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Asian Grain Legumes Network Activities

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Abstract. *The Asian Grain Legumes Network (AGLN) is a research network whose members are scientists and research administrators in Asia, interested in coordinating their activities on groundnut, chickpea, and pigeonpea. Its major goal is to strengthen the capability of national programs in Asia to conduct research on these legumes, with an ultimate aim of increasing their production and consumption in Asia. Its members are drawn from national agricultural research systems (NARSs), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), other international and regional research institutes, and donor groups. The network activities include coordinated yield trials and nurseries, collaborative research, meetings, monitoring tours and workshops, training, exchange of ideas, information, technology and material, and distribution of literature.*

The network has a coordination unit that is supported by ICRISAT and is part of the ICRISAT Legumes Program. The coordination unit has developed strong links between ICRISAT and the national programs of 11 countries through formal Memoranda of Understanding and bilateral work plans. The coordination unit facilitates direct contact between national and ICRISAT scientists, who carry out collaborative research and activities identified in the work plan. Contact among national program network members, in AGLN countries and in other regional institutes associated with the AGLN, comes from joint meetings, tours, and workshops sponsored by the AGLN.

The AGLN is interested in studying alternative uses of its crops, particularly pigeonpea in Indonesia and Thailand. The lead role in this work has been taken by the Australian Centre for International Agricultural Research (ACIAR), and the scientists and economists in these two countries, with input from Regional Co-ordination Centre for Research and Development of Coarse Grains, Pulses, Roots and Tuber Crops in the Humid Tropics of Asia and the Pacific (CGPRT) and ICRISAT.

ICRISAT's future plans include giving more emphasis to the uses of its mandate crops. For this reason, there should be increased activity within the AGLN on developing new uses of groundnut, chickpea, and pigeonpea in Asian countries. The recommendations of this meeting will influence the nature of these activities, and contacts made here can form the basis for starting new initiatives.

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Introduction

The Asian Grain Legumes Network (AGLN) is a network that was formed in response to a need, identified by legume scientists from national agricultural research systems (NARSs) in Asia, to coordinate their research activities on groundnut, chickpea, and pigeonpea. This paper outlines the structure, states the philosophy, and indicates the types of activities associated with this network. It includes a brief listing of the network's activities on research on uses of the three legume crops, as a background for possible future activities.

Start up

Two meetings at ICRISAT in 1983 (ICRISAT 1984) and 1985 (ICRISAT 1987a) of NARS administrators and scientists, representatives from regional and international institutions and from donors in Asia, and ICRISAT staff identified the need for more research in Asia on groundnut, chickpea, and pigeonpea. This included listing the major constraints that needed to be overcome by research to ensure high, stable yields of these crops. In response to the recommendation of these meetings that a network be organized to coordinate the research on these problems, ICRISAT, on 1 January 1986, appointed a network coordinator and provided funds to support his activities.

Objectives

The network's aim is to strengthen the NARSs in Asia to do research on groundnut, chickpea, and pigeonpea by facilitating collaborative research, and the interchange of ideas, information, and material between NARS legume scientists in Asia and those at ICRISAT. The ultimate goals are to help farmers in the region increase their legume production, and to expand the use of legumes in the region.

The specific objectives of the network are to:

- produce a directory of AGLN cooperators;
- operate an information bank for the cooperators;
- support identification of adapted grain legume lines and the appropriate agronomy for their cultivation in each AGLN country;
- promote training of legume scientists from AGLN countries; and
- foster special research support projects.

These objectives are presently under review as the result of a recommendation by network coordinators, who met at ICRISAT Center, 15- 17 December 1988 (ICRISAT 1989).

The core countries of the AGLN are Bangladesh, Myanmar, India, Nepal, Pakistan, and Sri Lanka in South Asia, and the People's Republic of China, Indonesia, the Philippines, Thailand, and Vietnam in East and Southeast Asia. Other countries in Asia are also informally associated with the AGLN as needs arise.

Network Structure and Operation

The network structure is built on strong links between the core NARS and ICRISAT, based on a formal Memorandum of Understanding (MOU) between each country and ICRISAT. These MOUs are backed up by formal work plans which outline the specific annual commitments to network activities by each party (ICRISAT 1987b). These work plans are developed or reviewed at network meetings held in each country every year or two. These meetings also review research progress and identify the need to change initiatives.

The links between the NARSs and ICRISAT are facilitated by the AGLN coordination unit, which is part of the ICRISAT Legumes Program. This linkage is also aided by country-AGLN coordinators, who act as the administrative link between the ICRISAT-AGLN coordinator and the NARS. Each country-AGLN coordinator keeps track of, and helps to coordinate AGLN activities in the country where he or she is located.

The main function of this structure is to bring into contact the scientists who are AGLN cooperators in NARS and at ICRISAT so that they can work directly with each other. This can take the form of exchange of ideas and information, of material and trials, or of collaborative research projects.

Another part of the AGLN structure is formed by the regional and international institutes and donors involved in the activities of the AGLN. The list is very long, but includes ACIAR, ADB, IDRC, IRRI, FAO, CGPRT, ODNRI, AIDAB, and Peanut CRSP (see acronym list at end of paper). These groups have played an important role in supporting the activities of the network. For example, the ADB has provided funding for strengthening the NARS of Bangladesh, Myanmar, Nepal, and Sri Lanka through the activities of the AGLN. The ACIAR/AIDAB and CGPRT have provided assistance and inputs into studies on the utilization of pigeonpea in Indonesia and Thailand. FAO, Peanut CRSP, IDRC, and ACIAR have provided assistance and inputs into several specialized training courses organized by ICRISAT-AGLN.

Contacts between the cooperators in different NARSs are provided by network activities such as tours, meetings, and workshops (similar to the present), which bring scientists together from many countries. These activities provide an opportunity for scientists to share ideas and information, identify priority problems and the resources available among members, and develop plans for collaborative research. The workshops often take the form of a training exercise where scientists come together to share their data so as to learn and test new concepts. An example was the workshop on the Agroclimatology of AGLN countries, held at ICRISAT Center, 5-17 December 1989 (Virmani et al. 1990). At this workshop participants shared climate and crop data from their countries; they drew maps showing the distribution of AGLN crops in their own country and areas that could potentially grow these crops. Consultant geographers, cartographers, and agroclimatologists helped the participants produce these maps. At the same time the participants learned mapping techniques.

Use of AGLN Crops

Although the research and activities in the AGLN have emphasized research to improve crop production, it has been understood that farmers may not be interested in producing

these legumes if they do not have an assured market for the crops. Thus there have been several activities associated with the network aimed at determining the potential market for these crops, and identifying uses of the crops that would cater to consumer demands. The best example is pigeonpea in Indonesia and Thailand.

Research on pigeonpea carried out by NARS scientists in Indonesia and Thailand, with support mainly from ACIAR but also from ICRISAT, demonstrated that this crop can produce high yields in both countries. Adapted genotypes and an agronomic package for successfully growing them have been developed. However, pigeonpea was not an important crop in either country. Therefore, before this package was given to farmers, surveys were conducted by ACIAR scientists with support from CGPRT and ICRISAT (Wallis et al. 1988) to determine potential markets for pigeonpea. Research was carried out, again with support from ACIAR, to develop new uses for this crop, particularly as a substitute for soybean, which is being imported in large amounts into both countries. In Indonesia, research determined that pigeonpea could be successfully used as a partial replacement for soybean in making *tempeh*; in Thailand, research showed that pigeonpea could be used economically to replace 30% of soybean by mass in broiler chicken feed rations. Trials are presently underway to test these findings and their economics at an operational level, and ICRISAT-AGLN is becoming more involved in the new studies.

The concepts of these initiatives and greater involvement of ICRISAT-AGLN was supported in an ODNRI consultant's report (N. Poulter, ODNRI, personal communication 1988).

Other initiatives that ICRISAT-AGLN have been interested in through the Biochemistry Unit at ICRISAT, include an In-service Training Course on Analytical Techniques for Evaluation of Nutritional Quality of Food Legumes, held at ICRISAT Center, 1-14 August 1988, with financial support from the FAO through RAS/82/002. This training involved participants from eight AGLN countries. Another activity was the demonstration by a Thai scientist working in the ICRISAT Biochemistry laboratory that noodles could be made from pigeonpea *dhal* that were of better quality than those made from mung bean.

The Future

For the future, food scientists in Bangladesh, Myanmar, Nepal, and Pakistan have identified the need to standardize analytical methods for determining quality factors of chickpea as a first step to doing collaborative research. Scientists in Indonesia and Thailand see a need to extend the collaborative research already started to develop alternative uses for pigeonpea, for such products as *tempeh*, flour, starch, and starch products.

We expect that the increasing research emphasis within the AGLN will continue to identify more uses of groundnut, chickpea, and pigeonpea. We look forward to your suggestions and ideas for future research, and plans for research collaboration among food scientists. Where these suggestions involve collaborators in the AGLN, the AGLN coordination unit will be glad to consider and implement appropriate action to help facilitate these suggestions and try to help identify necessary sources of funding.

Acronyms

ACIAR	Australian Centre for International Agricultural Research
ADB	Asian Development Bank
AGLN	Asian Grain Legumes Network
AIDAB	Australian International Development Assistance Bureau
CGPRT	Regional Co-ordination Centre for Research and Development of Coarse Grains, Pulses, Root and Tuber Crops in the Humid Tropics of Asia and the Pacific
FAO	Food and Agriculture Organization of the United Nations
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDRC	International Development Research Centre
IRRI	International Rice Research Institute
MOU	Memorandum of Understanding
NARS	National agricultural research system
ODNRI	Overseas Development Natural Resources Institute
Peanut CRSP	Peanut Collaborative Research Support Program
RAS/82/002	Technical Cooperation among Developing Countries for the Research and Development of Food Legumes and Coarse Grains in the Tropics and Subtropics of Asia (FAO-UNDP project)

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Discussions

- The crop's environment, including growing conditions and its management, significantly influences the flavor and composition of groundnut. Some of these environmental factors can override groundnut cultivar differences. There are reports indicating that larger groundnut seeds have better flavor, but this needs further investigation and verification, as does the association between sugars and flavors in groundnut.
- The use of typical to atypical amino acid ratio as an indirect measure for flavor compounds in groundnut needs further confirmation. The use of gas chromatography and mass spectroscopy for flavor compounds identification was suggested.
- Since over 70% of groundnut produced in India is used for oil extraction, groundnuts could potentially be partially defatted and then roasted as the taste and texture quality of these nuts are quite acceptable and comparable to that of whole fat roasted nuts. The economics of the process are yet to be determined.
- Oil that is ultra filtered has better storage quality and appearance. In addition to fatty acid composition, the other factors that contribute to better storage quality of oil, need to be investigated.
- The unusable oil (slurry) obtained during refining of groundnut oil can be used for soap manufacture.
- Although India is one of the largest producers of groundnut, the quality aspect is not being investigated in detail in many of the institutions concerned with the crop. The Indian Oil and Produce Exporters Association is keen to collaborate in research to improve groundnut quality.
- The need to introduce mechanization for selecting better quality groundnut of the hand-picked selection (HPS) type for the export market was emphasized.
- By exporting 1 t of premium priced HPS groundnut containing 450 kg oil, India can earn $ 650 in foreign exchange which could be used to import 2 t of cheaper substitutes like palm oil, or palmolein oil. Therefore, economics favor export of HPS groundnut, and jumbo kernels of 40/50 counts and 38/42 counts per ounce are in demand. It was explained that counts per ounce (oz^{-1}) is followed in the trade though mass per seed or 100 seeds is used by the breeders.
- Edible grade defatted groundnut flour is available in India but consumer awareness of this high protein flour needs to be increased to promote its utilization.
- Partially defatted soybean meal can be used to make milk products with 30% supplementation. A similar attempt needs to be made for groundnut defatted flour.
- There was a suggestion that basic and applied research should be carried out to improve utilization of groundnut, and the presence and quantity of goitoregens should be investigated in groundnut.
- The shelf-life of composite (wheat and groundnut) flour is about 3 months. Loaf volume and specific volume are important criteria for the acceptance of bread made from composite flour. Supplementation of groundnut flour with wheat makes acceptable bread with no changes in crust color or texture up to the recommended level of fortification.
- Storage of groundnut needs further evaluation, and the effect of storage on viability and dormancy needs to be further investigated.

- Resistance to *Aspergillus flavus* seems to be related to three factors; seed coat resistance to preharvest infection, resistance to seed colonization, and resistance to aflatoxin production. Progress has been made using these three traits but resistance to *Aspergillus flavus* still poses a difficult problem.
- Regarding the limits to aflatoxin tolerance, it was noted that this was a matter of national policy to be decided by individual nations. Similar to quarantine, the restriction of imports from another country is regulated through the aflatoxin limit empowered by the concerned nation, and the level varies from 5 ppb in Japan to 30 ppb in the UK, and 20 ppb in the USA.