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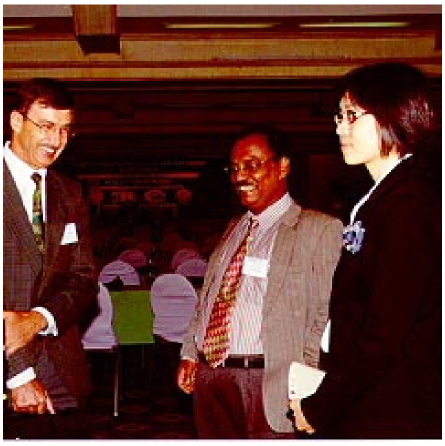
SEMINAR REPORT

ASEAN/APEC postharvest seminar in Chiang Mai

The 20th ASEAN/2nd APEC Seminar on Postharvest Technology, organised by the Entomology and Zoology Association of Thailand, the Thai Phytopathological Society, the Thai Society of Agricultural Engineering and the Department of Agriculture, Ministry of Agriculture and Cooperatives, was held from 11–14 September 2001 at the Lotus Hotel Pang Suan Kaew, in Chiang Mai, Thailand.

The seminar in Chiang Mai continued a series of meetings on current research and development in durable and perishable agricultural commodities that started more than 20 years ago. This was the second time that the ASEAN seminar covered perishable as well as durable products. The first meeting embracing both these groups of products was held in Ho Chi Minh City in 1999. The papers presented at that meeting are published as ACIAR Proceedings No. 100.

Mr Chuwit Sukprakarn (Secretary of the Organising Committee) gives his opening address.



Pictured in discussions during a session break are (L–R) Dr George Srzednicki (University of New South Wales, Sydney), Professor S. K. Bala (Bangladesh Agricultural University, Mymensingh), Miss Chaleeda Borompichaichartkul (UNSW, Sydney).

There were 266 participants in the Chiang Mai seminar, from 16 countries—Australia, Bangladesh, Cambodia, the People's Republic of China, Ecuador, Indonesia, Israel, Japan, the Lao People's Democratic Republic, Malaysia, the Philippines, Samoa, Singapore, Thailand, the USA, and Vietnam.

Three keynote papers were presented: Dr Amnaj Covanich (Thailand) gave an account of the history of the ASEAN postharvest seminars; New technology for the transport of fruits and vegetables was discussed by Dr Steve Bryant (USA); Professor Somchart Soponronnarit (Thailand) covered recent research and development work on paddy drying in Southeast Asia. A precis of Prof. Soponronnarit's paper appears on page 3 of this issue of the newsletter.

Some 48 other oral presentations were made, covering the following topics:

- maintaining quality of perishable produce (13 papers);
- maintaining grain quality: grain handling and processing (10 papers);
- maintaining grain quality: grain storage and pest control (15 papers);
- value adding through processing (6 papers); and
- technology transfer in postharvest technology (4 papers).

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Contributors to this issue:
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PROJECT UNDER DEVELOPMENT

Improving sago in Papua New Guinea

Sago palm (*Metroxylon sagu*) covers more than 1 million hectares of Papua New Guinea (PNG). Sago forms an important part of the staple diet in some areas of the country, but is nevertheless generally considered to be under-utilised.

There is an estimated local market for sago starch in PNG of over 12,000 tonnes per year—some of this is currently imported—as well as a large international trade in starch (15,000–20,000 tonnes imported into Australia alone). Expanding PNG's contribution to these markets is hindered primarily by product safety issues, namely that the sago produced in PNG is often contaminated with mycotoxins and food-borne pathogens, which are unacceptable to broader world markets.

The other primary benefit of managing the sago-contamination problem would be improving the health of local consumers as:

- mycotoxins are implicated in causing the well-recognised sago haemolytic disease that is found in the main sago-growing areas in southern parts of PNG; and
- pathogenic bacteria in sago are likely to contribute to the widespread incidence of diarrhoea.

These issues are at the heart of a proposal for an ACIAR medium-size project entitled "Sago Improvement of Food Safety and Processing" (PHT/2001/016). If the project is approved, its aim would be to determine the causes and extent of health risks to consumers caused by contamination of village-produced sago in PNG, and identify options for reducing those risks and improving the marketability of the processed sago. The proponents of the project are James Cook University and the Queensland Department of Primary Industries in Australia, and the Papua New Guinea University of Technology.

The research plan

If the project goes ahead, the researchers will first undertake a survey, led by PNG scientists, to collect sago samples from field and market sites in the Sepik, Western, and Gulf provinces of PNG. Also collected would be field data on harvesting, preparation, and storage of sago in the principal sago districts. Sago samples would be analysed for the presence of at least four bacterial pathogens that are involved in diarrhoeal diseases and spontaneous abortions. These organisms, which include *Salmonella* and *Listeria*, are of considerable interest in international trade negotiations and will be of increasing significance in domestic marketing arrangements, as development of PNG proceeds.

The same sago samples will also be analysed for a range of mycotoxins and the fungi that make them. Selected fungal isolates will be grown under controlled conditions in order to monitor their potential for mycotoxin production in various environments.

The type of sago end product and production methods differ between regions, and these factors may influence the risk of contamination. Hazard and critical control point analysis will be used to assess any causal links between contamination and postharvest practices.

Expected outputs

The information gathered in the course of the proposed project would be valuable in devising management and quality control strategies for groups wishing to further develop the sago resource in PNG. Production of safer food will have a number of positive outcomes for local communities. Any reduction in the incidence of diarrhoeal disease, which currently affects around 17% of the population, would lead to direct savings in health system expenditure and have a flow-on effect in terms of general health and the maintenance of earning capacity. The greatest financial benefit would come from the expansion of domestic and international markets. Income generated would have a direct effect at the rural community level.

Potential negative aspects of developing the sago palm industry relate to concerns about increased harvesting of palm stands and associated problems. These are management issues which have been resolved satisfactorily in countries like Malaysia, and are open to solution in PNG as well.

[MW]

ASEAN/APEC seminar report

...from page 1

There were, in addition, more than 40 poster presentations.

The proceedings of the seminar are currently being edited by the members of the scientific committee and should become available to the participants in the first half of the year 2002.

The scientific sessions of the seminar were followed by a technical tour to Huai Hong Krai Royal Development Study Center. The centre is researching models for sustainable development suited to various types of watersheds. Such models embrace forest, soil and water conservation objectives as well as agricultural development.

Also in conjunction with the seminar, a coordination meeting of representatives of ASEAN/APEC countries was held under the leadership of SEAMEO SEARCA (Los Baños, Philippines) to discuss issues relating to planning of future seminars. It was suggested that a working group be established to coordinate the future seminars, SEAMEO SEARCA offering to host that group. The Indonesian delegation agreed to organise the 21st ASEAN/3rd APEC Seminar on Postharvest Technology, scheduled to be held in Bali in 2003.

[GS]

Group photograph taken at the end of the seminar.

ASEAN/APEC SEMINAR KEYNOTE PAPER

Grain drying in Southeast Asia reviewed

Over the past decade, paddy drying has been the subject of much research by ACIAR and several collaborating ASEAN countries, including Thailand, Vietnam and the Philippines. Recently, the Japan International Research Centre for Agricultural Sciences (JIRCAS) has been cooperating with Thailand in research to reduce postharvest losses of paddy. Most of the work concentrates on rapid drying using fluidisation and spouted-bed techniques, as well as slow, in-store drying. In addition, much effort has been put into developing a rice husk furnace to supply energy for drying, especially one that uses the cyclone concept.

The progress of these developments in grain drying was the subject of a keynote paper given by Somchart Soponronnarit and Somkiat Prachayawarakorn* at the 20th ASEAN/2nd APEC Postharvest Technology Seminar held in Chiang Mai, Thailand during September (see page 1). The paper, presented by Professor Soponronnarit, gives a detailed history and specifications of the drying strategies that have been assessed, providing a well-rounded picture of the grain-drying situation in Thailand in particular and Southeast Asia more generally.

Fluidised-bed drying

The feasibility of using the fluidisation technique for paddy drying was first investigated about a decade ago. Subsequent work led to development of a cross-flow fluidised bed dryer which was commercialised in 1995. Fluidised-bed dryers with capacities of 5, 10 and 20 t/hour are now available and have been sold in several countries including Thailand, Malaysia, Indonesia, the Philippines, Taiwan, Myanmar, Laos, Spain, and Guyana. More than 100 units have been purchased so far.

The main components of the dryer are a drying chamber, a backward-curved blade centrifugal fan, a burner using diesel oil or fuel oil for heating air, and a cyclone. Paddy is fed in and out by rotary feeders and its depth is controlled by a weir. Hot air is blown into the drying chamber though a perforated steel sheet floor. The air and grain flows are perpendicular to each other. A small portion of the air leaving the drying chamber is vented to the atmosphere, while the remainder, after cleaning in a cyclone, is recycled to the dryer, mixed with ambient air, and reheated to the desired temperature.

The advantages of fluidised-bed drying include:

- relatively low energy consumption compared with conventional hot air dryers;
- uniform product moisture content —thus a high drying air temperature can be used, but with lower risk of producing over-dried grain;
- high drying capacity due to better heat and mass transfer;
- a much smaller drying chamber and thus a significantly lower initial cost; and
- significant spin-offs including increased head rice yield and the potential to produce aged rice.

Professor Somchart Soponronnarit (King Mongkut's University of Technology Thonburi, Thailand), on the right, receiving an award for his keynote paper from Mr Suraweth Krishnasreni.

There is also great potential to commercialise fluidised-bed dryers for other grains. So far, they have also been used in the parboiled rice, maize and animal feed (for eliminating trypsin inhibitor) industries. A significant spin-off for the animal feed industry is that urease activity in soybean kernels could be reduced to an acceptable level using this drying system.

Spouted-bed drying

Spouted-bed paddy drying has been much studied in the ASEAN region, especially in Thailand and Vietnam (see PH Newsletter No. 57). It offers an alternative to fluidised-bed drying for grains that are too coarse or non-uniform in size. The conventional spouted-bed dryer has a conical–cylindrical shape. Drying air with a sufficiently high velocity is introduced through a centrally-located small opening a the conical base, causing grains to rise rapidly though a hollow central core, i.e. the spout zone, within the chamber. These grains, after rising a certain height above the bed surface, separate from the air stream and drop into the annulus region. In this region, the grains move slowly downwards. Some grain may be re-entrained into the spout region before reaching the bottom, where the mixing of grain is very rigorous.

This conventional design is not appropriate on an industrial scale, but modifications made by inserting draft plates between the annulus and spout regions have improved its industrial applicability. Compared with fluidised-bed drying, spouted-bed drying can produce paddy of superior quality, but it has not yet been commercialised, possibly because of the relatively low drying rate possible using this system.

In-store drying

Systems for in-store drying, also known as fixed bed grain drying, consist of a bin, a heating unit, and a ventilation system. The drying zone starts are the bottom and moves up the grain bulk. A low airflow rate is used, and air is generally at ambient temperature and humidity, except under extreme conditions where slight heating may be required. In-store drying allows efficient use of heat and produces grain of superior quality. Despite its benefits, this system has not been widely accepted in Southeast Asia, primarily because of the requirement for long-term storage, which is usually not necessary or desirable in this region.

Concluded at the foot of page 4.

* Somchart Soponronnarit and Somkiat Prachayawarakorn. Recent research and development work on paddy drying in South-East Asia. In: Proceedings of the 20th ASEAN/2nd APEC Postharvest Technology Seminar, Chiang Mai, Thailand, 11–14 September 2001 (in press).

Few rush to store grain on farm in Australia*

Ten years ago, the grain industry in Australia was characterised by centralised grain storage associated with grain pooling that guaranteed farmers a partial payment for their grain on delivery to the pool, with further payments once the pool was finalised. Distribution and marketing were controlled by single marketing bodies for each grain, such as the former Australian Wheat Board, for both export and domestic markets.

Since that time, the system has been gradually changing, with more deregulation and privatisation. As a result, farmers have the opportunity to sell directly to marketing agents and end users of grain, and have a wider range of grain payment and delivery options available to them. With these more flexible arrangements available, it was expected that on-farm grain storage would increase as farmers held on to their grain for supply to specialised markets, waited for better prices, or for other reasons.

Over the same period, there has been a large increase in grain production. Grain handlers have responded to this by providing larger and more technologically advanced storage facilities aimed at reducing delivery and receival times, improving grain quality, reducing costs, and increasing segregations (therefore boosting marketing options).

The Australian Bureau of Agricultural and Resource Economics (ABARE) undertook a survey of farmers in 1998–99 in order to examine current on-farm grain storage patterns. Interestingly, results of this survey indicate that on-farm grain storage has not increased substantially over the last decade.

The average age of storage facilities in 1998–99 was about 17 years, with nearly 40% of the total storage capacity up to 10 years old, and a further 30% over 20 years old. Only 17% of on-farm storage facilities were thought to be gas-sealable—an interesting result, considering that long-term storage generally relies on fumigation in gastight structures. In addition, aeration systems—generally required to maintain the quality of grain over an extended period under Australian climatic conditions—were present in only 11% of storages. These statistics suggest that farmers are not storing or planning to store their own grain for any length of time.

Total permanent storage capacity in Australia increased by an estimated 6% between 1990–91 and 1998–99, while grain production increased by over 50%. Over the same period, on-farm storage availability dropped from about 55% to 38%. Thus, although grain production increased dramatically over the decade, changes to the handling and marketing system have encouraged farmers to continue to support the bulk-handling systems in preference to increasing on-farm storage capacity. The reasons for this were not explicitly given, but may include the issue of capital outlay—farmers may consider the cost of upgrading or replacing on-farm storages too high to justify. They may consider it impossible, or unnecessary, to try to compete with the major improvements being made to bulk-handling facilities.

[MW]

* This article draws on information provided in Turner, S., Connell, P., Hooper, S. and O'Donnell, V. 2001. On-farm grain storage in Australia. In: Stored grain in Australia 2000. Proceedings of the Australian Postharvest Technical Conference, Adelaide, 2000 (in press).

Grain drying in Southeast Asia...from page 3

However, some rice mills use in-store drying for aeration of bulk-stored paddy in order to replace grain turning (which is the traditional means of aerating the grain bulk).

Rice husk furnaces

Rice husk furnaces have been under development since 1980. They offer the advantage of being fuelled by a by-product of rice milling—the rice husks—that has traditionally been discarded as waste. After much research and development over the intervening years, a cyclonic rice husk furnace for use with fluidised-bed paddy dryers was commercialised in 1998. The furnace consists of a combustion chamber, feeding systems for air and rice husks, a control system and a suction blower.

Financial analysis has indicated that the pay-back period of the furnace is 1200 hours, when used in place of a diesel oil burner. A cyclonic rice husk furnace is now available commercially, with almost 100 units sold to date. Rice husk furnaces have become increasingly popular as the operating costs of grain dryers have soared because of increasing diesel oil prices.

[MW]

QA certification for Western Australian grain growers

The first 24 growers in the Grain Pool of Western Australia Quality Assurance Pilot Project have successfully completed their external certification audits, achieving joint accreditation to the "Great Grain" quality assurance (QA) program and the SQF1000 code of the SQF Institute based in Switzerland.

The "Great Grain" program, a collaborative effort of the Quality Wheat CRC (Cooperative Research Centre) Ltd, Pulse Australia Ltd, and the Australian Oilseeds Federation, is the first of its kind in the Australian grains industry. It paves the way for growers who wish to implement HACCP QA systems for other farm enterprises with only one audit.

The Chief Executive Officer of Pulse Australia, Gavin Gibson, said that the fact that the project had attracted a high level of participation was testimony to the increasing importance of QA. "This project is a major undertaking for the WA Grains Industry, but has been driven from the outset by clear market signals from compound stock feeders in Europe that fully quality-assured supply chains will become mandatory for market access. All the signs are that other markets will soon follow."

Mr Gibson said the major benefits to growers who complete the "Great Grain/SQF1000" program were the achievement of full Codex HACCP certification and international recognition for their efforts. "Great Grain's alignment with the SQF Institute ensures that growers are deploying locally based QA systems that have relevance to global markets."

The Agri Food Training Centre, a Perth-based private company, was engaged as the training provider in developing and delivering the course to growers in WA.

[EH]

ACIAR PROJECT NEWS

Research to reduce aflatoxins in Indonesian peanuts

The aflatoxins produced by the fungus *Aspergillus flavus* are highly toxic contaminants of many plant products, including peanuts. In Australia, substantial costs are incurred by processing industries to eliminate the contaminant from peanuts. Recently, these costs have been passed onto peanut growers, and large penalty payments for aflatoxin-positive product are threatening their viability.

A new ACIAR project, "Reducing Aflatoxin in Peanuts Using Agronomic Management and Bio-control Strategies in Indonesia and Australia" (PHT/1997/017), aims to develop management procedures that can minimise aflatoxin contamination at its source, i.e. on peanut farms. The project will test and adapt the latest research into the biocontrol approach to minimising aflatoxin, using non-toxigenic strains of *A. flavus*. Biocontrol technology will be trialled in dryland production areas of Queensland where aflatoxin poses the biggest threat (see article on page 6). Other management options, including best practice harvesting, postharvest management and assessment of resistant peanut varieties will also be tested and further adapted for Indonesian and Australian farmers.

Raw peanuts for sale in an Indonesian market.

The Indonesian perspective

Indonesia is a major consumer of peanuts as a food crop and although it produces over 800,000 tonnes annually, over the past decade it has imported large quantities of peanuts. Some preliminary surveys conducted over recent years have shown that peanuts in the Indonesian food chain can be highly contaminated with aflatoxin and pose a severe health threat to the Indonesian community, especially the poor who are more likely to consume contaminated product. The new project will seek to minimise aflatoxin contamination by implementing on-farm agronomic and varietal strategies, and assessing optimal postharvest storage management.

Researchers assess the local scene

During the week of 21–27 October 2001, Drs G.C. Wright and N.C. Rachaputi, from the Queensland Department of Primary Industries, visited Denpasar, Bali, Indonesia. Their tasks were:

- to conduct a start-up project workshop at the Udayana University to finalise the experimental plans for the year 1 Indonesian component of PHT/1997/017; and
- to visit the Bali Department of Agriculture and peanut processors and markets to determine the extent of aflatoxin contamination in the Balinese food chain.

Workshop participants at Udayana Lodge: (L–R) front row – R.C.N. Rachaputi (QDPI), Dr Nasir Saleh (RILET, Malang), Dr Taufiq (RILET, Malang); second row – Dr Anna Rahmianna (RILET, Malang), Dr Okky S. Dharmaputra (BIOTROP, Bogor), Dr Mrs Asmarina S.R. Putri (BIOTROP, Bogor); back row – Dr G. Wright (QDPI), Dr Mahendra (Udayana University, Bali), Dr Taryono (Gadjah Mada University, Yogyakarta), Professor I. Kennedy (University of Sydney).

Start-up workshop

A very successful meeting was held, with discussions on each of the five objectives of the project, how each sub-project would be tackled and by whom, possible difficulties and so on. The Indonesian institutions involved are the Research Institute for Legumes and Tuber Crops (RILET), which is the lead institute for the project in Indonesia, the Southeast Asian Regional Centre for Tropical Biology (BIOTROP), and Gadjah Mada University (GMU). Proposed activities under each objective are summarised below.

Objective 1. Survey for aflatoxin in the food delivery chain. The plan is to collect and test samples from each of the five major distribution levels in the peanut food chain in Indonesia: village farmer; "penebas" (farmer trader/ harvest contractor); "pengumpul" (village trader); wholesaler/regional trader; and retailer. Samples will be dried and stored uniformly, then analysed for aflatoxin and *A. flavus*. Soil samples will be taken at the same time and place as the peanut samples and also analysed for aflatoxins. Two surveys are planned: the first in the wet season (harvest January 2002) and the second in the dry season (harvest April 2002). Researchers also plan to interview farmers, penebas, pengambul and wholesalers/retailers during the sample collection period.

Objective 2. Develop integrated varietal and management packages. Several agronomic and varietal management trials aimed at reducing on-farm aflatoxin contamination in peanuts are planned for the coming season in Indonesia. These include the effects of irrigation, harvest timing, planting arrangement and mulching, postharvest storage conditions, and assessment of varietal tolerance to aflatoxin contamination.

Objective 3. Genotype–environment interaction and modelling for aflatoxin. Much of this work will be done in Australia, but a crop/aflatoxin training workshop for local scientists will be held in Indonesia, and long-term climate data for the main peanut production regions in Java will be collected, to permit prediction of long-term outcomes of various aflatoxin management options.

Objective 4. Biocontrol of aflatoxin using non-toxigenic strains. Again, much of this work will be done in Australia, but meeting participants were informed about some preliminary biocontrol research being conducted under a separately-funded BIOTROP project.

Continued at the foot of page 6.

Success in Queensland work to counter aflatoxin incidence

A survey of 170 peanut industry people and farmers by the Queensland Department of Primary Industries (QDPI) during May–July 2001 found that the Department's projects to minimise aflatoxin in peanuts are paying off.

The results of the survey indicate that work in the aflatoxin extension project, in conjunction with the activities of shellers and a Grains Research and Development Corporation aflatoxin management project, has had a significant impact on reducing on-farm aflatoxin contamination. Peanut Company of Australia intake statistics reveal that, over the past 3 years, the percentages of aflatoxin-positive loads were 9, 22 and 14%, compared with 20-year averages of 30–40%.

Almost all respondents in the survey were aware of the Department's aflatoxin management projects to minimise aflatoxin in peanuts. Some 96% of respondents considered they had easy access to information on aflatoxin minimisation practices. The area represented in the survey was approximately 5800 ha or about 50% of the total estimated 11,500 ha planted to dryland peanuts in the survey area.

The survey aimed to:

- assess the efficiency and effectiveness of information delivery by the QDPI aflatoxin research, development, and extension projects over the past 3 years;
- measure project impact on the degree of industry change and reductions in 'on-farm' aflatoxin levels;
- identify information gaps as a basis for future research and extension approaches in line with recommendations derived from industry stakeholders; and
- provide observations and recommendations.

Almost 70% of respondents felt that the projects had improved, or greatly improved, their understanding of the incidence of aflatoxin in peanuts, and had stimulated changed industry practices, particularly in relation to harvesting management. The majority of respondents nominating timely pulling, windrow inversion, early threshing, and pre-cleaning and drying as the main change to practices.

Many respondents had views on the need for future research, development, and extension. They identified the following aspects of aflatoxin management as requiring attention:

- More reliable aflatoxin testing at intake. Aflatoxin testing is complex owing to the low frequency of aflatoxin-contaminated nuts and difficulties in obtaining representative samples from the loads delivered to shellers. Shellers have invested in improved sampling and sub-sampling equipment and techniques, and have increased sub-sample sizes for the final test. Nevertheless, a 100% accurate sampling system (and hence aflatoxin test) is virtually impossible unless every nut of every load is tested. More effective consultation between growers and shellers on ways to improve and/or modify the sampling system has been suggested as a way of addressing this very complex issue in future years.
- In-field test kits for monitoring of aflatoxin levels in crops.
- Better, more quantitative maturity tests in high aflatoxin risk years.
- Economic evaluation of capital expenditure required for aflatoxin minimisation practices, including harvesting equipment modifications for smaller-scale producers.
- Assessment of the aflatoxin biocontrol program on a commercial scale to minimise on-farm aflatoxin.
- Investigations into a varietal solution for aflatoxin using a genetically modified organism (GMO) approach.

[EH]

Aflatoxins in peanuts...from page 5

Objective 5. Fostering implementation of aflatoxin monitoring and control in Indonesia. There are two major elements to this objective: (i) socioeconomic input to advise on future options for effective aflatoxin management at the farmer, trader, retailer and government levels, and (ii) low-cost aflatoxin analytical methods in Indonesia. The former aspect is still under development, while the latter will involve establishing enzyme-linked immunosorbent assay (ELISA) aflatoxin analysis systems in the three collaborating centres (RILET, GMU, and BIOTROP). This will follow development of appropriate ELISA test kits by collaborators at the University of Sydney. The simple-to-use kits will be capable of quantitative analysis, giving a 'yes/no' result above a predetermined level.

Drs Taufiq (RILET, Malang), Rahmianna (RILET, Malang), and Endang Rahayu (Gadjah Mada University) inspecting *A. flavus*-affected kernels from market samples.

Workshop excursions

The workshop participants visited the Department of Agriculture's offices in Denpasar to gather information on the size of the Balinese peanut industry and related issues concerning aflatoxin contamination. There are four main growing areas, with total production of approximately 15,500 tonnes of kernels. Aflaxtoxin was not considered a major problem, although there is no testing system in place and there have been no surveys.

The group also visited a local market to view raw peanuts in the food chain. Peanuts were offered for sale in large hessian bags. An inspection of these peanuts quickly revealed kernels that were heavily infected with *A. flavus*, especially among the smaller, immature kernels, suggesting that aflatoxin may have been a serious issue. The researchers also visited a facility that processes (mainly roasting) peanut products in Bali, but unfortunately the owners were not available for discussions with the group.

[MW]

Postharvest at the University of Rajshahi, Bangladesh

*Dr Md Wahedul Islam**

The Institute of Biological Sciences, University of Rajshahi is a national research cum teaching institute in Bangladesh that promotes and provides facilities for higher studies and coordinated researches on advanced biological fields for both Masters and PhD degrees. Integrated pest management (IPM) is one of the areas of research being undertaken.

Stored product insect pests affect cereal grains, pulses, wheat, rice, flour, groundnuts etc. Of these, cereal grains make up the majority of commodities maintained in storage, and represent an important component of the world's food supply. Recent postharvest losses have been estimated to be 10–15% in Bangladesh.

Research on postharvest losses during storage has been carried out in the IPM Laboratory since its establishment. Studies are being conducted into alternatives to chemical pesticides for grain protection, and development of IPM methods.

There are several species of insect pests that attack different stored commodities in Bangladesh, including *Callosobruchus chinensis*, *C. analis*, *C. maculatus*, *Sitophilus oryzae*, *Rhyzopertha dominica*, *Tribolium*, *Oryzaephilus*, *Cryptolestes*, *Cadra cautela*, and *Lasioderma serricorne*. Populations of pests can be suppressed by one or more species of natural enemy. Important natural enemies include parasitoid wasps of the families Braconidae, Ichneumonidae, Pteromalidae, Bethylidae, and Trichogrammatidae, and predatory pirate bugs.

Current activities

The Institute's current studies into the biology and management of stored product insect pests encompass three broad disciplinary areas: biological control (parasitoids, predators and pathogens), pheromones and insect growth regulators (IGRs), and botanicals (powders and oils as well as crude forms).

* Dr Md Wahedul Islam, Professor, Institute of Biological Sciences, Rajshahi University, Rajshahi 6205, Bangladesh. Email: <mwislam2001@yahoo.com>.

Dr Md Wahedul Islam

Biological control with parasitoids, predators, and pathogens

- Biology, host searching behaviour, host range, functional response, life table and intrinsic rate of growth, reproductive potential, and temperature and humidity tolerances of the parasitoids *Dinarmus basalis* (Rond.), *Anisopteromalus calandare* (How.), *Choetospila elegans* Westw., *Rhabdepyris zeae* Waterston, *Holepyris sylvanidis* etc. of *Callosobruchus*, *Sitophilus*, *Tribolium* and *R. dominica*
- Develop in vitro mass-rearing techniques and production, release and suppression of the parasitoids in both the laboratory and insectary.
- Develop an artificial diet to mass-rear *Xylocoris flavipes* for the purpose of biological control of *Tribolium*, *Oryzaephilus* and *Cryptolestes* etc.
- Efficacy of entomogenous fungi against *Tribolium*.
- Effect of *Bacillus thuringiensis* (Bt) var. *kurstaki*, synthetic pyrethroids and ionising radiation on *Cadra cautella* (Walker).

Pheromones and insect growth regulators (IGRs)

Different IGRs are being used for protecting stored products from postharvest losses due to insect infestation. These IGRs include triflumuron, cynomazine, dimillin and deltamethrin. They are being used individually and sometimes combined with low-dose insecticides and/or botanicals. Studies on dose-related mortality response, behavioural response, and effects on development (fecundity, fertility), adult mortality and populations have been carried out.

Botanicals

The Indian–Pakistan region is rich in indigenous plants, many of which possess insecticidal properties. The important plants include *Azadirachta indica*, *Amoora* sp., *Thevetia peruviana* Schum., *Annona squamosa* Linn., *Murraya paniculata* Linn., *Datura metel* Linn., *Calotropis procera* Ait., *Ipomoea maxima* Linn., *Polygonum hydropiper* etc. Botanical extracts and products, including oils, have been reported to repel and be toxic to *Callosobruchus*, *Tribolium* and *R. dominica*.

Other ongoing research on stored products

- Integrated management of *Tribolium*
- Effect of gamma irradiation on *Tribolium*
- Potential of naphthalene and sumithion in the control of *Tribolium*
- Biology and control of *R. dominica*. ■

CURRENT AWARENESS ...cont'd

Per Pinstrup-Andersen wins World Food Prize

Per Pinstrup-Andersen, Director General of the International Food Policy Research Institute (IFPRI), a Future Harvest Center, was named the 2001 World Food Prize Laureate by the World Bank and the Consultative Group on International Agricultural Research (CGIAR) on 27 August 2001. The award recognises Dr Pinstrup-Andersen's research which has helped to modify and refocus food subsidy programs in developing countries, thereby increasing the amount of food available to poor people.

"This prestigious award is testimony to Per's achievement of excellence in addressing the problems of hunger and food insecurity in the world," said Ian Johnson, World Bank Vice President and Chairman of the CGIAR. "His leadership has helped shape the thinking of a new generation of food policymakers around the world and under his direction, IFPRI has become one of the world's premier food policy research organizations."

For more information on IFPRI, visit <www.ifpri.org>. The CGIAR website is at <www.cgiar.org>. The World Food Prize Foundation is located in Des Moines, Iowa <www.worldfoodprize.org>. ■

CURRENT AWARENESS

NEWS

Durian project information

Project PHT/1995/134, "Management of *Phytophthora* diseases of durian", has a new web site address: <http://www.botany.unimelb.edu.au/botanyunimelb/1pages/research/labs/mycology/duriansite/index.html>.

8th IWCSPP "early bird" registration

A reminder that 31 December is the closing date for early registration for the 8th International Working Conference on Stored-product Protection, to be held in York, UK from 22–26 July 2002. Up till then, the registration fee is £260 (approx. US$500); after that it rises to £320 (approx. US$640). For information about the conference and a registration form, go to its web site at <www.icscs.co.uk/iwcspp2002>.

Postharvest horticulture conference

A note for longer-term diaries: the next Australasian Postharvest Horticulture Conference will be held in Brisbane, Queensland, Australia on 5–8 October 2003. A First Announcement is scheduled for distribution in early 2002.

13th International Drying Symposium

The 13th International Drying Symposium (IDS'2002) will be held in Beijing, China from 27–30 August 2002. The International Drying Symposium (IDS) was founded in 1978 by Professor Arun S. Mujumdar. The objective of these biennial symposia is to promote the exchange of knowledge and expertise on the science and technology of drying.

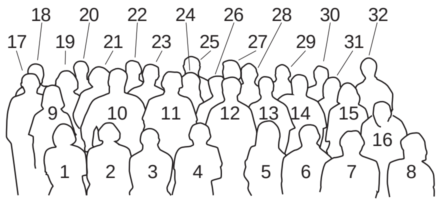
The chairman of the organising committee for the 13th Symposium is Professor Cao Chong Wen of China Agricultural University, who can be contacted at:

IDS'2002
P.O. Box 401
17 Qinguhua East Road
Beijing 100083
People's Republic of China
Phone: +86-10-6233 6545
Fax: +86-10-64427616
Email: ids@ids2002.com

The Symposium has a web site at <http://www.ids2002.com>.

Continued on page 7.

This photograph was taken at the 2001 annual meeting of the Postharvest Technology Program, held in Nambour, Queensland during November. Most personnel associated with Australian project activities attended the meeting.



1. Shinta Singgih (University of Queensland, UQ); 2. Robyn McConchie (Univesity of Sydney, USyd); 3. Irene Horne (CSIRO); 4. Sherri Wei (UQ); 5. Michelle Robbins (Queensland Department of Primary Industries, QDPI); 6. Tim O'Hare (QDPI); 7. Neil Hollywood (QDPI); 8. Melinda Su (UQ); 9. Lien Ko (QDPI); 10. Steve Morris (Sydney Postharvest Laboratory) 11. Betty Robertson (ACIAR); 12. Bernard Maladina (ACIAR); 13. R.C.N. Rachaputi (QDPI); 14. Rod Jordan (QDPI); 15. Elizabeth Dan (QDPI); 16. Peter Lynch (ACIAR); 17. Ivan Kennedy (USyd); 18. Jan van Graver (CSIRO); 19. Debbie Templeton (ACIAR); 20. Peter Hofman (QDPI); 21. Irene Kernot (QDPI); 22. Philip Keane (La Trobe University); 23. George Srzednicki (University of New South Wales, UNSW); 24. Smilja Lambert (Mars Confectionary of Australia); 25. John Skerritt (ACIAR); 26. Warren Shipton (James Cook University);27. Barry Blaney (QDPI); 28. Graeme Wright (QDPI); 29. Tony Cooke (QDPI); 30. Robert Driscoll (UNSW); 31. Lindy Coates (QDPI); 32. David Guest (University of Melbourne).

ACIAR Postharvest Newsletter

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The Australian Centre for International Agricultural Research was established in June 1982 by an Act of the Australian Parliament. The Centre encourages research aimed at identifying agricultural problems in developing countries and finding solutions to such problems. It is empowered both to commission research and to communicate the results of such research to interested persons and institutions.

ACIAR
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