

PHT/1994/037 NEWS

In-store drying research assessed in northern China

Participants in ACIAR project PHT/1994/037, "In store drying of grain in China", met in Harbin, Heilongjiang Province on 21 August 2000 to discuss, in particular, progress in research in the north China component of the project, which is targeting in-store drying of frozen maize during the severely cold winter months. The group visited the project work site near Zhaodong to inspect the silos, grain, and aeration equipment

being used in the experiments (see photograph below).

Attending the meeting were the project coordinator, Mr Li Fujun, Deputy Division Director, Department of Management, State Administration of Grain Reserves (SAG), and key personnel from both northern and southern teams, the latter based in Chengdu, Sichuan Province. The project's technical adviser, Dr Niu Xinghe, China Central Reserve Grain Management Co. Ltd and the Australian project scientist, Dr George

Szrednicki from the University of New South Wales, also participated.

The thermophysical data collected and the results of work on the physical state of water done at the China Agricultural University in Beijing and at the University of New South Wales in Sydney were presented, together with details of the modelling work completed. Plans for future activities were discussed, including field experiment protocols, methods for financial analysis of the drying methods in place, and dissemination of the results.

Concluded at foot of page 2.



Participants in the August 2000 meeting visit the Project PHT/1994/037 experimental site at Sifan grain depot near Zhaodong (Heilongjiang Province). Included in the group are: 1st from right, Mr Li Fujun, Deputy Division Director, Department of Management, State Administration of Grain Reserves (SAG); 4th from right, Wang Guanglin, ACIAR China Office, Beijing; 5th from right, Dr Niu Xinghe, China Central Reserve Grain Management Co. Ltd; 6th from right, Mr Ren Ronghua, Deputy Division Director, Department of Foreign Affairs, SAG; 7th from right, Mr Ju Jinfeng, Harbin Guanghua Grain Chilling Technology, Co. Ltd; 8th from right, Mr Tang Baifei; Division Director, Department of Management, SAG; 9th from right, Dr George Szrednicki, University of New South Wales; and 2nd from left, Mr Li Huanshan, Deputy Chief, Storage Division, Heilongjiang Provincial Grain Bureau.

IN THIS ISSUE

In-store drying research assessed in northern China ... page 1

Postharvest studies a focus of new Mekong Delta university ... page 2

FORTHCOMING MEETINGS

8th IWCSPP - UK 2002 ... page 2

Controlled atmosphere research; Global food security; Horticulture postharvest ... page 4

20th ASEAN/2nd APEC Postharvest Seminar; Agricultural science and technology ... page 5

Assessing institutional networks and a postharvest network ... page 3

Linking farmers to markets ... page 6

Promoting a global initiative on postharvest technology ... page 7

Big is not necessarily better in the postharvest sector ... page 8

Training News: Agro-enterprise development ... page 10

"Current Awareness" ... pages 11-12 ... and more

Contributors to this issue:

Ed Highley, Robert Holmes, Greg Johnson, George Szrednicki, Mary Webb

Postharvest studies a focus of new Mekong Delta university

Establishment of specialised curricula in postharvest technology, rural mechanisation, and rural environment and resources management is one of the first priorities of the new Angiang University, in Viet Nam's Mekong Delta.

The university's permanent campus, whose facilities will also include a Center for Information and Communication Technology, a Foreign Languages Center, Rural Development Center, and a Library, will be built on 40 hectares of agricultural land provided by its farmer owners.

Speaking at the inauguration of the university on 9 September 2000, Rector Vo-Tong Xuan said that the new academic institute would also be designing an agribusiness curriculum to train "young experts operating in the pure agricultural production surroundings, especially in future agricultural cooperatives".

In his speech, Professor Xuan highlighted the challenges that globalisation presented to Viet Nam, and the roles that education and training would play in meeting that challenge. In the 21st century, he said, "The world will no longer distinguish between rich and poor people but only between people who know how to manage well and those who manage less well".

Professor Xuan lamented the poor competitiveness of the Vietnamese agricultural economy compared with that of its neighbours. "Farmers in the Mekong Delta in general, and in Angiang and its surrounding provinces in particular", he said, "always suffer from the dwindling market prices. They produce a large surplus of rice and other agricultural products

In-store drying research assessed in northern China...from page 1

The meeting agreed that all opportunities should be taken to publish the results of the completed research work in journals and present them at seminars, as well as incorporating them in training packages, so that they can be applied under the various conditions in which the grain industry in China operates. [GS/EH]

for export, making Vietnam the second largest rice exporting country in the world. Ironically their income is among the lowest among the workers in Viet Nam."

To overcome this problem, Angiang University will concentrate not only on teaching and research in postharvest and related disciplines, but also on renovating teaching methodology, especially in the field of teacher education within the university, and gradually extending to high schools in the provinces. Professor Xuan spoke of major improvements

in the methods of preparation of lesson plans and course syllabuses to be published on the university's Intranet, and of the introduction of a Rural Development Technician's education and training program to serve the on-going national effort in poverty alleviation.

"Both teachers and students", Professor Xuan said, "will be provided opportunities for doing research and extension, using budget supports from Departments of Science, Technology and Environment at provincial and central levels, and through international collaborations." He warmly thanked the large number of national and international agencies that had already provided support for the establishment of the university.

[GJ/EH]

FORTHCOMING MEETING

8th IWCSPP — UK 2002

The International Working Conferences on Stored-product Protection (IWCSPP), held every four years, are the premier series of international meetings for research scientists, consultants, extension workers, and industrialists concerned with the safe storage of the world's durable food commodities, such as grains, legumes, pulses, nuts, beverage crops, and animal feedstuffs. Each conference generally attracts some 300–400 participants from all parts of the globe.

The 8th International Working Conference on Stored-product Protection will be held in the historic city of York, UK on 22–26 July 2002, with the University of York as the venue.

The meeting will showcase work on the pests and diseases that may cause spoilage, adverse health effects, and loss of commodity after-harvest, and discuss new techniques aimed at safe, effective, and environmentally friendly management of stored products. The objectives are to exchange information from widely differing agricultural and economic scenarios, ranging from farmer scale in the tropics to bulk scale in Australia, North America, and Europe, and to explore appropriate and cost-effective solutions to storage problems.

The local organising committee is developing a dynamic program for the 8th IWCSPP under the banner

"Technology into Action" and will be encouraging presentation and discussion of issues of rapidly emerging importance in the postharvest area, such as molecular biological approaches, and novel, high-value, and genetically modified crops. It is also seeking to organise, as part of the program, workshops on topics such as stored products on the Internet, diagnostics, living without methyl bromide, and food hygiene and health.

Key themes of the general program will be:

- Biology, detection, and biological control of stored product pests
- Food safety
- Chemical and physical control systems
- Processing and applications
- The future of stored-product protection: impacts of global issues.

A first circular for the conference has been released; a second circular and call for papers is scheduled for June 2001. Full organisational and program details can be found at <www.icscs.co.uk/iwcspp2002>. Contact addresses are:

8th IWCSPP
c/- Central Science Laboratory
Sand Hutton
York YO41 1LZ UK.
Fax: +44 (0) 1904 462252.
Email: <iwcspp@icscs.co.uk>.

[EH]

Assessing institutional linkages and a postharvest network

Two postharvest projects funded by the Asia-Pacific Economic Cooperation (APEC) forum were the subject of consultative workshops held in Bangkok on 17–18 August 2000.

The projects involve researchers from five APEC economies—Australia, Canada, Indonesia, Malaysia and Thailand. Both are led by Dr Sirichai Kanlayanarat, Head of the Division of Postharvest Technology at the School of Bioresources at King Mongkut's University of Technology Thonburi in Bangkok.

The first workshop looked at the project "Institutional linkage for human resources development in postharvest technology (ATC01/2000)" which is funded by the APEC Agricultural Technical Cooperation Working Group. Participants included several scientists from Thai research organisations working in postharvest technology and delegates from Australia, Indonesia and Malaysia. They reviewed program objectives, outlined training proposals spanning short courses to higher degrees, discussed coordination of delivery of courses among APEC members in Southeast Asia, and made plans for the future development of the project.

Of particular concern to researchers in the project is that it be relevant to industry needs. APEC itself is committed to business facilitation and the regular involvement of the private sector. Thus, a participatory system will be followed in the project to ensure relevance of continuing education programs (postgraduate education,

training) and research activities. In addition, the project will establish linkages with national and international agencies and the postharvest industry to develop human resources.

As regards the mode of delivery of teaching and training materials, a strong case has been put for adoption of computer-assisted learning (CAL). The following characteristics of CAL were emphasised:

- it is inherently interactive;
- it is multi-media;
- it fosters a consistent approach;
- it permits self-paced learning; and
- it is eminently suited to distance learning.

In collaboration with scientists from Indonesia, the Philippines, Thailand, and Vietnam, the Australian team involved in the project has already developed a CAL package for grain postharvest technology (in ACIAR project PHT/1997/131). There are English-Indonesian, English-Thai, and English-Vietnamese bilingual versions of the package, all beta-tested in the respective countries, as well as an English-only version in the Philippines. The dissemination of this package for training and for incorporation into formal curricula has been proposed by the project overseer to APEC as a key activity for the second year of the project.

An APEC postharvest network?

A project funded by the APEC Industrial Science and Technology Working Group, "Feasibility study for

the development of a postharvest network for the APEC Region (IST04/1999)", was the topic of second workshop in Bangkok. The broad aim of the project is to initiate the development of a postharvest network of firms, universities, and public and private research and development (R&D) organisations, and to create a "Virtual Postharvest R&D Center".

The workshop reviewed program objectives, presented the results of a resources survey, and developed action plans. Two resource persons from outside the project joined this workshop: Dr Alastair Hicks (FAO Regional Office, Bangkok) and Dr Greg Johnson (ACIAR).

Participants agreed that, to be relevant to APEC needs, a network would need to:

- improve flows of technological information and technology;
- improve exchange of researchers and human resources development;
- facilitate joint research projects;
- improve transparency of regulatory frameworks;
- contribute to sustainable development; and
- enhance policy dialogues and review.

ACIAR's Dr Greg Johnson noted that APEC members are competitors as well as collaborators, and that the Thai initiative to propose the project was therefore especially commendable, given its place as an important exporter of agricultural produce and its already strong linkages within the region. Indeed, there are many existing formal and informal linkages in APEC, such as email networks linking business or/and scientists. At the regional level, the former Food Handling Bureau (AFHB) of the Association of South-East Asian Nations (ASEAN) used to advise on food trade matters. That function is now overseen internationally by the World Trade Organization.

Dr Johnson stressed the need for a holistic approach covering the food supply chain, focusing on cost minimisation and on linking farmers to markets. The idea of networks in postharvest technology has already been addressed in the past through ACIAR or FAO initiatives in regional workshops or seminars. Among the most significant of these are the ASEAN (now ASEAN/APEC) Postharvest Technology Seminars that have been conducted for more than twenty years.



Participants in the APEC ISTWG project on the feasibility study for the development of a postharvest network, at a workshop in Bangkok in August 2000.

Continued at foot of page 4.

Controlled atmosphere research

The 8th International Controlled Atmosphere Research Conference will take place in Rotterdam, The Netherlands on 8–13 July 2001. This series of conferences focuses on CA for fruit and vegetables.

The deadline for receipt of abstracts and a reduced registration fee has already passed, but registrations will be received right up to the time of the conference.

Topics to be covered during the scientific program are: physiology of CA-treated produce; CA-related disorders; optimal conditions; ethylene; texture; nutritional value and human health; flavour and taste; genomics and CA; pre- and postharvest relations; biological and insect control; CA technology; sensor technology and quality measurements; modelling; consumer packaging; transport packaging; marketing and consumer acceptance; logistics and transport; and economic aspects.

Full conference details, including a registration facility, can be found at <www.ato.wageningen-ur.nl/CA2001>.

Global food security

The International Food Policy Research Institute (IFPRI), in collaboration with the German Federal Ministry for Economic Cooperation and Development (BMZ), has organised a conference entitled “Sustainable food security for all by 2020: from dialogue to action”, to be held in Bonn, Germany on 4–6 September 2001.

The meeting will review progress in achieving food security since the first IFPRI “Vision 2020” conference in 1995, and offer state-of-the-art projections from the Institute to show how many people will go hungry in 2020 if appropriate action is not taken. It will prioritise actions that can have the greatest impact on improving food security, that can multiply local successes and innovative approaches and partnerships, and that can empower disenfranchised people, especially women.

Go to <www.ifpri.org/2020conference> for details, or contact:

Ms Simone Hill-Lee
IFPRI
2033 K Street, NW
Washington, DC 20006-1002 USA
Fax: +1 202 467 4439
Email: <s.hill-lee@cgiar.org>.

Horticulture postharvest

The 2001 Australasian Postharvest Conference will be held in Adelaide, South Australia on 23–28 September. This series of conferences provides a forum for horticulture postharvest research and industry sector people to exchange the latest in research information and to stimulate research and development.

Topics on the scientific program will include physiology, pathology, technology, quality management systems, human nutrition, consumer preferences/market research, pre- and postharvest interactions, biotechnology/molecular biology, minimal processing, and disinfestation.

The organising committee is calling for papers, with a 5 March 2001 cut-off date. Full details of the conference organisation and program can be found at <www.waite.adelaide.edu.au/APHC2001>.

[EH]

APEC postharvest workshops ... from page 3

Also, the South-East Asia Regional Center for Graduate Study in Agriculture (SEARCA) in the Philippines has been focusing on agroindustry training programs for some time.

Other forms of networking mentioned by Dr Johnson are through the professional associations (e.g. agricultural engineers, plant pathologists etc.) as well as electronic conferencing. Significant advantages of these forms of networking are their informality and the almost instant feedback on what worked and what did not.

Dr Helen Nair of the University of Malaya commented on the use of the proposed “Virtual R&D Centre”. It is important that the private sector be involved in it, she said, but there should be perceived advantages for them and it has to be easy to access. The virtual R&D centre should combine information on scientific breakthroughs in the area of postharvest and also on new designs that would make it attractive to the industrial users.

Dr Hadi Purwadaria of Institut



Mrs Sing Ching Tongdee of the Thailand Institute for Scientific and Technological Research, Bangkok (standing) presents her views on an APEC postharvest network. Also in the picture are (L-R): Prof. Hadi Purwadaria, IPB Bogor (Indonesia), Prof. Helen Nair, University of Malaya (Malaysia), and A/Prof. Niphon Visarathanonth, Dept. of Plant Pathology, Kasetsart University Bangkok.

Pertanian Bogor in Indonesia stressed that in his country, like in most of the neighbouring countries, the postharvest handling of perishable produce is mostly the domain of small and medium enterprises (SME), unlike for grain where there are often few large companies dominating the

market. Non-government organisations seem to play an important role in his country as well and indicate interest in being included in the survey.

During a presentation of the FAO INPhO (Information Network for Post-Harvest Operations) software, FAO's Dr Alastair Hicks pointed out the variety of technologies, from basic to high tech, included in the package and also stressed the possibility of rapidly adding new information.

Finally, Dr Johnson emphasised innovation and exchange of information by linking the project web site with all the relevant web sites in order to provide an up-to-date source of information in postharvest technology for the industry as a whole.

Both of the workshops in Bangkok stressed the importance of the postharvest technology for the APEC economies, a view that was later confirmed by the official representatives of these economies at the APEC meeting in Brunei in November 2000.

[GS/EH]

Chiang Mai the venue for 20th ASEAN/2nd APEC Seminar

The 20th ASEAN/2nd APEC Seminar on Postharvest Technology is to be held at Chiang Mai in Thailand's north on 11–14 September 2001, under the auspices of 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,

The ASEAN/APEC seminars are the premier series of colloquia on postharvest technology held in Southeast Asia. The seminar this year will again be an international gathering to discuss current research and development on durable and perishable agricultural commodities, including rice, maize, wheat, coffee, cocoa, pulses, root crops, and fruits and vegetables. Coverage was extended to perishable commodities for the first time at the ASEAN/APEC seminar in Ho Chi Minh City in 1999 and many interesting papers on the handling and storage of fruits and vegetables were presented.

Scientific program

The official language of the seminar is English. The four-day scientific program will consist of plenary lectures, symposia, and oral and poster presentations.

A tentative list of seminar topics is:

- quality assurance;
- systems and supply chain management;
- grain quality attributes;
- pesticide residues and mycotoxin contamination;
- village marketing and cooperatives;
- decision-support tools for pest and pathogen control and quality maintenance;
- food processing and value-adding;
- postharvest technology for fruit and leafy vegetables;
- managing field-based postharvest research; and
- the World Trade Organization and national policies.

Call for contributed papers and posters

A call has been made for pre-registrations and for contributed oral and poster papers. A first circular for the seminar, which incorporates a form for this purpose, can be obtained on request by emailing <chuwit@doa.go.th>.

Dates and deadlines

- The closing date for submission of paper titles and abstracts is Friday 15 June 2001.
- Authors will be notified of acceptance of papers by Friday 6 July 2001.
- The closing date for registration is Friday 27 July 2001.
- The closing date for receipt of manuscripts is Friday 10 August 2001.

Registration fee

The registration fee for the seminar will be US\$250.00. After 27 July 2001 registration will be US\$300.00. Day registration will be US\$75.00 per day. A final circular to be distributed in June will provide payment details.

Accommodation

The Lotus Hotel Pang Suan Kaew, 99/44 Huay Kaew Road, Chang Mai 50200 (Tel: +66 53 224 333, Fax: +66 53 224 493) has been selected as the seminar location. The hotel is offering a special room rate of Baht 1,300 for single room and 1,500 for double room (US\$1.00 = approx. 43 Baht) inclusive of breakfast, government tax, and service charge.

Seminar inquiries should be directed to:

Mr Chuwit Sukprakarn/Ms Arunee Wongkokrat
Entomology and Zoology Division
Department of Agriculture
Chatuchak, Bangkok 10900
Thailand.
Fax: +66 2 940 5396
Email: <chuwit@doa.go.th>.

[EH]

International conference on agricultural science and technology

Postharvest management is one of the main themes of an International Conference on Agricultural Science and Technology (ICAST) to be held in Beijing, China on 7–9 November 2001.

The postharvest session at the conference will explore:

- processing, storage, preservation, marketing technologies and equipment;
- the processing technologies and equipment for grains, cotton, edible oils, meat, dairy products, and fruits; and
- technical trends in processing and other key areas of agri-produce processing industry.

The program also includes an "Agricultural business forum", described as a "Presentation of science and technology development by head of the world leading agricultural business corporation".

The overall theme of ICAST, which was initiated and is being sponsored by the Chinese Government and cosponsored by several international organisations, is "Promoting global innovation of agricultural science & technology and sustainable agriculture development". A First Announcement has been circulated in which the organising committee of the conference, warmly invites senior officers and scientists in charge of agricultural science and technology in governments, academic institutions and international organisations, outstanding agricultural science and technology experts, agribusiness, and other relevant people to attend the meeting. It also includes a call for papers. Full details can be found at <www.agscience2001.org>. Other contact addresses are:

ICAST
China Science and Technology
Exchange Center
P. O. Box 2143
Beijing 100045, P.R. China
Fax: 0086-10-68319267.
E-mail: <icast-4@sohu.com> or
<icast4@hotmail.com>.

[EH]

Linking farmers to markets

Ed Highley and Mary Webb

“Food for all” is a common catchcry, but is it a pipe dream or a real possibility?

Producing enough food for the world’s rapidly increasing population remains the greatest challenge facing humanity. The “Future Harvest” program of the Consultative Group for International Agricultural Research (CGIAR) predicts that food supplies will need to increase by 50% by 2020 in order to feed the world at that time.

Though this is a frightening statistic, it seems that many governments in both developed and developing countries cannot comprehend it. How else can one explain their steadily decreasing support for the agricultural research whose results are surely the sole means by which we can increase food production and, in many developing countries, promote continued economic development?

The food crisis predicted by the Club of Rome in the 1970s was averted by the green revolution. Perhaps because of this, policymakers might feel supremely confident that science will again deliver the goods and, in a new world of “economic efficiency”, will do so with even less support and fewer resources, and in a more difficult physical environment.

To continue to feed the world, we will need more than a new green revolution, crucial though that will be: we will also need to spread research and development much more evenly across the food supply chain from farmers to markets, putting much more effort into postharvest activities. While the green revolution was a stupendous achievement in increasing food supplies in developing countries, there is, unfortunately, little evidence that it has reduced, to any great degree, overall levels of poverty among small farmers and farming communities. That there continues to be a strong drift of population from rural to urban areas in most developing countries is testimony to this.

A prime reason why even those farmers producing a surplus remain trapped in the poverty cycle is lack of access to profitable markets. All too often they are forced to sell to the buyer of convenience at whatever price that buyer dictates. At a recent seminar on “Linking farmers to

markets”,* Edward Heinemann of the International Fund for Agricultural Development succinctly put their quandary:

In their dealings with [the] market, smallholder farmers find themselves at a major disadvantage. Many do not well understand the market, how it works and why prices fluctuate; they have little or no information on market conditions and prices; they are not organised collectively; and they have no experience of market negotiation. To the extent that they have had contact with government agricultural extension services, they have received little guidance on these issues, as the services have tended to pass on technologies with little reference to markets and prices. With no information, no experience and no organisation, they have no basis on which to plan a market-oriented production system or to negotiate market prices and conditions, and they are obliged to take the first offer made to them.

To overcome this problem, farming communities have formed cooperatives and other mutual alliances to increase their buying and selling power in the marketplace. Larger commercial players have also been active, forming mutually beneficial alliances with farmers supplying marketable products at agreed prices. Clearly, it is only by such means that most developing country farmers can move from a poverty cycle to an income cycle, and begin to make a real contribution to overall economic development. To do this, they need much more help from governments, aid agencies, and donor groups.

What are the best sorts of structures to adopt to ensure that farmers have ready access to profitable markets? This is as important a question as, say, what is the best variety of maize to plant in a particular region. Indeed, it may be a more important question insofar as there is little point in harvesting a bumper crop for which there is no market. To answer both types of questions — production and postharvest — requires research.

* Linking farmers to markets. Proceedings of PhAction Seminar 12, held at Eschborn, Germany on 7 June 2000. View at <www.fao.org/inpho>.

Postharvest research will be an essential ingredient in the recipe to increase world food production and to overcome impediments to the distribution of food. Farmers will not grow more food if it is not profitable for them to do so. If it is profitable, they will spend the surplus cash they make from selling their crops on farm inputs, processed foods, manufactures, and better services, injecting funds into the whole economy. Urban populations cannot buy more food or different types of food in a stagnant economy that provides no growth in income for them to do so. In other words, the profits of farmers can be a primary driver of economic development.

The point is that an increase in food production will not, in itself, be sufficient to ensure global food security. Unless there is a major, parallel effort on postharvest issues, increased production will do little to alleviate poverty and overcome the “distribution” problem that already plagues world food supplies.

While postharvest research will be an essential ingredient in solving world food problems, it is at present in short supply. Those International Agricultural Research Centres (IARCs) of the Consultative Group for International Agricultural Research (CGIAR) targeting food crops support only a handful of postharvest research projects, devoting by far the bulk of their resources to research to increase production. Indeed, the current budgetary allocation for postharvest development within the CGIAR is less than 4% of total funding.

For farmers to capture the full value of increases in production and contribute to economic growth, much more support is needed for postharvest research on not only technological innovations, important as they will continue to be, but also on topics such as:

- distribution systems and market access;
- enhancing the potential of farmer and agri-business cooperatives;
- value adding within the rural community;
- improving the quality of agricultural products;
- reducing contamination by mycotoxins, pesticides and heavy metals;
- developing private sector linkages;
- tailoring products to suit consumer demands; and
- managing supply chains.

Continued on page 7.

Linking farmers to markets ... from page 6

Though existing IARC postharvest research projects are small in number, their proponents clearly recognise the need to take a much broader view in providing support for post-farm gate activities.

- The International Center for Tropical Agriculture (CIAT) is designing and establishing small-scale agro-industries that link market opportunities and processing technologies with environmentally sound production practices — the ultimate beneficiaries being the rural population, especially female small farmers, and entrepreneurs, who benefit from training and information on postharvest processing technologies, market analysis and support services.
- The International Center for the Improvement of Maize and Wheat (CIMMYT) is developing lines of

maize and wheat which are resistant to storage pests and diseases, following an initial assessment of the losses associated with postharvest pests in developing countries.

- The International Potato Center (CIP) is exploring a range of means for diversifying and expanding the use of sweet potato, developing small enterprises based on value adding during primary processing (e.g. starch and starch-derived products), and more efficient use of sweet potato roots, vines and by-products as animal feed.
- The International Food Policy Research Institute (IFPRI) has, as an intermediate goal of its project on promoting growth and diversification through markets for high-value crop and animal products, improved access of smallholder farmers and the poor, especially women, to reliable markets for high-value and perishable items.

- The International Institute of Tropical Agriculture (IITA) is identifying market opportunities within the postharvest system in Africa and generating a range of technologies which will enhance food security and provide competitive options for farmers, processors and consumers in the food, feed and agro-industrial sectors, with planned outputs in the areas of product quality, utilisation and marketing, harvest and storage, and capacity building and information exchange.
- The International Rice Research Institute (IRRI) is working to improve the profitability of rice farming through a number of means including more efficient management and mechanisation, improvements in grain handling, drying and storage, opportunities to add value to rice through field and postharvest management, utilisation of rice by-products (straw, husks and bran) in

Continued at foot of page 8.

FAO NEWS

Promoting a global initiative on postharvest technology

A “Global Post-Harvest Symposium” to be held in Rome in April 2002 will develop a vision and plan of action to form the basis of, and seek funding for, a new “Global Initiative on Post-harvest Technology” (GIPHT).

The initiative is an activity of the Secretariat of FAO’s Global Forum for Agricultural Research (GFAR). GFAR is collaborating with another FAO group, the Agro-Industries and Post-Harvest Management Service (AGSI) in organising the symposium.

The symposium will seek to generate an international focus and awareness of the breadth of the postharvest sector as a means of contributing to socioeconomic development in developing countries; and to explore and highlight technical and policy issues which impact upon growth and change within the sector.

The organisation of the symposium is proceeding in three phases:

1. Background papers are being prepared on the status of the postharvest sector in each sub-region of the five regional fora (Asia/Pacific; Sub-Saharan Africa; West Asia and North Africa; Latin America and the Caribbean;

Central Asia and the Caucasus) that constitute GFAR. From these will be synthesised, for each region, a document that presents a general view of the development of the sector.

Regional workshops will be held to allow representative groups of stakeholders to analyse and discuss those documents. The aim here will be to assess the current status and requirements of the postharvest sector in each region, and identify major areas for improvement and development that can lead to specific follow-up actions.

2. The second phase will be an inter-regional analysis of the results of the regional needs-assessments and of the action proposals, in order to identify the concrete proposals that could be integrated into the Global Initiative on Post-harvest Technology (GIPHT). An electronic conference is envisaged to facilitate this inter-regional dialogue.
3. The third phase will be the symposium itself, and the follow-up action to implement GIPHT.

Funds will be made available to each of the regional fora of GFAR to

appoint a consultant to act as regional technical coordinator. These people should be specialists in postharvest management. Funds will also be made available to appoint sub-regional consultants to prepare the background papers on the postharvest situation in each sub-region, according to a common format that has been developed for that purpose.

In addition, support will be provided for up to 15–18 “eligible” participants from the various sub-regions and stakeholder categories, to attend a regional workshop organised by each regional forum.

Advance information on the international symposium (coined IN-PhASE) says that a web site will be established to provide up-to-date information on the event, but no further details are available on that at the moment.

In the interim, further information can be obtained from:

Fernando Chaparro
Executive Secretary
GFAR Secretariat
FAO, Viale delle Terme di Caracalla
Rome, Italy
Fax 39-06-5705-3898
e-mail: <Fernando.Chaparro@fao.org>

[EH]

Big is not necessarily better in the postharvest sector

Globalisation is affecting most aspects of the agrofood industry throughout the world and the postharvest sector is no exception. The industry has become more concentrated, demand patterns have shifted towards higher value-added products, and supermarkets are increasingly major actors in the farmer-to-consumer chain.

Despite these global changes, most enterprises in developing countries are small to medium—often household businesses with little capital, limited access to modern technology, and poor integration with urban and international markets. How will they fare against the rise of large enterprises?

Analysts at the Washington-based International Food Policy Research Institute (IFPRI) are very interested in such questions, particularly from the point of view of rural livelihoods. In a recent paper, IFPRI's Francesco Goletti and Emma Samman* highlight the rising significance of the postharvest sector and the need to maintain a broad-based approach to postharvest and agroindustry development. They use a detailed and compelling case study to support their thesis.

The importance of the postharvest sector

Goletti and Samman identify five global trends that make for the increasing importance of postharvest systems in developing countries:

1. contraction of the agricultural sector—measured both by a diminishing portion of the labour force engaged in agriculture and a declining share of agriculture in gross domestic product (GDP). Increasing postharvest processing and marketing in rural areas could help reverse this trend by improving employment opportunities and increasing value added in rural communities;
2. urbanisation—the share of the urban population in developing

* Goletti, F. and Samman, E. 2000. Globalisation and the benefits of a broad-based approach to postharvest systems development. In: Johnson, G.I., Le Van To, Nguyen Duy Duc and Webb, M.C., ed., Quality assurance in agricultural produce. Proceedings of the 19th ASEAN/1st APEC Seminar on Postharvest Technology, Ho Chi Minh City, Vietnam, 9–12 November 1999. ACIAR Proceedings No. 100, 18–40.

countries has grown 3.3% annually since 1980 and has yet to reach its peak. As people move away from rural areas, they increasingly rely on transport, storage, processing, and marketing systems for a secure and safe food supply;

3. the move toward a more liberalised international trade system and an increasing orientation of developing countries toward export markets as a source of economic growth—this requires improved marketing, information and transport networks, quality control and product standardisation, and trade facilities;
4. growing interest in redressing gender inequality—recognising the important role played by women in the postharvest and marketing sectors; and
5. rising concern with environmental issues and sustainable development—with resultant demand for “organic” produce and the need to develop alternative strategies for pest and waste management.

The broad-based approach

According to Goletti and Samman, a broad-based approach to postharvest and agroindustry development implies a balanced expansion of small, medium and large enterprises that can capture different scale

Continued on page 9.

Linking farmers to markets ... from page 7

homestead-based activities involving women, and through the development of the household- and village-level capacities to take advantage of the growing demand for quality rice and for diversified rice products.

But much more effort along these lines is needed to capture the benefits of a vitalised postharvest system. This is the focus of *PhAction*, a new global postharvest forum, which is encouraging CGIAR and other agencies to develop and implement more postproduction projects. The current members of *PhAction* are:

- ACIAR – Australian Centre for International Agricultural Research
- CIT – International Centre for Tropical Agriculture, Colombia
- CIP – International Potato Center, Peru
- CIRAD – Centre for International Cooperation in Agricultural Research for Development, France

- FAO INPhO – Food and Agriculture Organization of the United Nations Information Network on Post-harvest Operations, Italy
- GTZ – German Agency for Technical Cooperation
- IFPRI – International Food Policy Research Institute, USA
- IITA – International Institute of Tropical Agriculture, Nigeria (FOODNET Project, Uganda)
- IRRI – International Rice Research Institute, Philippines
- JIRCAS – Japan International Research Centre for Agricultural Sciences
- NRI – Natural Resources Institute of the University of Greenwich, UK

These agencies, which include several IARCs, are working towards *PhAction*'s mission to achieve recognition of the true importance of the postharvest sector in developing countries and increase the resources devoted to it, and to act as a platform for more effective and coordinated postharvest interventions.

They will support, and seek support for, projects that target primarily smallholder farmers to:

- increase their incomes;
- increase their marketing skills and power;
- increase the proportions of end-market prices they obtain;
- explore new markets and alliances and establish mutually profitable linkages; and
- position them to benefit from growing international trade and globalisation.

Only through successful carriage of such activities, *PhAction* believes, can the achievement of “Food for All” move from pipe dream to possibility. *PhAction* also looks forward to contributing to the aims of the Global Initiative on Post-harvest Technology of the Global Forum for Agricultural Research (see item on page 5). ■

Big is not necessarily better in the postharvest sector ... from page 8

economies, niche markets, linkages with urban and international markets, and intra-industry linkages.

Worldwide, the trend is toward consolidation in the agroindustrial market share. For example, in the United Kingdom just four retailers accounted for nearly 75% of food sales in 1998, and in both Kenya and Zimbabwe, five exporters control over 75% of all fresh vegetable exports. Such concentration may be inevitable in the long term, but Goletti and Samman argue that a broad-based approach can be compatible with globalisation of the agrofood industry in the short to medium term, and would be more beneficial to rural development and poverty alleviation.

Much of the move toward larger firms is driven by the desire by large retailers for produce of consistent quality; the supply of which requires relatively sophisticated information, transport, and storage systems. The problem is that, in many developing countries, postharvest systems are the province of a multitude of small and medium enterprises, which undoubtedly suffer under such a regime.

To avoid their demise, small to medium enterprises have a number of options, including specialising in niche markets that stress differentiation in their export produce—such as organic fruit, or traditional foods sought by immigrant communities.

Goletti and Samman also point to evidence supporting the view that, in some rural environments, small enterprises might even be more competitive than large ones. Large enterprises can be disadvantaged where:

- input supply is insufficient to permit substantial economies of scale;
- managerial problems and lack of effective coordination result in input loss;
- markets are not large or constant enough to absorb the output of a large plant running at full capacity; and/or
- there are diseconomies of scale, especially outside the plant itself, such as inadequate roads, workers requiring housing, lack of infrastructure and poor industrial linkages.

Small enterprises are more flexible, both in terms of labour and in adapting to disruptive circumstances.

Case study: starch in Viet Nam

The Government of Viet Nam has recognised the key roles of agriculture and the rural economy for the promotion of industrialisation and modernisation and their contribution to increasing employment and incomes of the rural population.

The starch industry in Viet Nam is one example of successful diversification, having expanded considerably over the past decade. It utilises low-value cassava to produce high-value “wet” and “dry” starch for a variety of food and industrial purposes. In the past few years, a few large-scale foreign and domestic enterprises have arrived, suggesting significant potential for further development of the industry, but 90% of starch processors could still be classified as small processors, with production capacity of less than 10 tonnes per day. Many of the problems faced by the Vietnamese starch industry are similar to those discussed above, thus it can be used as a model to examine issues that may be applicable to many rural industries in developing countries.

Goletti and Samman sought to ascertain the relative benefit of targeting assistance to the starch industry in different ways, in order to test their hypothesis that a broad-based approach to postharvest systems development was viable. They conducted simulations of three possible scenarios for injecting into the industry a 10% increase in the value of capital equipment (as a proxy for a credit injection) via: (1) the entire sector—to small and large enterprises alike; (2) small enterprises only—this is akin to increasing the size of small enterprises and transforming them into ‘larger’ enterprises; or (3) large enterprises only. In all simulations, the investment was considered as a type of loan that could generate enough income to be repaid at market interest rates.

In brief, while the first and third policy scenarios made very little difference, the second scenario was highly successful, with total income rising by nearly 11%, the benefit generally remaining in the local community, and the investment/loan able to be easily repaid over a short period of time.

This modelling work suggests that a broad-based approach that promotes small and medium enterprises has benefits not only in terms of employment and equity, but also in terms of growth.

[MW]

MEETING REPORT

Impact of agricultural R&D

An International Conference on the Impact of Agricultural Research and Development in South East Asia was held at the Cambodian Research and Development Institute (CARDI), Phnom Penh, Cambodia on 24–26 October 2000.

The meeting was attended by several ACIAR staff, including Deputy Director (R&D Programs) Dr John Skeritt, who presented a keynote paper on the Current status of agricultural research for development in Southeast Asia, and Postharvest Technology Program Manager Dr Greg Johnson who gave a paper on The impact of agricultural research on postharvest development.

A panel session to wrap-up the meeting covered, among other things, the role of donors and the future of CARDI.

Participants in the panel included Catholic Relief Services (Numa Shams), ADB (Dimyati Nangju), ACIAR (John Skeritt as moderator) AusAID (Rob Ferraris), USAID (Dennis Cengel), CAAEP (Dennis West), and CARDI (Men Sarom).

One of the key issues was to what extent CARDI should diversify its activities and move away from a rice-focused centre. There is already a small amount of work in progress on fruit and vegetable production on rice bunds or raised beds, as well as some small livestock projects.

A second key issue was for CARDI to cooperate more closely with other groups, and gain the benefits of networking.

[GJ]

Coming up next issue...

Rice quality management

7th JIRCAS symposium

Phosphine resistance monitoring in India

ACIAR-France Tropical Fruit Research in the Pacific

... and more

Agro-enterprise development

The International Institute for Tropical Agriculture (IITA) FOODNET program and the International Center for Tropical Agriculture (CIAT, Colombia) are the lead agencies organising a proposed course on agro-enterprise development to be held at IITA headquarters in Kampala, Uganda on 1–12 May 2001.

This course is intended to introduce people in research and non-government organisations, and budding entrepreneurs and network project members, to ideas and principles that will help them to work effectively with the private sector, and to improve existing agro-enterprises or develop new ones.

Rationale

Recent years have seen significant changes in the focus of rural and agricultural development. Today, multiple objectives are the norm: these include increasing production of food and agricultural raw materials; poverty alleviation/eradication; preservation of the natural environ-

ment; and building social capital. At the same time, many countries have initiated economic reforms aimed opening their economies to regional and global trade. In this approach, measures to improve productivity and product quality must be adopted, in order to increase competitiveness in domestic and export markets.

Faced with these changes, small-scale agriculture has survived, and continues to play an important role in the production of agricultural goods. This role will increase if links between rural producers and markets (local, regional, national and export) can be strengthened. Rural agro-enterprises, as a mechanism for matching agricultural production with market needs, can play an increasingly important role if they can be developed within a sound economic framework.

This course, the first of its kind in Africa, will present a conceptual framework and a series of methodologies and tools that will permit participants to improve decision-making in rural agro-enterprise development, within the context of sustainable agricultural development at the

Program's annual meeting held at Gatton

The 2000 annual meeting of the Postharvest Technology Program was held at the Queensland Department of Primary Industries, Gatton on 12–13 December 2000. The meeting was attended by most Australian personnel associated with the Program's projects.

The meeting reviewed progress in current and recently completed projects and discussed potential future activities.

Participants also enjoyed an address by ACIAR Board Chair, Professor Elizabeth Woods, who spoke about the revision of the ACIAR Corporate Plan and summarised some of the views of external delegates to a planning retreat held in Canberra during the previous week. Issues raised included the impacts of WTO and strengthening links to the private sector, as well as the continuing need to build technology transfer pathways into projects. (GJ)

micro-regional level. Its objective is to contribute to the strengthening of institutional capacity in the design, formulation, and implementation of research and development projects that integrate the components of production, postharvest/processing and marketing in an enterprise context, with the aim of linking small farmers with growth markets and fostering preservation of natural resources.

Content and enrolment

The course, which will be conducted in English, will have four modules (see Box to left). The minimum requirements for enrolment are a bachelors degree related to rural development and two years of experience in a government or non-governmental institution associated with rural sector activities. The all-inclusive course fee will be around US\$1500, but note that some complete scholarships will be offered by FOODNET and other collaborating ASARECA networks. These cover costs of international travel, registration, board and lodging and medical insurance. For more details on this and other matters to do with the course, contact Shaun Ferris at IITA; email: <sferris@imul.com>.

[EH]

COURSE PROGRAM

Module 1.

Defining the course objectives and expectations of the participants. Discussions will cover how small-scale rural enterprises relate to the changing economic environment (free market, globalisation) and their impact on rural society; causes and effects of degradation of natural resources; organisation and community participation towards a strategy for management of these resources; and the role and current contribution of rural agro-industry, and a vision for its future development.

Module 2.

Sustainable development at micro-regional level: through discussion and analysis of case studies, presented by invited speakers and course participants. The fundamental principles and criteria for the design of sustainable development programs at the micro-regional level, with emphasis on the incorporation of an agro-enterprise component.

Module 3.

Rural agro-enterprise systems: integrated productive chains, market intelligence, support services (management and administration, credit, technical assistance, training etc.), and prioritisation of portfolios of investment and research projects.

Module 4.

Integrated agro-enterprise projects: collection and analysis of information, participatory planning of projects, technology search and selection strategies; participatory development of technologies with users; feasibility studies for pre-investment projects; measurement of adoption and impact; enterprise organisation for the implementation of agro-enterprise projects; and design and formulation of research and development projects.

CURRENT AWARENESS

POSTHARVEST PUBLICATIONS

ACIAR Proceedings 100 on CD-ROM

ACIAR has produced a CD-ROM version of "Quality assurance in agricultural produce", Proceedings of the 19th ASEAN/1st APEC Seminar on Postharvest Technology. The CD can be run on either PC or Macintosh computers. Contact the ACIAR Publications Manager, Peter Lynch <lynch@aciar.gov.au>, for details of availability. ACIAR's addresses are on the back page of this newsletter.

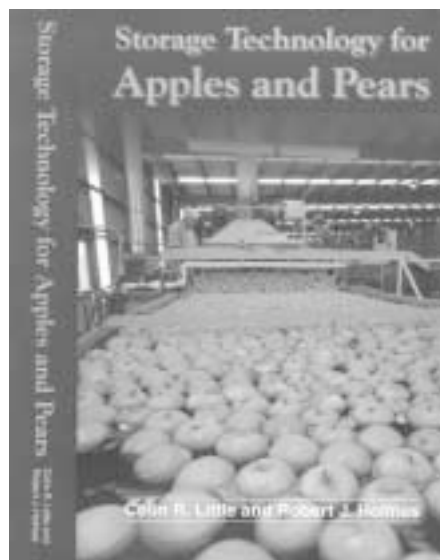
Storage technology for apples and pears*

This book of 10 chapters provides a wealth of practical and technical information on growing, picking, treating, storing, and marketing of apples and pears. It brings together the knowledge and work of the two authors, members of the Institute for Horticultural Development, Agriculture Victoria, Australia, collected over 40 years of research, extension, and consulting. It should prove a valuable reference book for growers, cold-store operators, produce managers, researchers, extension workers, students and teachers, in all apple and pear growing countries.

The book begins with a chapter on the history of cold storage, then systematically examines the biological aspects of fruit growth and development, including the processes of maturation, ripening, and senescence. The third chapter relates cultural practices such as nutrition, soil management, pruning technique, crop regulation, and rootstock to fruit quality and storage potential. There is a section listing the desirable leaf, fruitlet, and fruit mineral levels for major varieties. A chapter on harvest maturity follows which tabulates the harvest maturity parameters for apples, pears, and nashi and supplies colour photographs of starch patterns for accurate maturity assessments.

The fifth chapter describes the biological aspects of the major diseases, with special attention to

core rots. Recommendations follow on the optimisation of chemical management and the beneficial effects of hygienic handling. The postharvest application of calcium, the most critical nutrient for storage quality, is featured in chapter 6.



Chapter 7 examines the biological aspects and climatic influence on scald and the optimisation of postharvest drenching treatments for scald and rot control. Later chapters cover design features for controlled atmosphere (CA) storage construction and calculation for refrigeration design capacity. Requirements for the effective operation and management of cold storage and CA storage are given, together with strategies for

Availability and price of soybean conference proceedings

A short report on the Proceedings of the Third International Soybean Processing and Utilization Conference appeared in *PH News* 55. Dr Kyoko Saio, chair of the conference organising committee, has now kindly informed us that a few copies of the volume remain available from the publisher:

Korin Publishing Co. Ltd,
4-27-1 Iriya Taitou-ku
Tokyo, Japan 110.

The cost per copy is Yen6000 plus tax and postage. Anyone interested should make direct contact with the publisher. ■

short, medium, and long-term storage of the numerous pome fruit varieties grown in Australia and New Zealand. The book examines contemporary trends, especially the phasing-in of nitrogen generation and automated CA. Chapter 10 gives a practical guide to the storage potential of all popular varieties and includes colour photographs of storage disorders related to incorrect CA conditions.

While this book was written specifically for Australian conditions it includes many examples relating to other production regions including North and South America and Europe. This book is meant for any reader who understands orcharding and simple plant physiology, and is familiar with postharvest handling and storage of pome fruit. For those who want more detail, reading lists are provided.

Preparation and publication of the book, which was edited by John Faragher from the IHD, Knoxfield was financed by Agriculture Victoria, the apple and pear levy, and the Australian Horticultural Research and Development Corporation.

Copies are available from the Australian Apple and Pear Growers' Association for \$A55 (incl. GST) plus \$10 postage within Australia and \$25 overseas. Payment by cash or cheque only. Australian Apple and Pear Growers' Association, 62 O'Connell Street, North Melbourne, Victoria 3051, Australia.

QASAF end-of-project workshop

The three-year QASAF (Quality Assurance Systems for ASEAN Fruits) project was conducted between 1997 and 1999 under the auspices of the ASEAN-Australia Economic Cooperation Program - Phase III. Its goal was to assist in developing consistent and reliable systems for the postharvest handling, minimal processing, and marketing of fresh fruits produced by the ASEAN countries.

The 21 technical papers presented at a QASAF end-of-project workshop held in Singapore in December 2000 have been assembled and published by the Australian Managing Contractor for the project, Palamere Pty Ltd. A few spare copies are available. Anyone interested in obtaining one could contact Palamere at <palamere@compuserve.com>. ■

* Holmes, R. and Little, C. 2000. Storage technology for apples and pears. Knoxfield, Victoria, Department of Natural Resources and Environment, 528 pp.

CURRENT AWARENESS

NEWS

Change to ACIAR arrangements in Indonesia

ACIAR has accepted the resignation of Mr Ronald Rakiman as ACIAR's country manager for Indonesia, with effect from 1 January 2001. Mr Rakiman had been with ACIAR since April 1993. Ms Mirah Nuryati is acting as ACIAR Country Manager for Indonesia until a permanent appointment is made.

XVth International Plant Protection Congress

A first circular for this congress, to be held in Beijing, China in July 2003, has been released. A few items on the program may be of interest to postharvest people. Details can be found at <www.ipmchina.cn.net/ippc> or <www.ipmchina.net>.

Fumigants and pheromones workshop

The 5th Fumigants and Pheromones International Workshop is being held in Thessaloniki, Greece on 20–22 March 2001. Go to <www.insects.limited.com> for details.

1st International Postharvest Horticulture

This conference, with the theme "Quality assurance in marketing of fresh horticultural produce", will be held in the Philippines in October 2001. More information will be provided in the next newsletter.

POSTHARVEST PUBLICATIONS

Recently published FAO Agricultural Services Bulletins

Spices and medicinals as grain protectants

FAO Agricultural Services Bulletin 137 (ISBN 92-5-104294-2) is a comprehensive review by Peter Golob et al. of the UK Natural Resources Institute on "The use of spices and medicinals as bioactive protectants for grains". The chapter headings are: Introduction; Plants as storage pesticides; Alphabetical list of plant species with insecticidal properties (this is the bulk of the work summarising all that is known on each species); Botanical oils as grain protectants; Toxicology of plant materials under consideration; Development and use of spices and medicinals as grain protectants; Bibliography and further reading. The abstract reads as follows:

Opinion now favours a shift away from the reliance on conventional insecticides towards the use of more natural, sustainable methods of protecting crops from insect damage. This bulletin considers alternatives which could be used as storage grain protectants, concentrating particularly on plants which have found other uses as food spices or for medical application.

Over 100 plant species are described in the review. Difficulty arose in defining what classified a

plant as a spice as opposed to a herb or other edible material. All edible plant materials with potential as control agents have been considered to avoid confusion. At the current time, only a few plant species have been sufficiently tested in the laboratory to indicate their potential usefulness as protectants. These are all from the genera *Azadirachta*, *Acorus*, *Chenopodium*, *Eucalyptus*, *Mentha*, *Ocimum*, *Piper*, *Tetradenia* or are traditional vegetable oils.

Research which has been undertaken is described briefly and discussed but it is evident that far more research is required to critically evaluate most of the plants as stored product protectants, particularly with respect to mammalian toxicity and residual action. Very little information exists concerning actual use by farmers of botanical grain protectants, nor has the efficacy of the materials been assessed under real conditions of use on farms.

The situation for *Azadirachta indica* (Neem) is slightly different; commercial formulations of the product have recently been registered for application to horticultural and agricultural crops in the USA. Neem has been extensively studied in several forms against a wide range of storage pests on various commodities, but results from standardised long-term trials are still required. There is no evidence that any other spice or medicinal has been commercialised.

Fermented cereals

FAO Agricultural Services Bulletin 138 (ISBN 92-5-104296-9), by Norman F. Haard et al., gives a global perspective on the history, classification, processing methods, and future potential of fermented cereals. Following an introductory chapter discussing the basic properties of cereal grains and the rationale for fermentation, three chapters cover the topic in Africa, the Asia-Pacific region, and Latin America. The book makes extensive use of flow charts and tables to outline how the various products are made and their nutritional and other characteristics.

Copies of the bulletins can be obtained from Information Division, FAO, Viale delle Terme di Caracalla, 00100 Rome, Italy. [I was unable to track down either of these publications on the FAO web site. Ed.]

More "Current Awareness" on page 11.

ACIAR Postharvest Newsletter

This newsletter is published quarterly in March, June, September, and December by the ACIAR Postharvest Technology Program.

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.



Newsletter Compiler and Editor: Mr E. Highley

Program Manager: Dr G. I. Johnson

ACIAR's address:

GPO Box 1571
Canberra, ACT 2601, Australia.
Phone: (02) [Int'l 61 2] 6217 0500.
Fax: (02) [Int'l 61 2] 6217 0501.
Editorial email: ed@arawang.com.au

Home Page: <http://www.aciar.gov.au>

Mailing list enquiries: Arawang Editorial,
GPO Box 661, Canberra, ACT 2601, Australia.

Fax: (02) [Int'l 61 2] 6257 7808.
Email: kerry@arawang.com.au

ISSN: 10304-8999.