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**FOOD LEGUMES - IDRC-SUPPORTED PROJECTS**

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Food legumes are very important for small farmers' cropping systems in most developing areas of the world. They are important in crop rotation because of their nitrogen fixing ability. They can also be beneficial in crop rotation to prevent soil and disease build up in other crops. They are a very important, if not essential, component of the diet of billions of people. Their protein complementarity with cereals makes them very desirable in cereal-based diets. Grain legumes also supply important cash income for many small farmers. And a point that is often forgotten, the by-products (hulls and stalks) are traditionally fed to animals or in some cases e.g. pigeonpea, the stalks are important cooking fuel.

As the "green revolution" has increased cereal production, the grain legume crops have become less important. A recent CGIAR study shows that cereal crops have increased annually at almost 4% per year while food legume increased only 0.2% per year. In Asia there has been decreases in some countries. However, recent increased rice and wheat production, resulting surpluses and lower prices have forced planners and farmers to explore alternatives of which the grain legume crops are the most logical.

IDRC has supported grain legumes research since the early 70's. Support goes to all regions and is primarily to national researchers although there is also some support to international agricultural research centres (IARC's) for aspects of research that is linked to national programs. IDRC's current support to grain legumes research worldwide is almost 9 million dollars (Canadian). We support research on the two major ecological groups of pulses: warm season/lowland types such as phaseolus beans, cowpeas, pigeonpeas, green and black grams; and cool season/highland types such as peas, chickpeas, faba beans, lentils and grasspeas (lathyrus). In addition IDRC includes groundnut and soybean as grain legume crops. I will report only on the support for research in East and South East Asia and hope my colleagues from other regions will give more details for other regions in subsequent ACIAR newsletters.

The IDRC support for grain legumes in S E Asia has grown out of previous support for multiple cropping/crop diversification and cropping systems research. Starting in the mid 70's, researchers have explored alternative crops suitable for small farmers. This has focussed on the most dominant cropping systems in S E Asia - a rice-based system. It has been recognized that much of the previous work on grain legumes was not suitable for the special conditions of rice-based systems: the peculiar soil conditions, the often alternating water logging and drought, the more serious disease problems and the requirement for appropriate duration varieties. As

the projects have developed, they have also realised that other conditions particularly the socio-economics conditions are very important to the farmers' acceptance of the technologies. In many cases, grain legumes are planted with very few inputs, often little or no fertilizer, pest control, cultivation or weeding. The crops are often planted at a time when farmers are migrating elsewhere to work seasonally, therefore, there is little labour available for crop management. The researchers realized in order to have farmers' acceptance of their new varieties or other component technologies, it was very important that testing be done under these severe farmers' conditions rather than the optimal conditions of most research stations.

IDRC currently supports five grain legumes related projects in China and S E Asia. Figure 1 lists the project, project leader and institution. Short summaries of the research objectives and achievements follow. Additional information on the projects and project reports can be obtained from the project leaders or IDRC.

**Grain Legumes (Philippines).** This is a cooperative research project between the Institute of Plant Breeding, the University of the Philippines at Los Banos and the International Rice Research Institute. The primary objective of this project is to develop promising varieties of soybeans, mungbeans and peanuts for evaluation in the rainfed and partially irrigated rice areas in several environments at research stations and farmers' fields in 10 countries of Asia. It links closely with Asian national programs through the Asian Rice Farming Systems Network (ARFSN). Some of the varieties which have been tested in the Network are now being released by participating countries. In addition the project cooperates with national and international programs, organizes monitoring tours and workshops to enable breeders and crop scientists to meet and discuss important issues related to the varietal improvement work for rice-based system. Training is offered and conducted through the project for junior staff engaged in varietal improvement and evaluation from the member countries of the ARFSN. The program has just started the Phase II and while continuing the earlier objectives will also concentrate on screening for tolerance to drought and water logging conditions and insect and disease resistance. It will also emphasize closer cooperation and germplasm exchange between the various grain legumes projects in Asia.

**Food Legumes (Indonesia).** This project based at Bogor also works at research sites and farmers' fields in Sumatra, Bali, Sulawesi and throughout Java. The objectives are to breed and select groundnut, mungbean and soybean cultivars (1) that yield well under farmers' field conditions after rice with no cultivation, (2) under upland acid soil conditions and (3) to assist seed increase of promising lines suitable for varietal release. The first phase of the project has assisted the breeding program to release 4 soybean, 3 peanut and 4 mungbean cultivars. In addition there are a number of promising lines suitable for the after-rice and acid soil conditions currently undergoing further testing. A second phase is currently under development which will expand the objectives to include management of acid soils for legume production and assist in coordinating grain legumes work in Indonesia.

**Groundnut Improvement (Thailand).** This project is unique in that it not only supports the research project but actively works to increase cooperation and collaboration among Thailand groundnut researchers. The project is a result of joint funding by USAID's Peanut CRSP to the Thailand Department of Agriculture and IDRC's support to two universities: Kasetsart and Khon Kaen.

The project aims to develop improved varieties of groundnuts suitable for the small farmers throughout Thailand, to improve production practices by determining major diseases and insect pests, breeding for disease and insect resistance, studying groundnut rhizobia and associated agronomic and soil management, and developing seed technology.

During Phase I considerable progress was achieved in breeding with a number of lines showing promise as being superior to the local variety. Likewise considerable advances were achieved in disease and pest surveys and control, mycorrhiza research and seed technology. In fact it now appears that seed can be stored at the farm level for 8 months provided that initial germination is high.

The most important achievement of this project now in the second Phase has been its support to the national coordination of groundnut research. The annual meeting of groundnut researchers not only presents research results but considers socio-economics aspects, marketing, extension and farmers' adoption. This meeting also determines future workplans and cooperation. The 1986 meeting, for example, indicated an important change in the attitude of researchers toward closer cooperation. "There was a general feeling that the direction of research in some areas was not clear, particularly those related to management practices and farmers' adoption. The group also felt that linkage between research and extension needs to be further strengthened."

**Soy Rhizobium (Alberta/Thailand).** This is a cooperative project between the Agriculture Canada Research Station, Lethbridge, Alberta and the Thailand Department of Agriculture researchers from the Isotope Chemistry Lab, the Rhizobium Lab and Kasetsart and Khon Kaen Universities. The Asian Vegetable Research and Development Centre (AVRDC)-Thailand Outreach Program (TOP) is the coordinator. This project is using nitrogen<sup>15</sup> fixing techniques to select and evaluate soybean cultivars and rhizobium strains, and assess the contribution of inoculum under field conditions, and also assist the technical and regulatory aspects of rhizobium production and sales in Thailand. To date the project has developed considerable methodology including non-fixing controls for utilizing the N<sup>15</sup> techniques. It has screened rhizobium for acid and aluminium tolerances, determine the most effective strains of rhizobium (most of them of Thai origin) for Thai soybean cultivars. The experiments currently underway are starting to apply and test these results under farmers' field conditions.

**Vegetables (China).** This project was established to allow cooperation between AVRDC-TOP and Chinese scientists to increase production of various crops including soybean and mungbean. The project has established significant cooperation particularly through training and exchange of expertise and genetic material. Material has been collected in China and a large amount of AVRDC material has been made available to be tested in 7 locations from Guangzhou in the South to Harbin in North East China. The improved mungbean lines have performed extremely well, outyielding the local varieties in almost all trials. For example, in Jiangsu Province, all 21 AVRDC's advance lines outyielded the local checks by 150 to 419%. After only two years of trials, one of the lines is being released as a new variety in Jiangsu Province, while in Hubei Province some lines were being increased in preparation for release. The soybean lines while yielding lower than Chinese lines in most trials do show useful traits of disease resistance and earliness that will be used in future breeding programs.

### **Future Directions**

The IDRC-funded projects will continue with the strong farming systems emphasis in order to bring the farmers, extensionists, specialists and researchers closer together in order to increase the production of grain legumes to the benefit of small farmers. The second emphasis will be increased coordination and collaboration among national and regional researchers which was one of the conclusions of the ACIAR sponsored "Food Legumes Improvement for Asian Farming Systems Workshop" in Khon Kaen. The IDRC grain legumes projects in Asia will continue to emphasize this cooperation between local researchers, international centres and also donors. In fact recent discussion with ACIAR project personnel in Indonesia and Thailand is the first step in this. Another concrete example is an BNF meeting jointly sponsored by ACIAR, BOSTID and IDRC, At this meeting the IDRC-funded researchers will highlight their research programs on the relationship of BNF and grain legumes. It is this cooperation that is necessary to avoid overlap and have the maximum benefit so that the billions of small farm families can increase their food supply and income by increased production of grain legumes.

The International Development Research Centre (IDRC) is a corporation created by the Parliament of Canada in 1970 to stimulate and support scientific and technical research by developing countries for their own benefit. Although funded entirely by the Canadian Parliament, its operations are guided by an international 21-member Board of Governors.

IDRC supports financial and professional programs in food production, storage, processing, and distribution; forestry; fisheries; animal sciences; energy; tropical diseases; water supplies; maternal and child health; education; population studies; economics; communications; urban policies; science and technology policy; and information systems.

IDRC emphasizes the role of the scientist in international development and encourages Third World countries to draw on the talent of their own scientific communities. Building a strong local base for future research is an important objective of most IDRC-supported work. Research projects are identified, designed, conducted, and managed by developing-country researchers in their own countries, to meet their own priorities.

IDRC helps to create and supports international research networks through which developing countries can learn from each other, share common experiences, and conduct similarly designed studies in areas of mutual concern. It also promotes cooperation between developing-country researchers and their counterparts in Canada.

The largest division is the Agriculture, Food and Nutrition Sciences. This AFNS Division covers similar areas to that of ACIAR. Emphasis is on farming systems, social forestry in arid and semi-arid lands, and aquaculture. Specific areas of support include: previously neglected food sources such as root crops, food legumes, and oilseeds; agroforestry; multiple cropping systems; improvement of pasture lands; use of nonconventional feeds for animals; fish and shellfish farming; postproduction systems for the preservation, processing, and distribution of food crops, fruit, and fish; and the economics of small-scale farm production and marketing.

IDRC's headquarters are in Canada, but there are 6 regional offices in Latin America (Bogota), West Africa (Dakar), East Africa (Nairobi), North Africa (Cairo), South Asia (New Delhi), and S E Asia (Singapore).

FIGURE 1

<u>Project</u>	<u>Institution</u>	<u>Project Leader</u>
Grain Legumes (Philippines)	IRRI	Dr V R Carangal Head, Rice Farming Systems Program International Rice Research Institute P O Box 933 Manila, Philippines
	UPLB	Dr Ruben L Villareal Institute of Plant Breeding College of Agriculture University of the Philippines at Los Banos College, Laguna 3720 Philippines
Food Legumes (Indonesia)	CRIFC (Central Research Institute for Food Crops)	Dr Sumarno Legume Breeder Bogor Research Institute for Food Crops Jalan Cimanggu No. 3A P O Box 368/Boo Bogor, Indonesia
Groundnut Improvement (Thailand)	KKU	Dr Aran Patanothai Department of Plant Science Faculty of Agriculture Khon Kaen University Khon Kaen 40002 Thailand
	KU	Dr Aree Waranyuwat Department of Agronomy Faculty of Agriculture Kasetsart University Kamphaengsaen Campus Nakhon Pathom 73140 Thailand
Soy Rhizobium (Alberta/Thailand)	AVRDC-TOP	Dr Charles Y Yang Director/Resident Scientist AVRDC-TOP P O Box 9-1010 (Kasetsart) Bangkok 10903, Thailand
	Ag Canada- Lethbridge	Dr R M N Kucey Research Scientist (Soil Microbiology) Soil Science Section Lethbridge Research Station P O Box 3000, Main Lethbridge, Alberta Canada T1J 4B1

<u>Project</u>	<u>Institution</u>	<u>Project Leader</u>
Vegetables (China)	AVRDC-TOP	Dr Charles Y Yang Director/Resident Scientist AVRDC-TOP P O Box 9-1010 (Kasetsart) Bangkok 10903 Thailand
	China	Dr Zhu Dewei Deputy Director Vegetable Research Institute Chinese Academy of Agricultural Sciences (CAAS) 30 Bai Shi Qiao Lu West Suburbs, Beijing People's Republic of China

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