from the stem are sold in the market. It is boiled and the green beans are consumed. In the USA, vegetable soybean was considered distinctly superior to grain soybean in the 1950s for human consumption (Weber, 1956). From the time the Asian Vegetable Research and Development Center (AVRDC) began research on vegetable soybean in 1980, the objective was to extend the use of vegetable soybean around the world. In this paper, the manner in which vegetable soybeans have gained worldwide recognition; and the various fresh and frozen vegetable soybean products developed in Taiwan and a few other countries are reviewed.

Extension of Vegetable Soybean

In the early days of soybean development in the USA, three general groups were recognized – commercial (grain), forage and vegetable types (Morse and Carter 1952). The soybean accessions collected by Dorsett and Morse until 1950 were used primarily for the development of vegetable soybean cultivars (Hymowitz 1984). In the US, vegetable soybeans were grown primarily by home gardeners, canners and frozen food processors (Weber, 1956). In 1971 with USAID/csd-3292, the University of Illinois commenced a Program for International Research, Improvement and Development of Soybeans (PIRIDS); in March 1973, and the name PIRIDS was later changed to International Soybean Program (INTSOY). INTSOY provided grain soybean trial sets to anyone interested in soybean. The yield potential and adaptation of American soybean cultivars were determined around the world from the international soybean variety experiment of INTSOY (Shanmugasundaram, 1979). However, vegetable soybeans were neglected. In 1985, AVRDC initiated the vegetable soybean research in cooperation with Kaohsiung District Agricultural Improvement Station (DAIS) with support from Council of Agriculture (COA) in Taiwan. Through AVRDC newsletter and annual report, availability of vegetable soybean for trials was announced. From around the world, there was considerable interest to evaluate vegetable soybean. AVRDC provided vegetable soybean germplasm, breeding lines and improved varieties for trials by cooperators.

In 1987 Kaohsiung DAIS in cooperation with AVRDC released the first vegetable soybean variety, Kaohsiung No. 1 (AGS 292) for Taiwan farmers (See Lin et al. in this proceedings). In 1990, Kaohsiung No. 1 occupied 84% of the total vegetable soybean area in Taiwan. In 1992,

AGS 292 was released as KPS 292 by the Kasetsart University in Thailand. The list of countries commercially growing vegetable soybeans in 1980s was very few but in 2000, 10 countries have commercially released vegetable soybeans (Fig. 1a and b) for their farmers.

Private seed companies in Japan continue to develop vegetable soybean varieties. In the USA, a few universities, for example, Iowa State University, University of Illinois, Washington State University, University of Hawaii and University of Delaware have conducted some research and some have released large seeded soybean varieties for use as vegetable soybeans (Shurtleff and Aoyagi, 1991, Shanmugasundaram, 1996). In this conference, a number of papers are presented by people who have successfully introduced vegetable soybean into new areas.

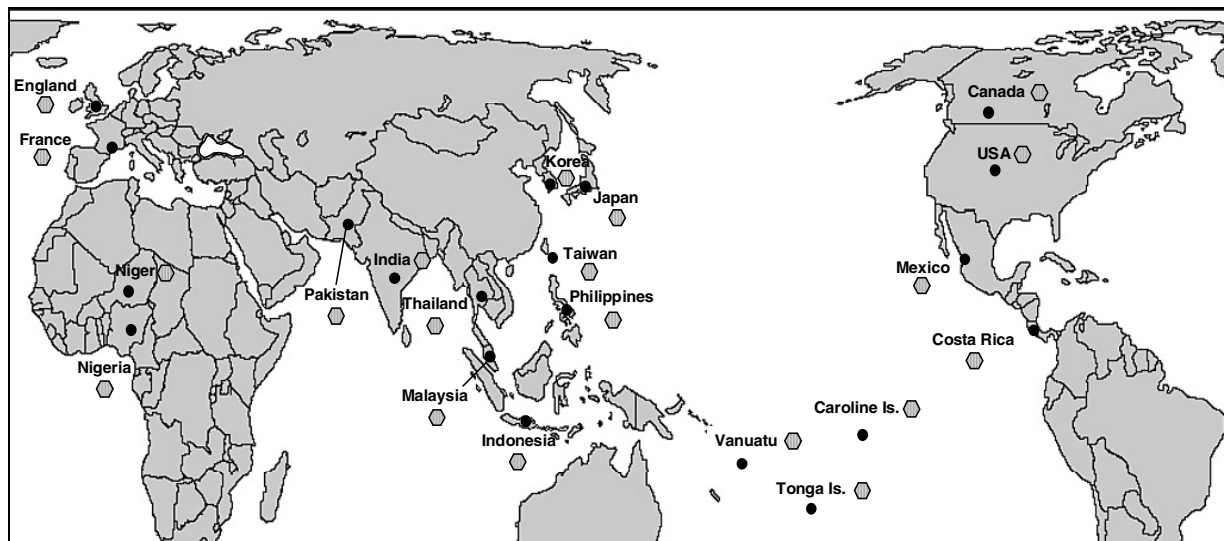


Fig. 1a. Progress in evaluation and release of AVRDC vegetable soybean from 1979 to 1983.

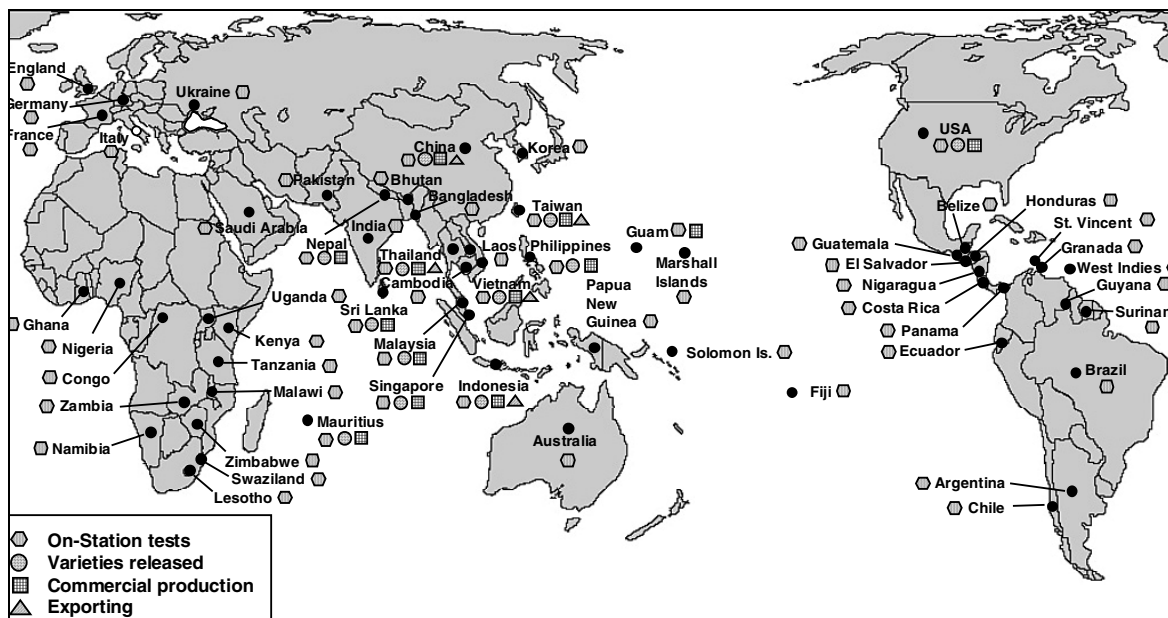


Fig. 1b. AVRDC vegetable soybean evaluation, commercial production and export in the world as of 2000.

Diversification of Fresh and Frozen Vegetable Soybean

At the first international vegetable soybean workshop organized by AVRDC in 1991 to expand the market for vegetable soybean, development of new products from vegetable soybean was encouraged (Shanmugasundaram, 1991). The frozen food manufacturers, trading companies and AVRDC have undertaken research to develop new products from vegetable soybean.

Grain soybean is commonly used for making milk. Soybean milk can also be prepared using vegetable soybean. Vegetable soybeans are ground with water under high temperature and treated with sodium hydrogen bicarbonate. The resulting soybean milk is green in color and has no beany flavor. If the beans are blanched prior to grinding then the protein recovery is low. By adding different flavors, the product can be diversified. High quality bean curd (tofu) with good color and texture can be made from vegetable soybean milk. Calcium sulfate at a suitable concentration as a coagulant is used with appropriate water/vegetable soybean ratio. Dehydrated vegetable soybean is used for making flour. Vegetable soybean flour can be used for making noodles and other flour products to enrich their nutritional value. Vegetable soybean powder $\leq 40\%$ is mixed with wheat flour to make green vegetable soybean noodles and vegetable soybean meat balls. It is already available in the market.

Vegetable soybean milk can also be used to make ice cream, ice-bar and yogurt.

In Mauritius, after they introduced the vegetable soybean in 1998, the consumers used the beans like peas. To shell the beans from the pods, the housewives boiled the pods for 2 to 3 minutes and then drained the water. The boiled beans were easy to shell compared to the raw beans.

Traditionally, beans are cooked either alone as a vegetable or they are mixed with meats or seafood in many ways. The beans are also included in fresh or frozen mixed vegetable pack or fried rice that can be readily cooked. Vegetable soybeans are mixed with carrot and corn and sold as three color beans.

Soynuts are common in the USA with grain soybeans. In Sri Lanka, vegetable soybeans are dried and deep fried like peanuts and marketed.

Recently in Bangkok, Lanna Products Company in Lamphur, Thailand produced a product called 'Seleco' using green vegetable soybean fried in oil with 2% salt. It is labeled as no aflatoxin, high vitamin A and low fat and served as a snack in all Thai Airlines international flights as a snack.

Taiwan, China, Thailand and Indonesia export frozen vegetable soybean to Japan. There is potential to export vegetable soybeans to European countries. At the same time, the domestic market for vegetable soybean in all countries can also be expanded. However, in order to expand the domestic market, efforts should be made to diversify the products to meet the consumer preferences.

In Taiwan, the frozen vegetable soybean industry has combined garlic, pepper, wasabi, stockfish, perilla or Chinese spice after blanching and market them as seasoned vegetable soybean in the supermarket. For South Asia, it is possible to develop curry flavored vegetable soybean.

Conclusions

In cooperation with national partners, AVRDC has brought worldwide awareness for vegetable soybean. AVRDC will continue to promote the expansion of vegetable soybean to the

poor around the globe. Research focus will address the consumer requirements with special emphasis on eating and nutritional qualities. Seed production strategies and location specific management needs will be another area that requires research. Developing country governments should be encouraged to incorporate vegetable soybean in their farmer's cropping system to sustain soil productivity, to increase their income and to improve the micronutrient deficiencies of the poor. The sub-regional consumer preferences should be studied to diversify the development of locally preferred vegetable soybean products.

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