IICA

Consultant final Report
IICA/EMBRAPA-PROCENSUL II

SOYBEANS PROCESSING TECHNOLOGY

CA
A4/
89-

ESCRITÓRIO NO BRASIL

Consultant final Report
IICA/EMBRAPA-PROCENSUL II

SOYBEANS PROCESSING TECHNOLOGY

00001652

Série Publicações Miscelâneas Nº A4/BR-89-048
ISSN-0534-0591

SOYBEANS PROCESSING TECHNOLOGY

Consultant Final Report
IICA/EMBRAPA-PROCENSUL II

Harold Kauffman

Brasília, agosto de 1989

INSTITUTO INTERAMERICANO DE COOPERAÇÃO PARA A AGRICULTURA
EMPRESA BRASILEIRA DE PESQUISA AGROPECUARIA

BV 6391

IICA
PM-A4/BR
no. 89-048

Kauffman, Harold
Soybeans processing technology. Consultant final report IICA/EMBRAPA-PROCENSUL II/por Harold Kauffman.-Brasília:IICA/EMBRAPA, 1989.
17 p. (IICA. Série Publicações Miscelâneas, A4 Br 87-048)
ISSN 0534-0591

1. Soja-Processamento. I. Título. II. Série.

AGRIS Q02
CDU 633.31:664.78

APRESENTAÇÃO

A reprodução e difusão dos Relatórios de Consultores, no âmbito restrito das Diretorias das Unidades do Sistema Nacional de Pesquisa Agropecuária, vinculado à EMBRAPA, tem como objetivo principal o de divulgar as atividades desenvolvidas pelos consultores e as opiniões e recomendações geradas sobre os problemas de interesse para a pesquisa agropecuária.

As atividades de consultoria são realizadas no âmbito do Projeto de Desenvolvimento da Pesquisa Agropecuária e Difusão de Tecnologia na Região Centro-Sul do Brasil - PROCENSUL II, financiado parcialmente pelo Banco Interamericano de Desenvolvimento - BID e a EMBRAPA conforme os contratos de Empréstimo 139/IC-BR e 760/SF-BR, assinados em 14 de março de 1985 entre o Governo Brasileiro e o BID.

As opiniões dos consultores são inteiramente pessoais e não refletem, necessariamente, o ponto de vista do IICA ou da EMBRAPA.

A coordenação dos Contratos IICA/EMBRAPA agradeceria receber comentários sobre estes relatórios.

Horacio H. Stagno
Coordenador Contratos IICA/EMBRAPA

INTER-AMERICAN INSTITUTE FOR COOPERATION ON AGRICULTURE
IICA/EMBRAPA CONTRACT

CONSULTANT FINAL REPORT

1. Consultant's full name:
2. Specialist in: *Tecnologia de derivados da Soja*
3. Title of IICA Project: *2.SB.3*

4. EMBRAPA Program for which consultancy is provided:

PROGRAMA : PROCENSUL II

SUBPROGRAMA : 05-RECURSOS GENÉTICOS

IICA Project Activity Code: *2,SB.3.05*	Administrative Code: *R 4894 31B 03105*
Title of Activity of IICA Project corresponding to this consultancy	*Cooperation with EMBRAPA on research and applications of genetic resources, biotechnology and biologic control of plagues, diseases and weeds.*

CONSULTANT CONTRACT PERIOD	DUTY LOCATION (Center)
June 3 rd. to 1oth., 1989.	*CNPSO/EMBRAPA, Londrina-PR.*
CONTRACT EXTENTION PERIOD (If any)	DUTY LOCATION (Center)

5. Financial support: *PROCENSUL II*

6. **INSTITUTION ASSISTED/COLLABORATED WITH OR HAD DISCUSSIONS WITH STAFF:**

CNPSO/EMBRAPA, Londrina-PR.

CTAA/EMBRAPA, Rio de Janeiro-RI.

7. **STAFF MET:**

CNPSO/EMBRAPA:

Decio Gazzoni	Director of CNPSO and newly named Director, Technical Services, EMBRAPA National Headquarters, Brasilia
Norman Neumaier	Associate Director
Romeu Kiihl	Breeder
Jose Tadashi Yorinori	Plant Pathologist
Carlos Machado	Plant Pathologist
Flavio Moscardi	Entomologist, Coordinator
Antonio Panizzi	Entomologist
Ivan C. Corso	Entomologist
Clara B. H. Campo	Entomologist
Beatriz S. C. Ferreira	Entomologist
Mercedes Carrao Panizzi	Utilization
Clovis Manuel Bockert	Soil Fertility
Jose G. Maia Andrade	Extension

CTAA/EMBRAPA:

Lair Chaves Cabral	Soy Processing Specialist

8. **DISCUSSIONS WITH PERSONS ABOUT RESEARCH AND DEVELOPMENT COLLABORATION:**

Norman Neumaier	Associate Director
Romeu Kiihl	Breeder
Mercedes Carrao Panizzi	Utilization

9. **ACTIVITIES DEVELOPED/DISCUSSED:**

Characteristics of soybean varieties used for food.

Small scale processing of soybeans for food uses.

Product development from extrusion/expelling.

Collaboration between EMBRAPA and INTSOY on improving nutrition in Brazil through increased use of soy products.

Global cooperation in increasing the use of soy products to improve nutrition in developing countries.

10. RESULTS OF THE DISCUSSIONS:

Characteristics of soybean varieties used for food:

The following are some major characteristics to consider when breeding soybean varieties for specialty food uses:

Seed Size:

* large - for tofu, miso and several other soy foods
* small - for use as sprouts and the making of natto

Seed Coat:

* light hilum - for miso, tempeh and several other foods

Chemical Composition:

* high protein - for soymilk, tofu, dairy analogs and flour
* high oil - for use where oil is in high demand
* lipoxygenase free - for tofu and soymilk free of the beany flavor
* trypsin inhibitor free - for use in products which may require less heating
* reduced oligosacharides - to reduce the flatus problem in many soy products
* fatty acid profile - variòus profiles such as high linolenic acid to increase the amount of omega-3 for a number of soy products
* reduced urease - primarily for animal feed

Vegetable Soybeans:

* determinate plant type and large seed size

Small Scale Processing of Soybeans for Food Uses:

Information was exchanged on progress being made in the small scale processing of soybeans for food and feed uses at INTSOY. The attached brochure "INTSOY AGENDA: EXPANDING THE USE OF SOYBEANS' outlines and describes program in this area.

Product Development from Extrusion/Expelling:

The merits of partially defatted meal and the natural oil from extrusion coupled with expelling is discussed in the attached paper titled "Processing and Utilization of Soybean and Diversification of End-uses through Extrusion Processing" by Wilmot B. Wijeratne and Alvin I. Nelson.

Collaboration between EMBRAPA and INTSOY on improving nutrition in Brazil through increased use of soy products

Several companies are coming out with new products of soymilk or soymilk based products as well as textured soy protein. Soy products are being increasingly used in school lunch programs. In spite of this, the current economic situation in Brazil is leading to an increased number of people with malnutrition.

There is a need for more low cost, highly nutritious food products made from soybeans to reverse this trend. One option is to diversify into processing whole soybeans with dry extrusion. Another is to increase the processing of beans in the home.

EMBRAPA and INTSOY could develop a collaborative program to conduct research and development on:

* Extrusion/expelling processing technology - use of Brazilian made equipment.
* Development of products from extrusion/expelling - locally acceptable products from the high protein meal and the natural oil.
* Promotion methods for popularizing new products - mass marketing/promotion of products by commercial and government means towards various segments of the population.
* Development of home processing methods - refine and improve home processing methods which are acceptable in Brazil.
* Development of varieties for food use - discuss breeding strategies and exchange germplasm and breeding lines.

Global cooperation in increasing the use of soy products to improve nutrition in developing countries

EMBRAPA has been very successful at establishing and operating an outstanding soybean research program. For the first time, a very strong soybean industry has been established in a tropical developing country. As CNPSO moves into their new facilities, capabilities will be further improved and the program should become even more efficient.

CNPSO/EMBRAPA is now in a unique position to join INTSOY and other countries like Japan and China in helping other developing countries which want to establish soybean industries to help meet rapidly expanding needs for high protein foods and feeds and for edible oil. INTSOY has had an international soybean research program since 1973 which has worked with many developing countries. The current INTSOY focus on processing and utilization would complement the strengths of the EMBRAPA program in helping developing countries. The work of Marise Galerani in the INTSOY program is a good first step in establishing a strong collaborative relationship between INTSOY and EMBRAPA in promoting international cooperation.

11. CONCLUSIONS:

* Increase communications/exchanges between CNPSO/CTAA and INTSOY staff.
* Develop proposals to obtain funds to initiate collaborative research and development activities in the program areas mentioned above.
* Cooperate in training programs where appropriate.
* Cooperate in promoting expanded global efforts to increase the use of soy products to improve nutrition in developing countries.

12. SUGGESTIONS WHICH WOULD HAVE IMPROVED THIS PROJECT:

* Increased communications/clarification about the objectives of assignment prior to the assignment.
* Earlier receipt of travel and other documents prior to the assignment
* Participation of more company and government officials in the seminar.

ANNEX

PROCESSING AND UTILIZATION OF SOYBEAN AND DIVERSIFICATION OF END-USES THROUGH EXTRUSION PROCESSING

Wilmot B. Wijeratne and Alvin I. Nelson

International Soybean Program (INTSOY) &
Department of Food Science
University of Illinois
113 Mumford Hall
1301 West Gregory Drive,
Urbana, Illinois 61801, USA

Paper presented at:
The Consultants' Meeting on Uses of Grain Legumes
International Crops Research Institute for the Semi-Arid Tropics
(ICRISAT)
Hyderabad, India

March 27 - 30, 1989

Processing and Utilization of Soybean and Diversification of End-Uses through Extrusion Processing

Soybean is the world's leading grain legume crop. It contains approximately 20% oil and 40% protein on a moisture free basis. conventionally, the soybean has been exploited primarily as a source of edible oil for human food and protein rich meal for livestock. Traditional soybean foods have been consumed in the Oriental countries for centuries; but this accounts for only a small fraction of the world soybean crop. Many developing countries have recognized the potential of soybean as a source for supplementing the traditional cereal staples with much needed protein and calories. National level programs are in place in many developing countries for expanding the local production potential for soybeans. India has already attained a production level of one million metric tons per year.

Nutritional Considerations

Soybeans are rich in both protein and oil; but they contain little or no starch. Soy protein is rich in lysine, which is deficient in cereals. On the other hand, soy protein is somewhat deficient in the sulfur bearing amino acids which are contained in adequate quantities in cereals. When soy protein and cereal protein are combined in appropriate proportions, the nutritional value approaches that of casein. This nutritional complimentarity is found to be optimum when cereals and soybeans are blended so that 50% of the total protein in the blend is contributed by each of the ingredients (Bressani and Elias 1974). Blends of 70 parts by weight of cereal and 30 parts by weight of soybean on dry matter basis satisfy this requirement. The direct use of soybean in food products results in the incorporation of oil which increases the caloric density. Natural soybean oil is highly unsaturated and contains approximately 7% of omega-3 (alfa-linolenic) fatty acid. Recent research (Kinsella 1988) indicates that omega-3 polyunsaturated fatty acids in the diet may be beneficial to the cardiovascular health of humans.

Proper heat treatment during processing, greatly improves the nutritional value of soy protein. This is attributed to the destruction of natural anti-tryptic factors and also the thermal denaturization of proteins (Rackis 1972). Heat treatment also inactivates undesirable enzyme systems such as the lipoxygenases which produce off flavor. The process must also ensure proper tenderization of the bean tissue which is tougher than those of other food legumes.

Strategies for Food Use of Soybeans

In recent times, traditional oriental soy foods have appeared on the grocery shelves in western countries. Products such as soymilk, tofu, and tempeh find a market conditioned primarily by health considerations. This market may grow provided the inputs are available for advertising, product improvement, and adaptation to suit the new market environments. The technical feasibility of converting soybean into flour and mass fortification of cereal flours has been established for a long time. However, this approach has not found wide application in developing countries where it is most needed. Logistical problems and pricing problems have been constraints against the wide use of this concept. Technology for the production of engineered foods such as meat substitutes and meat extenders is available. Unfortunately, these products are marketed at about the same price as that of meat products. The high cost of production keeps these products out of reach of the most needy segments of many populations. Therefore, it is evident that alternative approaches to soybean processing are needed in order to benefit the majority that need better nutrition.

The International Soybean Program (INTSOY) and the Department of Food Science of the University of Illinois have carried out considerable research and development work on the processing of whole soybeans into food products. Through basic and applied research, as well as international programs, INTSOY has developed a three-pronged approach for soybean utilization. INTSOY advocates that a successful national program for soybean utilization must concentrate on the development of technology and products appropriate to the home level, village level, and the commercial level.

Extrusion Processing

Extrusion has become a widely used processing technique for the manufacture of a variety of food products. A variety of extruders have been developed and they vary in their capabilities and cost. In the simplest form, an extruder consists of a flighted Archimedean screw rotating within a tightly fitting barrel, a device to feed raw material, and a die through which the final product discharges. The screw and barrel are designed so that the raw material will be carried forward with progressive compression. Part of the mechanical power input for driving the screw is converted to heat by friction. The product finally emerges through a die. The extruder will continuously cook the input material by a high-temperature, short-time treatment. Different extruders vary in the design of screw, barrel, die, and the flexibility of temperature control during processing. This paper will be restricted to the so-called low cost, dry extrusion technology.

Dry extruders are single screw, high shear, autogenous extruders that generate heat purely by friction. The term "dry extruder" is used because the equipment can extrude raw material at a low moisture content so that the final product needs little or no further drying. The INSTA PRO Model-600 is a typical example of a dry extruder. This extruder has a segmented barrel and screw. The screw segments slip over a central-keyed shaft with ring-like flow restrictors called steam locks placed between the individual screw segments. Different screw configurations are achieved by the order of assembly of screw segments and steam locks. Barrel segments slipped over the assembled screw are clamped together to form a continuous barrel. The die is attached to the end plate which is clamped to the barrel to complete the assembly. The extruder is powered by a 50 horse power motor which turns the screw at 550 rpm. A variable speed feeder enables feeding the extruder at a desired constant rate. Provision is made for injecting either water or steam into the feed section of the barrel during processing.

Capabilities of the Dry Extruder

Dry extrusion systems are capable of continuously cooking legumes or mixtures of cereals and legumes in a high-temperature, short-time cycle. Residence times of 30-120 seconds and temperatures of 140-160° C can be achieved. The operating variables of the extruder and the composition of the raw material can be varied in order to obtain desired product characteristics. These extruders are relatively simple to operate and maintain. However, some skills have to be acquired for trouble free operation. Since food raw materials are complex multi-component systems, a given blend of raw material has to be matched with a compatible extruder screw configuration, proper moisture content, product flow rate, and temperature profile in order to obtain consistent product quality.

Dry extrusion is a continuous operation, and relatively large rates of throughput can be obtained for a relatively small capital investment. The equipment is compact and floor space requirement is minimal. This technique is useful in the decentralized processing of products having mass appeal. This incorporates the convenience of 'ready to serve' products and the consequent saving of the housewives' time for more gainful employment. The nutritional value of the products and other quality characteristics can be easily controlled in this operation. In the processing of soy and cereal blends, the dry extrusion process achieves the following specific functions.

* Cooking: The high temperature short time cooking cycle achieves gelatinization of starch and the development of desirable flavors with improvement in certain nutrients.

* Sterilization: The heat treatment results in considerable destruction of the natural microflora in the raw material.

* Expansion: During the flow of starchy material through the extruder, it is subject to heat, shear, and pressure. The material develops into a doughy mass at the die and suddenly emerges into the atmosphere. The sudden drop in pressure

expands the product and improves the textural characteristics. The moisture content has a profound influence on product expansion--low moisture content results in a dense product. As moisture content increases, expansion improves up to an optimum moisture content. Excess moisture and temperature results in degradation of starch and consequent loss of expansion.

* Dehydration: As the product emerges the die, there is also flashing of moisture vapor. A considerable degree of drying is achieved simultaneously with extrusion, resulting in improved product stability.

* Enzyme Inactivation: Trypsin inhibitors and other undesirable heat labile factors are inactivated during the extrusion process. The degree of enzyme inactivation will be dependent upon the time temperature relationships associated with the process.

* Forming and Shaping: Within limits, the use of certain accessories with the extruder will enable the production of specific shapes in the end product for improved consumer appeal.

The dry extrusion system is versatile, and lends itself to the processing of a variety of products by the combination of suitable raw materials. These systems are being used for the production of weaning foods from cereals and legumes in several developing countries (Wilson and Tribelhorn. 1980). Expanded snack type products can be produced from combinations of legumes and cereals. Whole soybeans can be directly extruded for producing full-fat flour for human consumption or full energy soybeans for livestock. A flow diagram for the dry extrusion system is given in Figure 1.

Dry Extrusion as an Aid to Oil Expelling

Recent research at the University of Illinois (Nelson et al. 1987) has demonstrated that dry extrusion facilitates the extraction of oil from soybeans by continuous expellers. The process yields fully processed low-fat soy flour and natural soybean oil. The reduced oil content in the extracted cake makes it possible to mill it into flour by conventional milling systems. By virtue of partial drying during extrusion and removal of oil, the protein content of the flour is increased to about 49%. This flour has good flavor and functional properties when used in food systems (INTSOY 1988). The oil extracted by the process is light in color and clear. It has good shelf life and can be directly used for edible purpose in situations where unrefined oils are traditionally accepted by the consumer. The oil has a tendency to foam during deep frying applications and this is overcome by degumming. A flow diagram for the combined extrusion and expelling process is given in Figure 2.

The process of extrusion and expelling has the potential of developing into a technology base for small-scale processing of soybeans in developing countries where conventional solvent extraction may not be a viable proposition. The process yields two products (low-fat flour and oil) which can be used in food applications. There has been considerable interest from developing countries in this technique, and the process is currently being scaled up for commercial application. Extension of this technique to processing of other oil seeds for producing edible oil and food grade meal is an interesting area of research.

Extrusion as a Means for Diversification of End Uses of the Mandate Legumes

Food legumes are utilized mainly as primary raw materials in the preparation of traditional products at the domestic level. They reach the consumer with little or no preprocessing. The conversion of these legumes into processed products on a commercial scale will lead to increased utilization and improve the image of legumes which are often considered subsistence foods. The success of such an approach will depend on the acceptability of the products. Therefore, research and product development must be country specific.

The proximate composition of the mandate legumes and soybeans (Table 1) offers interesting possibilities for the formulation of a variety of blends for extrusion processing. The major functional components affecting extrusion behavior such as protein, carbohydrates (starch), and fat occur in a wide range among the different legumes. All four legumes are high in protein; but vary in fat content. Peanut and soybeans have high-fat content while chickpea and pigeonpea have low-fat content. Pigeonpea and chickpea contain starch, while peanut and soybean have little or no starch. It is readily seen that these legumes could be combined with cereals in various proportions in order to obtain blends of desired nutrient density. The variation in composition also offers potential for investigation into developing functional characteristics in extrusion that affect product acceptability. Interactive effects of flavor profiles, expansion behavior, and product density are some important attributes for investigation. The main cereals currently used in dry extruded supplementary food products are wheat, corn, and to limited extent, rice. Little is known with regard to the performance of minor cereals such as sorghum and millets in the manufacture of food products by dry extrusion. The incorporation of these cereals, along with the mandate legumes in research and product development through extrusion, can make a significant contribution to their utilization on a commercial scale. Several broad product areas that merit consideration are listed below:

* pre-cooked legume flours

* cereal/legume blends fortified with vitamins and minerals as supplementary foods

* processed ready mixes from cereals and legumes as bases for gruels, soups, and gravies

* expanded high protein snack type products

* low fat flour from soybeans and peanuts for fortification of cereal flours
* enriched flour blends from low fat legume flour and minor cereal flours for use in traditional food preparations

References

Bressani, R., and Elias, L.G. 1974. Legume foods. Page 230 in New Protein Foods (Altschul, A.M.A.,ed.). New York, USA: Academic Press.

INTSOY (International Soybean Program). 1988. INTSOY Newsletter No.40. October 1988. University of Illinois, 113 Mumford Hall, Urbana, Illinois 61801, USA.

Kinsella, J.E. 1988. Food lipids and fatty acids: Importance in food quality, nutrition, and health. Food Technology. 42(10):124-145. 115 refs.

Purseglove, J.W. 1968. Tropical crops: Dicotyledons-1. New York, USA: John Wiley and Sons, Inc.

Nelson, A.I., Wijeratne, W.B., Yeh, S.W., Wei, T.M., and Wei, L.S. 1987. Dry extrusion as an aid to mechanical expelling of oil from soybeans. Journal of the American Oil Chemists' Society. 64(9):1341-1347.

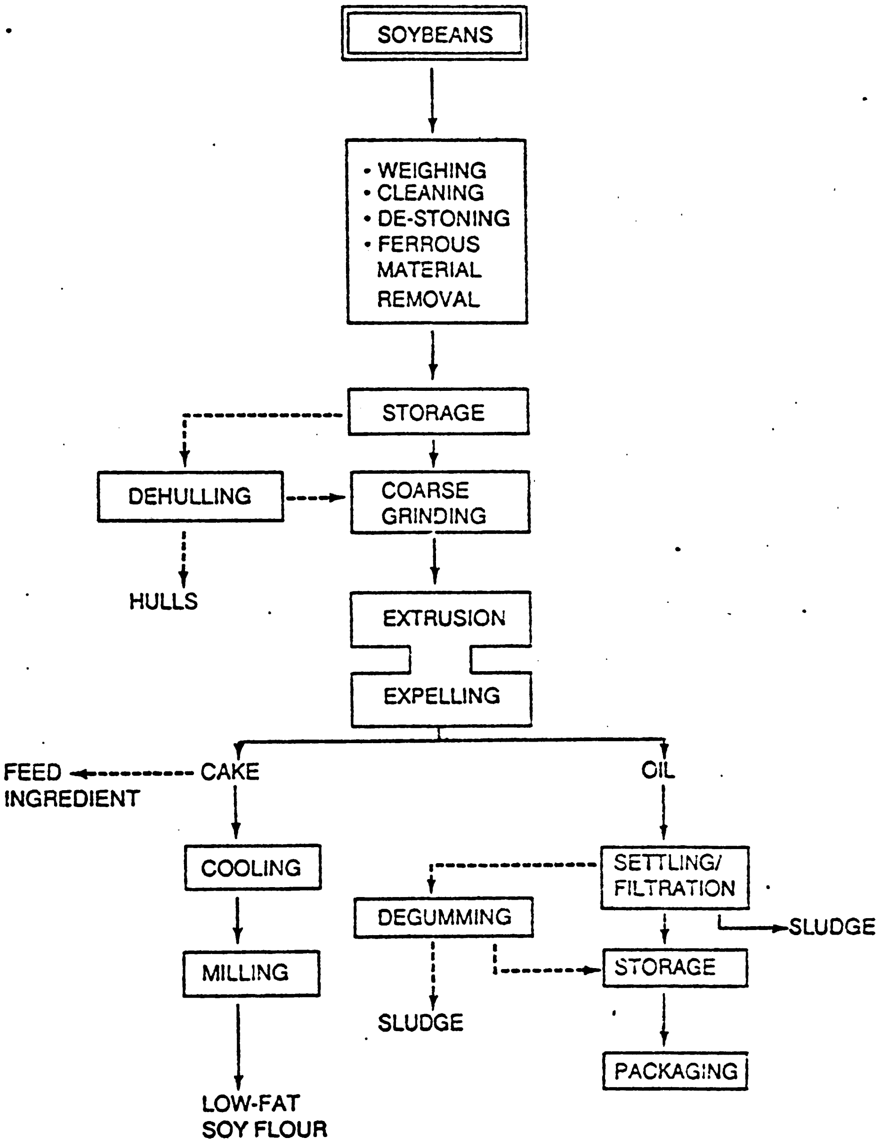
Rackis, J.J. 1972. Biologically active components. Pages 159-202 in Soybeans: Chemistry and technology (Smith, A.K., and Circle, S.J., eds.). New York, USA: The AVI Publishing Company.

Wilson, D.E.,and Tribelhorn, R.E.(eds.). 1979. Low cost extrusion cookers:Proceedings of the second international workshop. Colorado State University, Department of Agricultural and Chemical Engineering, Fort Collins, Colorado 80523, USA.

Table 1. Composition of Selected Legumes (percentage)

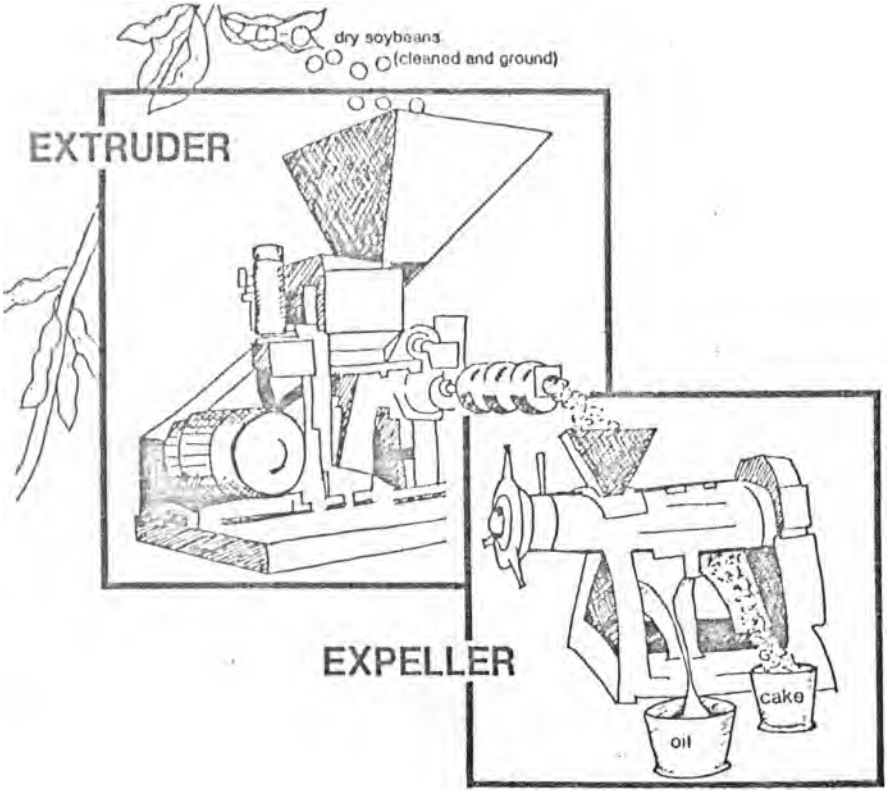
Legume	Moisture	Protein	Fat	Fiber	Ash	Carbohydrates
Pigeonpea	10.1	19.2	1.5	8.1	3.8	57.3
chickpea	9.8	17.1	5.3	3.9	2.7	61.2
Peanut	5.6	27.0	47.5	2.4	2.3	16.2
Soybean	8.0	36.7	20.3	2.4	4.6	28.0

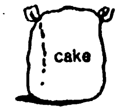
SOYBEAN PROCESSING BY EXTRUSION/EXPELLING



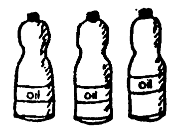
INTSOY

EXTRUDING AND EXPELLING





HIGH PROTEIN CAKE
- 5% oil-50% protein
- excellent color
- bland flavor
- can be ground into flour in conventional mills
- suitable for fortification of cereal flour and other foods



COOKING and SALAD OIL
- natural antitoxidants give stability
- free of any off-flavor

Programa II. Geração e Transferência de Tecnologia

O Programa de Geração e Transferência de Tecnologia é a resposta do IICA a dois aspectos fundamentais: (i) o reconhecimento, por parte dos países e da comunidade técnico-financeira internacional, da importância da tecnologia para o desenvolvimento produtivo do setor agropecuário; (ii) a convicção generalizada de que, para aproveitar plenamente o potencial da ciência e da tecnologia, é necessário que existam infra-estruturas institucionais capazes de desenvolver as respostas tecnológicas adequadas ás condições específicas de cada país, bem como um lineamento de políticas que promova e possibilite que tais infra-estruturas sejam incorporadas aos processos produtivos.

Nesse contexto, o Programa II visa a promover e apoiar as ações dos Estados membros destinadas a aprimorar a configuração de suas políticas tecnológicas, fortalecer a organização e administração de seus sistemas de geração e transferência de tecnologia e facilitar a transferência tecnológica internacional. Desse modo será possível fazer melhor aproveitamento de todos os recursos disponíveis e uma contribuição mais eficiente e efetiva para a solução dos problemas tecnológicos da produção agropecuária, num âmbito de igualdade na distribuição dos benefícios e de conservação dos recursos naturais.

INSTITUTO INTERAMERICANO DE COOPERAÇÃO PARA A AGRICULTURA

O Instituto Interamericano de Cooperação para a Agricultura (IICA) é o organismo especializado em agricultura do Sistema Interamericano. Suas origens datam de 7 outubro de 1942, quando o Conselho Diretor da União Pan-Americana aprovou a criação do Instituto Interamericano de Ciências Agrícolas.

Fundado como uma instituição de pesquisa agronômica e de ensino, de pós-graduação para os trópicos, o IICA, respondendo às mudanças e novas necessidades do Hemisfério, converteu-se progressivamente em um organismo de cooperação técnica e fortalecimento institucional no campo da agropecuária. Essas transformações foram reconhecidas oficialmente com a ratificação, em 8 de dezembro de 1980, de uma nova convenção, que estabeleceu como fins do IICA estimular, promover e apoiar os laços de cooperação entre seus 31 Estados membros para a obtenção do desenvolvimento agrícola e do bem-estar rural.

Com um mandato amplo e flexível e com uma estrutura que permite a participação direta dos Estados membros na Junta Interamericana de Agricultura e em seu Comitê Executivo, o IICA conta com ampla presença geográfica em todos os países membros para responder a suas necessidades de cooperação técnica.

As contribuições dos Estados membros e as relações que o IICA mantém com 12 Países Observadores, e com vários organismos internacionais, lhe permitem canalizar importantes recursos humanos e financeiros em prol do desenvolvimento agrícola do Hemisfério.

O Plano de Médio Prazo 1987-1991, documento normativo que assinala as prioridades do Instituto, enfatiza ações voltadas para a reativação do setor agropecuário como elemento central do crescimento econômico. Em vista disso, o Instituto atribui especial importância ao apoio e promoção de ações tendentes à modernização tecnológica do campo e ao fortalecimento dos processos de integração regional e sub-regional.

Para alcançar tais objetivos o IICA concentra suas atividades em cinco áreas fundamentais, a saber: Análise e Planejamento da Política Agrária; Geração e Transferência de Tecnologia; Organização e Administração para o Desenvolvimento Rural; Comercialização e Agroindústria, e Saúde Animal e Sanidade Vegetal.

Essas áreas de ação expressam, simultaneamente, as necessidades e prioridades determinadas pelos própios Estados membros e o âmbito de trabalho em que o IICA concentra seus esforços e sua capacidade técnica, tanto sob o ponto de vista de seus recursos humanos e financeiros, como de sua relação com outros organismos internacionais.

FECHA DE DEVOLUCION

IICA-PM-
A4/BR-89-048

Autor

Título
Soybeans processing technology

Fecha Devolución	Nombre del solicitante

INSTITUTO INTERAMERICANO DE COOPERAÇÃO PARA A AGRICULTURA
SHIS QI 5, Conj. 9, Bl. D, Comercial Local, Caixa Postal 09-1070, Brasília, D.F., Brasil
Tel.: (061) 248-5477 - Telex 611959 INAG-BR - Correio Eletrônico 1536 - Fac-Símile: (061) 248-5807