

Agency for International Development's Program for Development and Utilization of Soybeans in the Developing World

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ABSTRACT

The Department of State's Agency for Industrial Development is sponsoring a development program to increase yields and utilization of soybeans in tropical and subtropical countries. The work is being done under grants to the University of Illinois and the University of Puerto Rico.

INTRODUCTION

Soybeans are capable of producing the greatest amount of protein/unit of land of any major plant or animal source used as food by man. The protein is a good quality, being nearly equal to casein in value. These two attributes make the soybean potentially an excellent food crop for the protein deficient countries of the world. The U.S. Agency for International Development (AID) recognizes this and, accordingly, supports an extensive program of research and utilization to convert the potential of the soybean into reality as one important phase of its program to increase the production of nutritious crops in the developing world.

PROBLEMS FACE SOYBEAN ADAPTATION

There are two problems of adapting the soybean to the food needs of the developing world. First, the majority of the developing countries which need additional protein are in tropical and subtropical areas. While soybeans are grown in such areas, for example in Thailand and Indonesia, yields are low. The high yielding varieties of the temperate zone must be adapted through selection or breeding to make them adaptable to tropical and subtropical conditions, if the high yields of the soybean are to be realized. Concomitantly, there must be a complete evaluation of the cultural practices necessary to attain and maintain high yields. Attention also must be paid to the control of insect pests and diseases, particularly those pests and diseases peculiar to tropical and subtropical conditions, which will affect high yield.

The second problem is to develop means of utilizing the soybean directly as human food. While several countries in the Far East have developed interesting soybean dishes based upon fermentation, these have had little acceptance beyond their immediate area of use. What is needed are cooking methods adaptable to home use or to small scale village industries if soybeans are to become a significant factor in the diets of many developing countries. The rural populations of these countries are not purchasers of processed foods or food materials in any volume. Even if it were an acceptable food ingredient, few rural people in these countries can afford to buy soybean meal, and textured products would be completely beyond their reach. Further, soybean meal and textured products demand a solvent extraction facility which, in turn, can demand a raw material input beyond the amount a country can provide. The desirable approach is to use the bean directly with minimum processing, thus using the protein most economically and benefiting from the caloric contribution of the oil.

The problem of using the soybean directly is essentially one of reducing the long cooking time required to bring the beans to an acceptably tender texture and of eliminating, or minimizing, the painty or beany taste to which many consumers object. Cooking time of ordinary soybeans is 3-4 hr, far too long for consumers with limited supplies of cooking fuel.

APPROACHING THESE PROBLEMS

To approach these problems, AID is funding a research project with the University of Illinois, Champaign, Ill. The project deals with production, cultural and disease aspects, and development of simple processing procedures to enable soybeans to be used directly as human food.

On the production side, the results, to date, have shown that selected high yielding, commercially available soybean varieties will produce good yields under tropical and subtropical conditions, if all the cultural conditions, including water, adequate inoculation, and disease and insect pests are kept under good control.

Over the past 6 months, more than 80 uniform varietal trials have been conducted in over 40 countries in tropical and subtropical zones. The best performing varieties from these trials, plus other varieties from a number of sources with characteristics deemed essential for consistent performance, will form the basic stock for a further program of selection and breeding.

The selected varieties and new cultivars first will be tested at the experimental farms of the University of Puerto Rico, Mayaguez, Puerto Rico. These stations offer a variety of tropical and subtropical conditions, so that a realistic evaluation can be made of new cultivars before taking them out for more intensive trials in the developing countries. Additionally, the University of Puerto Rico will be increasingly concerned with investigations relating to limiting diseases and insects affecting soybeans in tropical areas.

To back up the research work, the University of Illinois is compiling a large synoptic collection of insects affecting soybean production throughout the world. It also is compiling a computer stored and cataloged reference list covering germ plasm resources world wide.

The Illinois-Puerto Rico research is coordinated further with several of the international centers which have direct interest in soybean production development. These currently include the International Institute for Tropical Agriculture (IITA) in Nigeria, the International Rice Research Institute (IRR) in the Philippines, and the International Center for Tropical Agriculture (CIAT) in Colombia. These institutes not only cooperate in research efforts, but they also operate as effective relay centers to take the fruits of research and convert them to practice. Additionally, research programs are underway, or being developed, with research institutions in a number of developing countries which have a keen interest in the potential of soybeans as human food. AID would welcome further collaborative efforts.

Regarding the direct utilization of soybeans as human food, the Food Science Department, University of Illinois, has developed a simple method for processing the beans.

The method involves three steps. First, the beans are inspected, and all broken or cracked beans are removed. The broken beans have been found to be the cause of the objectionable beany or painty flavor which develops quickly through enzymatic action if the bean is damaged in any way. Secondly, the beans are soaked for 6-8 hr in a 0.5% solution sodium bicarbonate and baking soda. Then they are drained and cooked for 20-30 min in a similar 0.5% baking soda solution. At the end of this short cooking period, the beans are tender in texture and bland in taste. The procedure is well adapted to home use. Increasingly sophisticated products can be made using this procedure. The cooked beans can be hulled, dried, and split to produce an acceptable food. The processed beans can be ground into a pabulum which can be eaten, per se, or mixed with other cereals to make an acceptable weaning food; or the ground material can be roller dried and ground to provide a bland stable flour which can be used as a raw material in a variety of food products. With further elaboration, the process can lead to "butter," "milks," and other products. In each case, however, the technology is essentially simple and adaptable to small scale processing.

Demonstrations of the method have been made in several countries, and more are underway. There is immediate interest in these procedures in child feeding programs in countries already producing soybeans.

INTERNATIONAL RESOURCE BASE FOR SOYBEANS

In September 1973, AID awarded two grants of \$500,000 each to the Universities of Illinois and Puerto

Rico under Section 211 (d) of the Foreign Assistance Act. This Section provides for funding American universities to increase their competence in specific areas, enabling them to deal with problems of development better and enabling their expertise and resources to be made readily available to other donors and to developing nations. The grant to the University of Illinois aims specifically at increasing their already great competence in developing improved soybeans to meet the requirements of tropical and subtropical production. The grant to the University of Puerto Rico is to strengthen their particular expertise in the area of plant pathology and entomology, with particular references to limiting pests which affect soybeans under tropical and subtropical conditions.

These grants form the basis for creating an International Resource Base for Soybeans, capable of carrying out development functions similar to those performed by CIAT, IRRI, the International Wheat Improvement Center in Mexico, and others.

This type of internationally oriented research on food crops is essential if the world is to feed itself in a satisfactory manner. AID believes strongly that the developing world must be capable of feeding itself adequately and hopefully producing more food to provide a continuingly better diet for its citizens. Attainment is imperative, because it will be increasingly difficult for the large producing nations to supply emergency food supplies. We must seek self sufficiency in the developing world. The soybean research program of AID is one important step toward this goal.