



POSTHARVEST INSTITUTE FOR PERISHABLES

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POSTHARVEST LOSS METHODOLOGY TRIP REPORT

by

Jerry La Gra
Poo-Chow Leong
Robert J. Haggerty

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I. INTRODUCTION

1.0 Frame of Reference

In addressing the problem of reducing postharvest losses of perishables, the Postharvest Institute for Perishables (PIP) and others have concluded that decision makers often lack sufficient information. This can often be attributed to a shortage of personnel trained to collect and evaluate data on postharvest losses. It is usually very costly and time consuming to recruit experts and conduct a scientifically adequate loss assessment in the field. Utilizing human resources already in the field to generate the information, which then could be evaluated by postharvest experts, is a means to expedite postharvest loss assessments. PIP formulated the concept of developing a methodology which will utilize local agents in developing countries, not necessarily experts in postharvest technology, to generate information which would be used to make assessments of postharvest losses and offer ways to reduce losses.

The Association of Southeast Asian Nations Food Handling Bureau (ASEAN FHB or AFHB) has been active for several years in the field of postharvest technology of food handling. AFHB has been involved in postharvest perishable activities in Malaysia, Singapore, Thailand, Indonesia, Brunei and Philippines, setting up a network for activities through its Horticulture Working Group, consisting of participants from each member country. PIP contacted AFHB to investigate possible collaboration for developing a methodology and manual. Mid-level technicians would be used to generate information that specialists would then evaluate to start the postharvest loss identification process. AFHB responded favorably to PIP's inquiry; PIP then contacted the Inter-American Institute for Cooperation on Agriculture (IICA), which agreed to participate by providing the services of an agricultural economist.

PIP organized a team, consisting of Team Leader, Jerry La Gra from IICA, Poo-Chow Leong from AFHB, and Robert Haggerty from PIP. The team visited key locations in the ASEAN region and designed a methodology based on the team members' experience and consideration of information gathered and lessons learned from personnel working in postharvest activities in the ASEAN region. Logistics were worked out by AFHB and PIP. The team travelled to Malaysia,

Singapore, Thailand, Indonesia and the Philippines from August 22, 1986 until September 24, 1986. The itinerary for the team is found in Appendix A.

The team spent the first day of its visit to Malaysia in Kuala Lumpur meeting with and being briefed by Mr. Ray Gonzalez at the offices of the AFHB. Considerable time was spent discussing the approach to the design and content of the "manual" or "guidelines" the team was to produce by the end of the 30 day trip through the ASEAN region. It soon became obvious that the expectations and concept of the "manual" among the team members differed significantly. Over the course of two days, a consensus was reached on the objective of the instrument to be produced and its relation to the PIP program goal of reducing postharvest food losses.

The initial goal for this program was to identify and reduce postharvest losses which are economically significant within an agricultural system. To arrive at this goal, information is needed on postharvest losses and their causes, the agricultural system in which they occur and the economics of the system.

It became apparent, after the project was underway, that the "manual" or "guideline" would offer more potential uses than just the identification and reduction of postharvest losses. By designing a systematic approach to perishable commodity handling processes, it was found that aberrations in the marketing system could be identified. In addition, the manual was found to have the potential for identifying areas requiring research to improve or upgrade the commodity being investigated.

Because of these new developments, the original purpose has been expanded to include a broader range of potential uses than just the assessment of losses.

In order for this information to be properly generated, it was decided that postharvest and economic specialists should plan and generally direct the gathering of information. Mid-level agents will gather the actual information, either through direct observation or solicitation from others. The methodology for the collecting the information will have to be carefully planned, with workshops or training sessions to inform everyone involved about the process.

The result will provide information on a given commodity, in a given geographical region and for a particular production season. The whole agricultural system within which the crop is being evaluated will be described. The information will be collected in a series of data sheets relating to various aspects of the total system. All aspects of the agricultural system that in some way relate to postharvest problems will be described. Each of the data sheets describing individual sectors of the agricultural system will contain the information necessary to evaluate its impact on postharvest losses, including, where appropriate, an estimate of the magnitude of losses. In addition, the potential for identifying market aberrations and research needs are recognized in an expanded use of the manual

1.1 Trip Report

The country visited organizes the trip report, giving a description of each country's institutional organization relevant to postharvest activities in perishable food crops and observations/conclusions reached by the team through visiting these institutions. These visits, observations and conclusions aided the team in designing and writing the draft methodology document.

1.2 Team Members

The methodology design team consisted of three members, each of whom were selected on the basis of their experience as well as discipline of education and profession. The disciplines of greatest importance for the team designing the methodology were identified by PIP to be agricultural economics/marketing, horticulture/plant pathology, and food science and technology. As a result, the following individuals were selected: Mr. Jerry La Gra, Agricultural Marketing Specialist and team leader; Dr. Poo-Chow Leong, Plant Pathologist and Horticulturalist; Mr. Bob Haggerty, Food Scientist.

La Gra has had extensive experience on postharvest loss assessment in the Caribbean, Latin America, Taiwan and other regions. He is currently affiliated with IICA in St. Lucia, West Indies.

Dr. Leong is the former Assistant Director of Agricultural Research in

the government of Singapore's Primary Production Department and former Singapore representative to the Horticulture Working Group of the AFHB. He has had many years experience in the ASEAN region in postharvest technology and marketing. Representing AFHB on this mission, Dr. Leong is now affiliated with Primary Industries Enterprise (Pte) Ltd. in Singapore.

Bob Haggerty has worked in the ASEAN region since 1982, largely in Indonesia, where he developed curriculum and teaching manuals for Food Science and Technology and Human Nutrition at the university level. He now serves as Training Coordinator in the College of Agriculture at the University of Idaho.

Joining the design team in Thailand, Indonesia and Philippines was Dr. Paul Muneta, Food Biochemist. Muneta acted as observer representing the Food Research Center at the University of Idaho. Muneta is serving in a collaborative role for PIP in its activities involving food biochemistry and postharvest handling of root crops.

The design team's selection and formation were accomplished through the cooperative efforts of PIP, AFHB and IICA. Key persons involved were Mr. Harvey Neese, PIP Field Director; Mr. Tom Dechert, Assistant PIP Field Director; and Mr. Ray Gonzalez, Project Officer for AFHB.

1.3 Itinerary and Visits Made

The itinerary and visits made by the design team were organized by Mr. Ray Gonzalez, Project Officer for AFHB in Kuala Lumpur, Malaysia. The institutions and persons visited were selected on the basis of their past and present involvement in postharvest loss reduction efforts coordinated by the AFHB and by actual or potential impact on loss reduction activities in their respective countries.

Institutions visited included various Ministries of Agriculture entities involved in planning, production inputs and practices, and extension. Contacts were also made with postharvest technology support institutions and universities conducting basic, adaptive/applied research. Other visits were made with government agricultural marketing institutions. Finally,

informal talks were held with the private sector including producers, packers, shippers, wholesalers and retailers on the local and regional level.

II. Results

2.1 Malaysia

2.1.1 Institutional Organization

There are basically five institutions involved directly or indirectly with postharvest handling of horticultural crops and marketing in Malaysia. These are:

1. Department of Agriculture (DOA) (under Ministry of Agriculture)
2. Malaysian Agricultural Research and Development Institute (MARDI)
3. Federal Agricultural Marketing Authority (FAMA)
4. University Pertanian Malaysia (UPM) (Agricultural University of Malaysia)
5. Integrated Agricultural Development Programme (IADP)/Malaysian Pineapple Industry Board (MPIB)

Under the Ministry of Agriculture, the DOA is responsible for overall planning for postharvest activities. The DOA charts out the planning, determines priority crops, and provides extension services and technology transfer. In Malaysia, horticultural produce is directed towards both domestic and export markets.

MARDI, under the Ministry of Agriculture, carries out research and development on a wide range of commodities, including fruits and vegetables. Research activities involve postharvest physiology, handling, packaging, chemical treatment, and simulated as well as commercial shipping trials of certain priority commodities, e.g. golden bananas, etc. Food processing and product development research is also conducted by MARDI. UPM conducts more fundamental research than MARDI, and it works with many of the same commodities. Undergraduate instruction is UPM's priority. Both MARDI and UPM are located near Kuala Lumpur in Serdang, Selangor Province.

FAMA is a statutory body under the Ministry of Agriculture, headquartered in Kuala Lumpur. Its main role is to improve the agricultural marketing system by assisting small-scale farmers in marketing their produce. FAMA actually becomes involved in buying and selling, processing (very limited), extension services, price information dissemination, and regulation of commodity grading. Recent activities have been in export market development of golden bananas. FAMA deals directly with a very small percentage of the total produce marketed in Malaysia.

IADP/MPIB, organized under the Ministry of Agriculture, is involved in pineapple production, harvesting, postharvest handling and extension services with both small scale and estate growers in Johor province. The program is located locally in Batu Pahat, West Johor. The majority of the pineapple produced is utilized in local canning operations and ultimately destined for export.

A complete list of persons contacted in Malaysia can be seen in Appendix B.

2.1.2 Conclusions from Visit

It was apparent from the contacts in Malaysia that there is well planned coordination among institutions involved in perishable crops postharvest activities. The presence of the AFHB in Kuala Lumpur facilitates this coordination. The relatively small size of the government bureaucracy also seems to contribute to increased coordination and cooperation among institutions. Government employees are paid adequate salaries in Malaysia, which allows them to dedicate full time to their job. This no doubt facilitates the high level of coordination that was observed. The various institutions, with few exceptions, frequently communicate, either directly or indirectly. Postharvest technology and quality control relatively appear to have a priority position in government planning, especially in certain key export targeted fruit crops such as golden bananas, rambutan, pineapple, mango, papaya, guava, langsung, mangosteen and starfruit. Vegetables of importance include the following crops: cabbage, Chinese cabbage, tomato, capsicum varieties, celery, okra, long bean, green bean, asparagus, and mushrooms.

Personnel in the various institutions are quite capable and, especially in the case of MARDI and FAMA, adequately motivated. The extension service in DOA has a well-structured system that is already set up to transfer technology to the field. To date, extension personnel have been production oriented. DOA administrators indicated interest in improving the postharvest capabilities of extension personnel. Videotaping is often used for in-service training of extension workers in Malaysia and could be a viable means for conducting training in food system analysis to reduce postharvest losses in the future. The AFHB has already produced a videotape concerning postharvest technology of rice.

The institutional research and development activities in Malaysia are shared by MARDI and UPM, both being very capable. However, UPM conducts more basic research, partly because it lacks small-scale food processing facilities (pilot plant). Its main emphasis is on training of students, primarily at the undergraduate level. MARDI conducts applied/adaptive research, often coordinated with FAMA. It appears MARDI needs more qualified technicians for more effective applied research and technology transfer. Indications are that MARDI will soon start providing UPM students with hands-on postharvest pilot plant and laboratory training at its facilities. The benefit for MARDI will be the development of a cadre of qualified graduates to work in adaptive research and technology transfer.

Past projects in postharvest technology, conducted with financial support from the AFHB and the government of Australia, have shown both satisfactory and unsatisfactory results. Malaysia's success in shipping bananas to Japan was due largely to adopting the systems approach, i.e., cooperation among government institutions and the private sector in pre-production planning, production practices, postharvest handling and marketing. The problem now is Malaysia's inability to supply the quality-conscious Japanese market with adequate volume of the desired quality product. Malaysia experienced unsatisfactory results in a scheme to provide cold storage facilities and refrigerated trucks throughout the peninsular region of the country to service the handling and marketing needs of perishable crops producers. In practice, the facilities and equipment are underutilized or are not used at all. Except for those exporting golden bananas to Japan, the producers have little or no

need to use cold storage or packing facilities because of the rapid turnover of produce in market channels. Apparently one needs to look at the whole marketing system in order to determine the actual need for a certain type of facility or course of action. Marketing conditions, prices and returns for producers have more impact on postharvest handling decisions than the availability of cold storage and packing facilities. If cold storage facilities improved returns for the user, then the facilities would be better utilized.

Whether cold storage facilities were used or not, MARDI researchers reported postharvest losses for a wide variety of fruits and vegetables in the peninsular region to range anywhere from 0-100%. They felt that if both technologists and marketing people had a better understanding of the whole food system they were dealing with, together they could devise means to reduce losses.

Institutionally, Malaysia would be an ideal place to test the postharvest loss methodology. MARDI researchers in particular grasp the concept of using a systems approach in efforts to reduce perishable losses. FAMA is prepared to cooperate with MARDI on any effort designed to improve marketing and reduce economic losses of produce. The assessment methodology using a food systems approach could be evaluated expediently in Malaysia. Based on the outcome of the evaluation, appropriate adjustments could be made in the methodology, resulting in a more useful tool.

Perhaps the greatest lesson learned in the visit to Malaysia was that postharvest handling decisions and resultant actions or inactions on the part of handlers is highly responsive to market conditions, i.e., prices, costs, profits.

2.2 Singapore

2.2.1 Institutional Organization

There are two principal institutions in Singapore which are responsible for research and development in agriculture and the marketing and trading of

horticultural produce: Primary Production Department (PPD) and Primary Industries Enterprise Pte. Ltd. (PIE). PPD is responsible for all agricultural activities, including horticultural. PPD, under the jurisdiction of the Ministry of National Development, is responsible for the overall planning of agricultural activities in Singapore. The Agriculture Research Section (ARS) of PPD, which is located at the Sembawang Field Experiment Station (SFES), conducts postharvest research and development in horticultural crops. Research is both basic and applied, dealing in pests and diseases, temperature effects, ripening studies, postharvest physiology and commercial transportation trials. ARS is also responsible for extension services.

PIE is a government owned private company incorporated in 1970. Among its responsibilities in assuring a regular supply of food in Singapore, PIE is involved in the trading of imported fruits and vegetables which come to Singapore from all over the world. PIE handles about 30-40 types of fruits and vegetables. PIE has worked with SFES and AFHB in transportation trials, assisting in analyses of results and the marketing situation. PIE also provides marketing information, export systems information and packaging/quality requirements of traders/importers for the promotion of trade.

A list of persons contacted in Singapore can be seen in Appendix C.

2.2.2 Conclusions from Visits

The situation in Singapore is significantly different from the other ASEAN countries. As a modern and highly commercialized city-state, Singapore is basically an importer and re-exporter of horticultural crops. An exception is some small-scale vegetable production still being carried out on the Island. Because of this, the institutions in Singapore are very aware of and involved in the marketing aspects of the food system, both domestically and internationally. Postharvest concerns are a priority in planning in Singapore. Coordination among PPD, SFES and PIE is strong and fluid. They are all in tune with the needs and realities of the private sector.

The institutional research and development capability of SFES is quite

strong. The postharvest researchers and technicians are highly qualified, and their facility at SFES is well equipped. By necessity, PIE and PPD at SFES take a systems approach to postharvest loss reduction, though SFES is more narrow in its focus. SFES researchers are perhaps more interested in addressing quality losses than quantity losses.

PPD and PIE have been involved in commercial transportation trials in coordination with the AFHB and exporters from other ASEAN countries, funded by AFHB and the government of Australia. They are in a constant state of readiness to work with the ASEAN produce exporting countries in improving their food systems to ensure a steady supply of quality produce for Singapore. Singapore, in cooperation with other ASEAN countries, could be an ideal place to test the methodology in an export market situation.

The private sector is highly involved in postharvest technology and handling, appropriately utilizing the range from low to high technology. The wholesale market at Pasir Panjang provided a lesson in comparison and contrast. The wholesale center is complete with cold storage facilities, consumer/retail packaging and high value, imported produce packed in cardboard cartons. The system works smoothly and profitably. In the same wholesale center, less costly produce from nearby Malaysia is handled in large quantities. Produce moves quickly and efficiently, especially in cardboard cartons. The contrast is found in the transport container used for the Malaysian produce. The containers are the traditionally used bamboo baskets. The question was asked in Malaysia, which supplies a large quantity of good quality, inexpensive produce to Singapore, as to why bamboo baskets are preferred over plastic or cardboard containers. The answer was that the bamboo baskets are inexpensive, sold along with the produce and re-used up to three times. Plastic containers, while reusable, are expensive, and the owner does not want to lose them. The marketing system does not provide a mechanism for recirculating the plastic containers. In the Malaysia-Singapore market, the bamboo baskets work satisfactorily to hold and protect the produce when filled and stacked properly. They are easy to handle and when worn out can easily and cheaply be replaced. Under these circumstances, they are more appropriate than plastic or cardboard containers. Here modern, high technology and intermediate technology functioned side by side, striking an impressive balance.

2.3 Thailand

2.3.1 Institutional Organization

Many institutions are involved in postharvest activities and marketing of horticultural crops in Thailand. They are:

1. Department of Agriculture (DOA) under the Ministry of Agriculture (MOA)
 - a. Plant Pathology and Microbiology Division
 - b. Field Crop Institute
 - c. Horticulture Institute
 - d. Pesticide Research Division
 - e. Agricultural Regulatory Division
 - f. Planning Division
 - g. Agricultural Engineering Division
 - h. Zoology and Entomology Division
2. Department of Agricultural Extension (DOAE) under MOA.
3. National Research Council of Thailand (NRCT) under the Ministry of Science, Technology and Energy (MSTE)
4. Thailand Institute of Scientific and Technological Research (TISTR) under MSTE
5. Kasetsart University, Bangkok
 - a. Department of Horticulture
 - b. Department of Plant Pathology
 - c. Institute of Food Research and Product Development (IFRPD)
6. Chiang Mai University, Chiang Mai
 - a. Department of Horticulture
 - b. Department of Plant Pathology
 - c. Department of Food Science and Technology

7. Ministry of Commerce and Trade

8. Royal Thai Project

Through its various divisions and institutes, the DOA addresses postharvest problems in horticultural produce through basic and applied research in pests and diseases, postharvest physiology, packing house operations, storage techniques, transportation trials, harvesting tools and warehouse design, pesticide residue and postharvest loss assessment.

DOAE is primarily concerned with problems arising at the farm level. Postharvest activities are centered on grains but with a growing emphasis on fruits and vegetables. Postharvest handling techniques are being applied and extended for certain fruits or vegetables of economic importance.

NRCT is the MSTE body responsible for planning, promoting, coordinating, supporting, documenting and disseminating results of research in both natural and social sciences in Thailand. Under NRCT, specific subcommittees are formed to handle specific crops and problems. NRCT is involved in the research and development of important economic crops. For example, NRCT was instrumental in Thailand's successful baby corn production, processing and exporting program, working with research institutions and the private sector. NRCT produced a very professional videotape program describing the baby corn program from production through harvesting, sorting, fresh packing, and canning and then to marketing.

TISTR, through its postharvest technology laboratory, conducts research on postharvest physiology, storage techniques, pests and diseases, maturity index, packaging, standards and grading, commercial treatments and transportation trials.

Kasetsart University conducts basic and applied research in pests and diseases, harvesting methods, postharvest physiology, storage techniques, grading, packaging, loss assessment, food processing and new product development. IFRPD concentrates mostly on protein foods (e.g. soybeans) but is involved in fruit processing under the Royal Thai Project. It also has a

regulatory role for quality control certification of processed foods from the private sector destined for export.

Chiang Mai University conducts research in pests and diseases, postharvest physiology, storage techniques, grading, packaging and food processing.

The Ministry of Commerce and Trade has a service function, providing information and assistance in identifying and developing new markets for horticultural produce.

The Royal Thai Project is a comprehensive program endowed and managed by the Royal Family of Thailand and directed at assisting isolated, hillstrife farmers in northern Thailand to diversify agricultural production. (It is hoped that these people can then become less dependent on opium production.) The crops grown in the hill areas are fruits and vegetables. The project is active in production, postharvest handling, sorting and packaging, transportation, processing and marketing.

A list of persons contacted in Thailand can be seen in Appendix D.

2.3.2 Conclusions from Visits

The institutional framework for alleviating the postharvest loss problems in Thailand is complex and fragmented and is concentrated very much on research rather than on technology transfer. Even among the DOA divisions, institutions tend to work independently of each other in their particular area of postharvest research. In addition to their postharvest work, many institutions/divisions also have responsibilities in crop production. In certain instances, the work of separate institutions tends to overlap.

In an attempt to coordinate the postharvest activities of its divisions, DOA has formed a new technical sub-committee composed of the heads of postharvest sections of the various divisions. "The Committee for the Coordination of Postharvest Researches and Pursuance of Postharvest Technology" will conduct activities to coordinate efforts in research, loss assessment, loss reduction, loss prevention, compilation of records and development/implementation

of training courses. At the DOA, officials are considering the formation of a new postharvest institute which would coordinate efforts and activities among DOA and other outside institutions such as Kasetsart University, and departments from other Ministries: e.g., Transport, Customs and Excise, Export Promotion, etc. The methodological approach designed by the team to generate information on the food system may be a vehicle to increase communication and improve efficiency among institutions.

The human resource capabilities in these institutions are high. Many highly qualified researchers and technicians are working in postharvest activities. All the institutions have strong research and development capabilities or potential. In some cases, such as at Chiang Mai University, capabilities are limited due to a lack of funds or equipment.

The DOAE has a large extension force with postharvest handling techniques now being extended to the farmers. Radio, television and monthly publications are used to provide information to farmers. With some exceptions, as in the successful case of baby corn, it seemed there was a general lack of interest among farmers concerning reduction of postharvest losses of crops because they move rapidly from the farm after harvest and appear to suffer little damage.

This attitude may soon change because there is growing recognition of and interest in horticultural crops with export potential. This recognition and interest rose largely from the recent success of developing a baby corn industry for export. Coordinated by NRCT, a coordinated, interdisciplinary and inter-institutional effort was mounted to meet a perceived export market demand for fresh and canned baby corn. Using a methodical, systems approach in planning, production practices, postharvest handling and marketing, this nationwide program is a success. The proper variety was selected for planting, and optimum spacing of plants and application of fertilizer was determined. Appropriate technology was developed to control quality through sanitation, sizing, grading, fresh packing and canning. Various qualities bring different prices and are destined for different domestic and export markets.

The government has recognized the postharvest area as having an important role in the five-year plan (1987-1991). The crops of greatest importance for their export potential are: mango, longan, mangosteen, pomelo, durian, long beans, baby corn, brassica varieties (spinach var.) and cassava.

There are many projects with donor assistance that touch on postharvest problems. Support for activities come from AFHB/Australia, USAID, Japan, Canada (IDRC), West Germany, Norway, EEC, FAO, UNDP and the Royal Thai Family. USAID is currently funding the Agricultural Technology Transfer Project under the Ministry of Agriculture. Future postharvest loss assessment activities in Thailand could be carried out under this project.

The Project's activities involve the whole food system from pre-production through production, postharvest handling and marketing. It wasn't clear how closely pre-production planning was linked to the intended market for the produce or processed product. The Project is planned to be self-sustaining but will need an undetermined amount of subsidies during the transition period.

The Thai government does not have a marketing body -- similar to FAMA in Malaysia -- but rather leaves this to the private sector. Research and development efforts by some Thai institutions are sometimes coordinated with the private sector. The baby corn project and recent DOA commercial transportation trials to Europe is one example. TISTR's postharvest technology group in particular uses a systems approach to its activities and successfully maintains a link with the private sector in testing and transferring viable technologies with immediate application. Consideration of market conditions and immediate needs of the private sector helps to focus research and ensure a useful result. This is recognized by some postharvest research institutions in Thailand.

There are a large number of small farmers with scarce resources and a few large scale farmers and orchardists in Thailand. The team observed an owner/manager of a large, mixed fruit orchard near Chiang Mai actually conducting in-service training for local extension workers in production and postharvest practices. Obviously these producers are recognized for their knowledge. It was evident in Thailand that farmers will adopt new methods or

technologies when shown and convinced that they are economical.

2.4 Indonesia

2.4.1 Institutional Organization

The great majority of postharvest activities in perishable crops are carried out by two major institutions within the Ministry of Agriculture (MOA). When a university is involved in relevant training or research, activities are also organized under the Ministry of Education and Culture.

The two major institutions under MOA responsible for research and development and extension are:

1. Agency for Agricultural Research and Development (AARD)
2. Directorate General of Food Crops (DGFC)

Provincial agricultural extension services are also involved in postharvest technology.

1. AARD is the umbrella organization for a number of nationwide research institutes, each with a national mandate that specifies commodity and/or agroclimatic area emphasis. Research activities at these institutes include postharvest problems of perishable crops. There are two Research Coordinating Centers under AARD which are responsible for activities in the regional institutes and their sub-stations.

a. The Research Coordinating Center for Horticulture (RCCH), formerly known as Central Research Institute for Horticulture, oversees research activities of the institutes under its jurisdiction. Postharvest research in vegetable crops is carried out at Lembang Research Institute for Horticulture (located in West Java Province) with supporting work carried out at research substations in West Java, East Java, and North Sumatra (in city of Berestagi). Postharvest research in fruits is conducted at Solok Research Institute for Horticulture (located in West Sumatra Province) with supporting work carried out at research substations in East Java (in city of Malang), South Sulawesi and Pasar Minggu (suburban Jakarta).

b. The Research Coordinating Center for Food Crops (RCCFC) oversees research activities under its jurisdiction dealing in secondary crops. Under RCCFC, the Malang Research Institute for Food Crops works with cassava and sweet potatoes as well as other secondary crops.

Research in these institutions deals with various aspects of postharvest handling loss assessment, pests and diseases, quality standards, storage, shelf-life treatments, postharvest physiology, commercial transportation trials, packaging, processing, and new product development. Research often covers preharvest factors which cause postharvest problems, marketing and export studies, and evaluations.

2. DGFC, through its Directorate of Horticulture (DH) and more than 1200 Rural Extension Centers nationwide, provides extension services to producers, of which the vast majority farm 0.6 ha or less. DH, as an intervention agent, attempts to adapt new technologies and methods in postharvest handling of horticultural crops (such as grading and packaging), conducts training, and gives workshops and demonstrations. DH also advises farmers on the optimum harvesting time. DH works with RRCH and RRCFC in commercial transportation trials and loss assessment. Finally, DH attempts to help develop markets for produce. It provides a daily price information service over national radio for markets throughout Sumatra, Java and South Sulawesi. DH also conducts price analysis in support of its market development activities. On the provincial level, the local Provincial Agricultural Services for Food Crops (under MOA) also work in extension, cooperating with the local AARD research institute.

In certain cases universities have worked with AARD in increasing manpower for the research system. These universities have become primary sources for undergraduate and graduate level training of personnel for the research system. Much of the training is done jointly with classroom instruction at the universities combined with thesis research conducted at and funded by AARD research institutes. The primary universities involved are: Institute of Agriculture, Bogor (West Java); Institute of Technology, Bandung (West Java); Gajah Mada University, Yogyakarta (Central Java); and Brawijaya University, Malang (East Java).

The design team visited AARD's RCCH in Jakarta, Horticulture Research Substation in Pasaar Minggu, Lembang Research Institute of Horticulture and the Horticulture Research Substation in Malang.

A list of persons contacted in Indonesia can be seen in Appendix E.

2.4.2 Conclusion from Visits

Coordination among institutions involved in postharvest activities appeared to be good. The highly structured organization of AARD research institutions lends itself well to avoiding overlap and facilitating the flow of communication and research assignments. DH, AARD institutes and provincial agricultural extension services are oriented towards cooperation and coordination of efforts. Most research directives come directly from Jakarta.

Generally speaking, the human resource capabilities of research organizations was high. Everyone visited by the team appeared to be technically competent and motivated, even if not well funded. There is a very large extension service (over 5000 under DGFC alone) with undetermined capabilities down to the grass roots level but with seemingly strong leadership. Quite a number of extension workers were trained under AFHB/Australia support at the Postharvest Horticulture Research and Training Center at the University of the Philippines at Los Banos (UPLB) on postharvest handling techniques. Training courses on postharvest handling techniques have also been conducted in Indonesia for local needs. Some of the researchers who are now involved in postharvest research did postgraduate studies at UPLB. As expressed by the DH leadership, there is still a need for more training courses for mid-level extensionists covering pre and postharvest handling of both perishables and grains/legumes. This need reflects the expectation of increased demand for horticultural produce resulting from new government policies. A project profile for training to be submitted to USAID Jakarta was written with inputs from the DH leadership. (See Appendix F).

Institutional research and development capabilities seemed adequate, though shortage of funds is a problem. Most facilities are adequately equipped to conduct postharvest research. Researchers were observed to be making

significant advances with simple modifications of current practices. Simple physical treatments to protect or assure product quality have been developed in Lembang and Malang. For example, covering apples on the tree with paper to protect them from birds also ensures a desirable color. Twisting heads of cabbage ninety degrees to break the roots causes outer leaves to wither, forming a protective shield for the inner leaves.

There are few donor assisted projects currently in Indonesia impacting on perishables postharvest activities. USAID does have a project underway dealing in development of secondary food crops which may soon begin investigating postharvest activities. In 1983, AFHB sponsored commercial transportation trials from Berestagi, North Sumatra and Lembang, West Java to Singapore that proved very instructive for Indonesia. In the loss assessment conducted during this trial, Indonesian producers, traders and researchers learned the Singapore market's needs and demands for quality. It was concluded that better quality control was needed, a more thorough job of selecting, grading, packaging, and appropriate handling was necessary. Since that time, with the assistance of a West German organization (PASMAKOP) and logistical support of PIE Pte. Ltd., Indonesia now ships produce to Singapore in refrigerated containers utilizing better packaging and improved quality control. Demand and prices have increased. In this project, the Indonesians investigated more of the food system than the postharvest component. They planned, took action and achieved good results. They are hoping to be more successful in exporting other commodities in the future.

The government of Indonesia has established new priorities for increasing domestic production to substitute for currently imported crops and their products. This includes citrus juices, seed potatoes, onions, grapes, apples, and export promotion of tomatoes, potatoes, finger bananas, salak, soursop, mango and chico (sapidilla). The government is also interested in processing produce for export. Both import substitution and export promotion will most likely increase the demand for technical assistance and training in proper pre and postharvest handling of fresh produce. The key point for improvement is at the farm level.

Farm size in Java, and most of Indonesia, averages about 0.6 ha with

0.1-0.3 ha common. This constitutes "backyard" scale production, with insufficient volume for having much flexibility in marketing. Farmers tend not to organize or cooperate in the marketing process. The contract system of selling produce, so often used in this area, is a constraint. Farmers make their harvesting and postharvest handling decisions based on price and immediate cash needs rather than on product quality. The farmers are very cost conscious and tend to minimize their production costs for short-term profit rather than optimizing costs for long-term market development and profits.

Apple producers in East Java are generally larger scale and systems oriented. They seek new postharvest methods, technologies or improved varieties resulting from AARD research which are delivered to them through the DH and provincial agricultural extension services. The producer tends to look after his own marketing which appears to be a constraint in optimizing product quality and maximizing returns.

2.5 Philippines

2.5.1 Institutional Organization

Philippine institutions involved in postharvest research, development, extension and marketing of perishable food crops are organized under the Ministry of Agriculture and Food (MAF), the National Science and Technology Authority (NSTA) and the university system throughout the country. The major institutions and implementing entities are:

A. MAF

1. National Food Authority (NFA)
 - a. Food Development Center (FDC, at the Food Terminal, Inc.)
 - b. Agricultural Processing and Marketing Programme (APMP)
2. Bureau of Plant Industry (BPI)
 - a. Plant Quarantine Section
 - b. Food Processing Section

3. Bureau of Agricultural Extension (BAEX)

4. National Postharvest Institute for Research and Extension (NAPHIRE)

B. NSTA

1. Food and Nutrition Research Institute (FNRI)

2. Philippine Council for Agriculture and Resources Research and Development (PCARRD)

3. Postharvest Horticulture Research and Training Center (PHTRC)

C. Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA), located at the University of Philippines in Los Banos

The National Food Authority (NFA) is the marketing arm of the government dealing with perishable food crops. It has been involved in postharvest handling and marketing of fresh produce on the wholesale and retail level. Under the NFA, the Agricultural Processing and Marketing Programme is attempting to modernize the postharvest and marketing facilities in the food crops sector to reduce losses and improve the quality of fruits and vegetables. It also tries to help producers by its efforts to maintain price stability and availability of fruits and vegetables in the domestic market.

The Food Development Center, under the now defunct Food Terminal Inc., is an industry oriented research organization dealing in postharvest handling of fresh foods, fruits and vegetables, shrimp, fish, etc., quality control of food processing; distribution and storage; product standards development; product and process development; food analysis, sensory evaluation and filth analysis. It serves NFA/FTI, the food industry, cottage food industries, exporters, farmers and fishermen. Much of FDC's work is oriented towards preparation of produce for processing. FDC's new filth analysis laboratory is intended to complement its food analysis capability and is the basis for pending licensing by the U.S. Food and Drug Administration to certify processed foods for export to the United States. FDC is also working with the USFDA in establishing quality standards for Philippine processed food products.

The Bureau of Plant Industry (BPI), under MAF, has three main functions: research, production, and regulation. Much attention is given to production of seeds and planting materials, both for grains and perishable crops. The Plant Quarantine Section (PQS) has a regulatory function under BPI. PQS is involved in private sector imports and exports through certification of plant materials. PQS is involved in developing alternatives to fumigation treatments of fruits and other plant materials. This research and development is concerned with pests and diseases in the laboratory as well as commercial shipping trials. The Food Processing Section (FPS) is charged with conducting research and development in characterization and utilization of food crops. New varieties of commodities or newly developed products are characterized for chemical and nutritional composition, microbiological condition and sensory quality.

The Bureau of Agricultural Extension (BAEX) plays the major role in agricultural extension, concentrating on small farmers and rural women in particular. BAEX has a work force of nearly 8,000 whose work includes production, nutrition, and, most recently, postharvest horticulture.

NAPHIRE is postharvest oriented and deals almost entirely with grains. It is just beginning to become involved with fruits, vegetables, roots and tubers.

The Food and Nutrition Research Institute's (FNRI) main role is that of upgrading nutritional status of the populace, with particular attention to the rural poor. Activities include household and street food vendor food handling and home food processing. FNRI is involved with fruits and vegetables and other food groups.

The Philippine Center for Agriculture and Resource Research and Development (PCARRD) is a national organization playing a key role as a coordinating body for research and development activities to support progress on a continuing basis in crops, livestock, forestry, fisheries, socio-economics, farm resources, and mining. PCARRD is mandated to define goals, purposes and scopes of research and development in agriculture and natural resources. Research and development in food crops, though more production oriented, has given attention to postharvest needs as well. This attention to

perishable commodities will increase as plans are submitted and implemented for the Postharvest Research and Development Program in Food Crops, and the Food and Feed Processing and Utilization Program. Postharvest research and development is actually conducted at the research centers and stations located throughout the country. PCARRD has worked with the Postharvest Horticulture Training and Research Center (PHTRC) and the private sector in postharvest physiology research and commercial transportation trials. PCARRD disseminates research results through printed publications, radio and television.

PHTRC is attached to the University of the Philippines in Los Banos, Laguna. PHTRC is involved in postharvest research, development and training. It works in virtually every aspect of postharvest of perishables. PHTRC serves as a center for postharvest training for the ASEAN region and other countries. PHTRC is involved mostly with fruits and vegetables, though it does carry out work in other perishables. Root crop research and training activities are also conducted at Visayas State College of Agriculture (Baybay, Leyte), Don Mariano Marcos Memorial State University (Bacraton, La Union), Northern Philippine Root Crop Research and Training Center at Benquet State University (La Trinidad, Benquet), Mariano Marcos State University (Batac, Ilocos Norte) and Central Luzon State University (Munoz, Nueva Ecija).

SEARCA is the agricultural component for the Southeast Asian Ministers of Education Organization (SEAMEO), an intergovernmental body to promote cooperation among Southeast Asian countries in education, science and culture. It is located on the campus of the University of the Philippines in Los Banos, Laguna. SEARCA has a graduate study program, research and development, extension and training programs. The research and development programs focus on agricultural and rural development problems besetting the SEAMEO region. One of the programs completed was the Southeast Asia Cooperative Postharvest Research and Development Programme. SEARCA continues to support postharvest concerns by building it into production and extension courses.

A list of persons contacted in the Philippines can be seen in Appendix G.

2.5.2 Conclusions from Visits

Coordination among institutions involved in postharvest work with perishables in the Philippines is somewhat mixed. Current reorganization in the Philippine government has caused some changes in personnel and emphasis of activities in various institutions. Generally speaking, coordination seems to be stronger than cooperation, though there are instances of good coordination and cooperation. Institutionally, the Philippines may be the strongest of the ASEAN countries visited in terms of having an integrated, interdisciplinary approach to addressing postharvest problems in perishable food crops. Pre-production, production, postharvest and marketing factors are all taken into consideration in those institutions that focus on postharvest problems. Human resource capabilities and institutional research and development capabilities are strong. There is a large complement of well-educated, well-trained researchers and technicians working in suitably equipped physical facilities. PHTRC in particular has highly skilled and experienced personnel and appropriately equipped facilities. The biggest constraints to progress in postharvest activities are the serious lack of funding and uncertainty about the short and long term direction of the government.

The presence of large amounts of postharvest activity despite acute funding shortages indicates the relative priority of postharvest concerns in government planning. PCARRD's new postharvest oriented programs show that this should continue for the next few years. Import substitution and export of key commodities are targeted in the new government planning. Crops identified as priorities are: mango, papaya, banana, citrus, avocado, pineapple, tomato, garlic, onion, white potato, cassava, sweet potato and taro.

There are several donor assisted projects just completed or currently underway. PHTRC was, until recently, funded through AFHB/Australia. APMP is funded with the assistance of the Asian Development Bank. To date, this program is not meeting its objectives. Activities have been in limbo since early 1986, and were then behind schedule. The project is due to terminate in 1987. USAID, the UN, and several European donors were and are instrumental in supporting SEARCA. West Germany is providing technical assistance and financing for a project in tree fruit and white potato production and plant

protection. World Bank monies supported establishing BPI's Food Processing Section Laboratory. Japan, through its Japan International Cooperation Agency (JICA), also supports research and development in postharvest treatment of mangoes and papayas for pest and disease control prior to export. USAID and the Philippine government have recently signed an agreement to begin the Accelerated Agricultural Production Project which is designed to rapidly diversify crop production. It is probable that postharvest methods and technology will be addressed under this project.

The joint JICA-BPI effort in pre-export treatment of mango and solo papaya studies has initiated a newly developed method, Vapor Heat Treatment (VHT). This is intended to eliminate fruit flies, their eggs and larvae. This activity is a favorable example demonstrating a systems approach to addressing a postharvest loss problem. There is a demand for Carabao variety of mango in Japan, and the Philippines can now produce it in ample supply. Japan restricts fruit-fly bearing products from entering the country but wants to avoid use of potentially dangerous chemical fumigants. Through cooperative planning, research and commercial transportation trials, BPI, the private sector, and JICA are developing VHT technology to address an immediate need. Solo papaya is being studied as well under this program to meet the demand of the US market.

BPI carried out simulated export trials on behalf of producers and exporters before the VHT technology was finally transferred to and adopted by the private sector. These included studies on mango, papaya and banana.

In the Philippines it appeared that the private sector was receptive to those technologies or methods which would benefit them economically. PHTRC takes advantage of this by tailoring certain research and development to the immediate needs of the private sector. The private sector usually provides funds for this type of research. Consideration of immediate needs and market conditions aids in ensuring focused research efforts that will yield an immediately applicable result. PHTRC and BPI have shown that this approach works in the Philippines.

2.6 General Conclusions and Recommendations

The design team produced a first draft of a document entitled Identification of and Solutions for Postharvest Losses, A Systems Approach. The draft of the manual is under revision currently and will be scrutinized by members of the AFHB Horticulture Working Group by the end of October 1986. It can be concluded that the design team met the terms of reference assigned by PIP. Below are a few other conclusions and recommendations concerning the effort of the design team:

1. The team was able to complete the program as planned. In some cases the team had too little time for meetings; in others, too much. A criticism of the study was that there were too many scheduled meetings in relation to the time available to digest what came out of the meetings. In most instances, the meetings were well coordinated by the ASEAN Food Handling Bureau.
2. The team was impressed with the attention that governments and institutions are giving postharvest activities. A considerable amount of resources are dedicated to this area. The impact they are having is not clear at this time.
3. In some meetings, the team received only favorable comments concerning the objective of developing a manual which would serve as a guide for mid-level technicians in analyzing the food system to identify where losses occur, along with the causes.
4. Although it is still too soon to tell whether this "manual" will lead to reduction in losses, at the minimum it will be a useful tool in training mid-level technicians to take a systems approach to problem solution.
5. There is enough interest in any of the countries visited to initiate a test of the "manual." However, a test should be undertaken where competent technicians exist, resources are available, there is professional interest in undertaking the effort, and coordination and follow-up can be provided. Given these criteria, it would seem that Malaysia represents the best location for a

field test in the near future.

6. While in Indonesia, the team wrote a rough draft project profile for in-service training of Indonesian extension agents in pre and postharvest handling of agricultural produce (see Appendix G), which appears to have some possibility for implementation. Personnel at the Directorate of Horticulture Development in Pasar Minggu provided the team with information that would permit the preparation of a more complete profile if there is demonstrated interest in following up on this idea. This type of project should have a permanent staff member providing technical assistance, coordination and follow-up.

7. There is interest on the part of AFHB to conduct a combined AFHB/PIP workshop on how to use the methodology. The target group would be five or so persons from each ASEAN country responsible for coordinating this activity in their respective countries and will use the format to generate information in a food system analysis addressing postharvest loss problems. It would be appropriate, for sake of continuity, if the members of the design team were involved in conducting this workshop. The timing of such a workshop should be after the AFHB Horticulture Working Group has its next meeting in February 1987. This will allow enough time for participants from the ASEAN countries to be selected and become familiar with the manual, and for logistics and planning to be worked out by AFHB and PIP. The proposed dates for such a workshop are March 9-13, 1987. The site for the workshop should be Kuala Lumpur, Malaysia or Singapore.

APPENDICES

APPENDIX A
ITINERARY FOR TEAM

MALAYSIA

25 August (Monday)

0900 - 1600 hrs Meeting at AFHB office

26 August (Tuesday)

0800 - 0900 hrs Travel time from KL to Serdang
0900 - 1300 hrs Meeting with Abdullah Hassan and Salleh Punan
(MARDI research officers)
1300 - 1400 hrs Lunch break
1400 - 1500 hrs Meeting with Dr. Mary Ann Augustin (UPM)
1500 - 1600 hrs Meeting with Dr. Siti Hajar Ahmad (UPM)

27 August (Wednesday)

0830 - 0900 hrs Travel time from hotel to FAMA office
0900 - 1200 hrs Meeting with FAMA staff and private sector
1200 - 1400 hrs Lunch break
1400 - 1600 hrs Meeting with extension workers of the Department of
Agriculture

28 August (Thursday)

0730 - 1100 hrs Travel time from KL to Tangkak, Johore (check-out from
Merlin, KL)
1100 - 1300 hrs Meeting with FAMA personnel involved in procurement
and marketing of horticulture produce
1300 - 1400 hrs Lunch break
1400 - 1700 hrs Travel time from Tangkak to Johore Bahru Check-in at Merlin Hotel, Johore
Bahru

29 August (Friday)

0830 - 1000 hrs Travel time from Johore Bahru to IADP office
(check-out from Merlin Hotel, Johore Bahru)
1000 - 1300 hrs Meeting with extension workers of IADP, Johore and the
Malaysian Pineapple Industry Board
1300 - 1400 hrs Lunch break
1400 - 1600 hrs Travel to Singapore
Check-in at Lady Hill Hotel, Singapore

SINGAPORE

30 August (Saturday)

0800 - 0830 hrs Travel time from hotel to Sembawang
0830 - 1000 hrs Meeting with Mr. Lee Song Khuen (PPD)

31 August (Sunday)

1255 - 1405 hrs Singapore/Bangkok (TH 404)
Check-in at New Imperial Hotel

THAILAND

1 September (Monday)

0830 - 0900 hrs Travel from hotel to Bangkok
0900 - 1000 hrs Dr. Somalee
Institute of Food Research & Product Development
1030 - 1200 hrs Dr. Samsiri
Dept of Plant Pathology, Kasetsart University
1200 - 1400 hrs Lunch break
1400 - 1600 hrs Horticulture Research Institute
(Mrs. Jarupan/Mr. Banchong)

2 September (Tuesday)

0830 - 0900 hrs Travel time from hotel to Bangkok
(whole day) Department of Extension
Mr. Somchai (Chief, Fruit Section)
Mrs. Ampa (Chief, Vegetable Section)

3 September (Wednesday)

0800 - 0845 hrs USAID/Doug Clark/AG Section/ADO
0830 - 0900 hrs Travel time from hotel to TISTR
0900 - 1200 hrs Thailand Institute for Scientific and Technological
Research
1200 - 1400 hrs Lunch break
1400 - 1700 hrs Mrs. Dara
Division of Plant Pathology, Dept of Agriculture

4 September (Thursday)

0600 - 0630 hrs Check-out from hotel
Travel time from hotel to domestic airport
0730 - 0830 hrs Bangkok/Chiangmai (TH 100)
(Picked up at airport by Dr. Danai)
0830 - 0900 hrs Travel with personnel from Chiangmai University
0900 - afternoon Meeting with personnel from Chiangmai University and the Royal Thai project

5 September (Friday)

0900 hrs Private fruit growers
1300 hrs Extension workers
1600 hrs (Schedule prepared by Dr. Danai)
1750 - 1850 hrs Chiangmai/Bangkok (TH 107)

6 September (Saturday)

Open Day

7 September (Sunday)

1140 - 1620 hrs Bangkok/Jakarta (TG 413)

INDONESIA

8 September (Monday)

0800 - 0900 hrs Travel time from hotel to Pasar Minggu
0900 (whole day) Meeting at the Central Research Institute for
Horticulture, Agency for Agricultural Research and
Development
Office of Mrs. Laksmi

9 September (Tuesday)

0800 - 0900 hrs Travel time from hotel to Pasar Minggu
0900 (whole day) Meeting with extension personnel
Office of Dr. Abu Haerah
Directorate for Horticulture Development
Directorate General of Food Crops Agriculture

10 September (Wednesday)

0730 - 0805 hrs Jakarta/Bandung (GA 400)
Meeting at Lembang Research Institute, AARD

11 September (Thursday)

Morning
1200 - 1300 hrs Meeting with provincial agriculturists
Bandung/Surabaya (GA 602)
Meeting with provincial agriculturists
(Contact Mr. Effrendi Salam)

12 September (Friday)

Travel to Malang
Meeting at Malang Research Station

13 September (Saturday)

1500 - 1705 hrs Malang/Jakarta (MZ 359)

14 September (Sunday)

1445 - 1715 hrs Jakarta/Singapore (SQ 205)
Overnight in Singapore

15 September (Monday)

1100 - 1415 hrs Singapore/Manila (SQ 082)

PHILIPPINES

16 September (Tuesday)

0800 - 0830 hrs Travel time from hotel to BPI office
0830 - 1000 hrs Meeting with personnel of the Bureau of Plant Industry
1000 - 1030 hrs Travel time from BPI office to APM-NFA office
1030 - 1200 hrs Meeting with personnel of the APM-NFA
1200 - 1400 hrs Lunch break and travel to the Bureau of Agricultural
Extension office
1400 - 1700 hrs Meeting with extension personnel of BAEX

17 September (Wednesday)

0830 - 0900 hrs Travel time from hotel to FTI
0900 - 1200 hrs Meeting with FTI staff
1200 - 1400 hrs Lunch break and travel to FNRI
1400 - 1700 hrs Meeting with FNRI personnel

18 September (Thursday)

0800 - 1000 hrs Transfer from Silahis Hotel to SEARCA guest house
(about 1 1/2 hours drive from Silahis to SEARCA)
1030 - 1200 hrs Meeting with SEARCA personnel
1200 - 1400 hrs Lunch break
1400 - 1700 hrs Meeting with PCARRD personnel

19 September (Friday)

Morning SEARCA - finalizing manual
1400 - 1700 hrs Meeting with PHTRC personnel

20 - 23 September (Saturday - Tuesday)

SEARCA - finalizing manual

APPENDIX B

Persons Contacted in Malaysia

1. Mr. Abdullah
West Johor Project, Integrated Agricultural Development Program
Ministry of Agriculture
Batu Pahat, Johore
Tel 07-224422
2. Mr. C.H. Tang, Extension Director
West Johor Project, Integrated Agricultural Development Program
Ministry of Agriculture
Batu Pahat, Johore
Tel 07-224422
3. Mr. Nasir
West Johor Project, Integrated Agricultural Development Program
Ministry of Agriculture
Batu Pahat, Johore
Tel 07-224422
4. Mr. Ahmad, Assistant Director
Agricultural Extension Services
Department of Agriculture
Kuala Lumpur, Malaysia
5. Dr. Anwar Hasan, Director of Veterinary Services
ASEAN Food Handling Bureau Sub-Committee on Food Handling, Ranking Member
Department of Agriculture
Kuala Lumpur, Malaysia
6. Mr. Ghafar, Standing Member
Sub-Committee on Food Handling
Department of Agriculture
Kuala Lumpur, Malaysia
7. Dr. Mohamed Yusoff Bin Mohd Noor
Project Officer ASEAN Food Handling Bureau
Level 5 F13 and 14
Damansara Town Centre 50490
Kuala Lumpur, Malaysia
Tel 2551088, 254.4199
TLX: MA31555 AFHBKL
8. Mr. Ray T. Gonzalez, Project Officer, ASEAN Food Handling Bureau
Level 5, F13 and 14
Damansara Town Centre 50490
Kuala Lumpur, Malaysia
Tel 2551088, 254.4199
TLX: MA31555 AFHBKL
9. Mr. Mat Nayan Hj. Abdullah
Federal Agricultural Marketing Authority
Tingkat 5,
Bangunan Kuwasa,
Jalan Raja Laut,
50350 Kuala Lumpur,
Malaysia
CABLE: PEMASARAN MALAYSIA
TELEX: FAMA MA 31669
TEL: 2932622

10. Mr. Low Wan Kim, Marketing Director
Federal Agricultural Marketing Authority
5,6,7 & 8 Floors,
Kuasa Building,
Jalan Raja Laut,
50350 Kuala Lumpur,
Malaysia
CABLE: PEMASARAN MALAYSIA
TELEX: FAMA MA 31769
TEL: 2932622
11. Mr. Mustapha, Statistician
Federal Agricultural Marketing Authority
5,6,7 & 8 Floors
Kuasa Building
Jalan Raja Laut
50350 Kuala Lumpur,
Malaysia
CABLE: PEMASARAN MALAYSIA
TELEX: FAMA MA 31769
TEL: 2932622
12. Mr. Abdul Shukor Bin Abd Wahman, Research Officer
Malaysian Agricultural Research and Development Institute
Food Technology Division Serdang, Selangor
P.O. Box 12301, GPO
50774 Kuala Lumpur
Malaysia
Tel: 9486401/2/3, Telex: MA 37115, Cable: MARDI
13. Mr. Abdullah Bin Hassan, Senior Research Officer
Malaysian Agricultural Research and Development Institute
Food Technology Division Serdang, Selangor
P.O. Box 12301, GPO
50774 Kuala Lumpur
Malaysia
Tel: 9486401/2/3, Telex: MA 37115, Cable: MARDI
14. Mr. Salleh Punan, Research Officer
Malaysian Agricultural Research and Development Institute
Food Technology Division Serdang, Selangor
P.O. Box 12301, GPO
50774 Kuala Lumpur
Malaysia
Tel: 9486401/2/3, Telex: MA 37115, Cable: MARDI
15. Mary Ann Augustin, Instructor
Faculty of Food Science and Technology
University of Agriculture Malaysia
Serdang, Selangor
16. Dr. Siti Hajar Ahmad, Faculty of Agriculture
Horticulture Department
University Pertanian Malaysia
Serdang, Selangor
Malaysia

APPENDIX C

Persons Contacted in Singapore

1. P.C. Leong
Manager, Project and Development
Primary Industries Enterprises (PTE) Pte. LTD
51B, Jalan Buroh, Jurong
Singapore 2261
Tel: 2657700 (6 lines)
Tlx: PIESIN RS 23936
Cable: PRI MEPRISE
2. Mr. Lee Song Khuen (Singapore representative to AFHB Horticulture Working Group)
Assistant Director, Agriculture Research
Primary Production Department
Agriculture Division
Sembawang Field Experiment Station
17 km Sembawang Road, Singapore 2776
Tel: 2570421 Ext 321
Tlx: PPD RS 28851
Cable: AGRIVET
3. Ms. Yik Choi Pheng, Nematologist
Primary Production Department
Agriculture Division
Sembawang Field Experiment Station
17 km Sembawang Road, Singapore 2776
Tel: 2570421 Ext 321
Tlx: PPD RS 28851
Cable: AGRIVET

APPENDIX D

Persons Visited in Thailand

1. Dr. Saipin Maneeapun, Food Technologist, Deputy Director
Institute of Food Research & Product Development
Kasetsart University
P.O. Box 4-170
Bangkok 10400 Thailand
Tel: 5790572, 5795551, 5790113 Ext 253
2. Dr. Choopol Swasdyakorn, Secretary General
National Research Council of Thailand
Bangkhen, Bangkok Thailand
Tel: 579-2280, 579-0118
3. Mrs. Ampar Tantisira
Vegetable Sub-Division/Crop Promotion Division
Agricultural Extension Department
Bangkhen, Bangkok, Thailand 10900
Tel: 5790121-8
5793797
4. Mr. Montri Wongrakpanich
Fruit Tree Sub-Division/Crop Promotion Division
Department of Agricultural Extension
Bangkhen, Bangkok, Thailand 10900
Tel: 579-3804
5. Dr. Prasartporn Smitamana, Associate Dean, Faculty of Agriculture
Assistant Professor, Department of Plant Pathology
Chiang Mai University
50002 Chiang Mai, Thailand
Tel: 221 699 Ext 215
6. Mr. Sombat Srichuwong, Assistant Professor
Plant Pathology Department
Chiang Mai University
5002 Chiang Mai, Thailand
Tel. 221699-215, 221091-203
7. Ms. Ratana Attabhanyo, Head, Department of Food Science and Technology
Faculty of Agriculture
Chiang Mai University
5002 Chiang Mai, Thailand
8. Douglas Clark, Agricultural Development Officer
USAID, Bangkok, Thailand
9. Robert A. Ralston, Projects Division
Office of Permanent Secretary
Ministry of Agriculture & Crops
Rajadamnern Ave.
Bangkok, Thailand
Tel: 2810648
2815955 Ext 228
Home: Thakal Sook Apt 9
115 Soi Ranong (DUST)
Bangkok 103000
Tel: 241-0150
10. Ms. Walapa, Head, Postharvest Group
Director, Plant Pathology & Microbiology
Department of Agriculture
Bangkhen, Bangkok 10900
Thailand
Tel: 5794111

11. Ms. Supah, Research Officer
Department of Agriculture
Bangkhen, Bangkok 10900
Thailand
Tel: 5794111
12. Ms. Rawami, Research Officer
Department of Agriculture
Bangkhen, Bangkok 10900
Thailand
Tel: 5794111
13. Mr. Prapat Sittisanka, Orchardist, Packer & Shipper
rural Chiang Mai, Thailand
14. Prince Bhisadej Rachanee, Royal Project
Chiang Mai, Thailand
15. Dr. Ampol Senanarong, Member, ASEAN Sub-Committee on Food Handling
Deputy Director General
Department of Agriculture
Bangkhen, Bangkok 10900
Thailand
Tel: 579081, 5790151-8, 5790581
Telex: 86-84478 INTERAG TH
16. Dr. Danai Boonyakiat, Lecturer
(Consultant to the Royal Thai Project)
Department of Horticulture
Faculty of Agriculture
Chiang Mai University
Chiang Mai 50002
Thailand
Tel: 221699 Ext 115
17. Ms. Bulan Phithakpol
Institute of Food Research and Product Development
Kasetsart University
P.C. Box 4 - 170
Bangkok 10400, Thailand
Tel: 5790572/5790592
18. Dr. Sumalee Tansiriyakul
Institute of Food Research and Product Development
Kasetsart University
P.O. Box 4 - 170
Bangkok 10400, Thailand
Tel: 5790572/5790592
19. Mrs. Dara Buangsuwon, Assistant Director
Division of Plant Pathology & Microbiology
Department of Agriculture
Bangkhen, Bangkok 10900
Thailand
Tel: 5794111
20. Mrs. Sing Ching Tongdee, Acting Head
Postharvest Technology Laboratory
Thailand Institute of Scientific & Technological Research
Bangkhen, Bangkok 10900
Thailand
Tel: 5791121
21. Dr. Suraphong Kosiyachinda, Lecturer
Department of Horticulture
Faculty of Agriculture
Kasetsart University
Bangkhen, Bangkok 10903
Thailand
Tel: 5791591
Telex: c/o Telex of Dr. Ampol Senanarong, 86-84478 INTERAG TH

APPENDIX E

Persons Contacted in Indonesia

1. Mr. Moestari, Extension Officer, Horticulture Division
Agriculture Services for Food Crops
East Java Province
Jalan A. Yani 152
Surabaya, East Java
Indonesia
Tel: 815107-08-09 ext 28
2. Mr. Effendi Salam
Regional Office
Agricultural Services
East Java Province
Jalan A. Yani 152
Surabaya, East Java
Indonesia
3. Mrs. Anggaruati Winarno, Head, Postharvest Section
Malang Horticulture Research Substation,
Agency for Agricultural Research and Development
Jalan Wiles No. 10
Malang, East Java
Indonesia
Tel: (341) 24422
4. Mr. Roesmiyanto, Research Officer
Malang Horticulture Research Substation
Agency for Agricultural Research and Development
Jalan Wiles No. 10
Malang, East Java
Indonesia
5. Mrs. Nur Imah, Research Officer
Malang Horticulture Research Station
Agency for Agricultural Research and Development
Jalan Wiles No. 10
Malang, East Java
Indonesia
6. Mr. Ari Supriyanto, Researcher
Malang Horticulture Research Substation
Agency for Agricultural Research and Development
Jalan Wiles No. 10
Malang, East Java
Indonesia
7. Mr. Cholil, Researcher
Malang Horticulture Research Substation
Agency for Agricultural Research and Development
Jalan Wiles No. 10
Malang, East Java
Indonesia
8. Mr. Herbagiyandono, Staff Researcher
Postharvest Technology of Horticulture
Lembang Horticulture Research Institute, AARD
Jl. Tangkubanprahu 517
Lembang, Bandung, 40391
Indonesia
Tel: 6025
9. Joanne Hale
Agriculture Section
Project Manager, Secondary Crops Project
USAID/Jakarta
Jl. Medan Merdeka Selatan 3
Jakarta, Indonesia
10. Cameron Bonner, Head, Education and Human Resources
USAID/Jakarta
Jl. Medan Merdeka Selatan 3
Jakarta, Indonesia

11. Dr. Abu Haerah, Director, Directorate of Horticulture Development
Directorate General of Food Crops
Ministry of Agriculture
Jalan Ragunan No. 19, Pasar Minggu
Jakarta Selatan, Indonesia
Tel. 782760, 782370, 781768
12. Drs. Mulyoto, Head, Postharvest Technology
Directorate for Horticulture Product Development
Directorate General of Food Crops Agriculture
Jl. Ragunan No. 19
Pasar Minggu, Jakarta 12520
Indonesia
Tel: 782570, 781768
13. Mr. H. Siregar, Market Specialist
Directorate for Horticulture Production Development
Directorate General of Food Crops Agriculture
Jl. Ragunan No. 19, Pasar Minggu
Jakarta Selatan 12520, Indonesia
14. Dr. Subijanto, Director
Central Research Institute for Horticulture
Agency for Agricultural Research and Development
Ministry of Agriculture
Jalan Ragunan No. 19, Pasar Minggu
Jakarta Selatan, Indonesia
Tel. 781135 (office) 26761 (Residence in Bogor)
Telex: c/o Mr Husin Anang 44246 or 44332 DEPTANJKT IA
15. Dr. Syaifullah, Research Officer, Postharvest
Central Research Institute for Horticulture
Agency for Agricultural Research and Development
Jl Ragunan No. 19, Pasar Minggu
Jakarta Selatan, Indonesia
16. Dr Soedibyo, Research Officer
Central Research Institute for Horticulture
Agency for Agricultural Research and Development
Jl. Ragunan No. 19, Pasar Minggu
Jakarta Selatan, Indonesia
17. Mrs Laksmi, Researcher
Central Research Institute for Horticulture
Agency for Agricultural Research and Development
Jl. Ragunan No.19, Pasar Minggu
Jakarta Selatan, Indonesia
Tel: 781135 (office) 26761 (Residence in Bogor)
Telex: c/o Husin Anang 44246 or 44332 DEPTANJKT IA
18. Mr. Sabari Sosrodihardjo, Researcher
Research Substation for Horticulture
Agency for Agricultural Research and Development
Jl. Ragunan No. 19, Pasar Minggu
Jakarta Selatan, Indonesia
19. Dr. Azis Asandhi Azirin, Director
Lembang Horticultural Research Institute
Agency for Agricultural Research and Development
P.O. Box 587
Bandung, West Java
Indonesia
Tel: Lembang 9 (Office) Lembang 99 (Home)
20. Mr. Kasiadi
Malang Horticulture Research Substation
Agency for Agricultural Research and Development
Jalan Wiles No. 10
Malang, East Java
Indonesia
Tel: (341) 24422

APPENDIX F

PROFILE 1: INDONESIA

Project Title: IN-SERVICE TRAINING OF EXTENSION AGENTS IN PRE AND POSTHARVEST HANDLING OF AGRICULTURAL PRODUCE

Justification: The Ministry of Agriculture of Indonesia has a total staff of approximately 5,000 persons directly associated with agricultural extension activities. Up until 1983 the extension agents worked directly with farmers only on production related activities. As a result of these activities, agricultural production has increased and Indonesia has become self-sufficient in rice production. Increased rice production has placed new pressures on the postharvest system and thusly the demand for extension agents trained in postharvest handling of both grains/legumes and perishables. Additionally, the government has established new priorities which include import substitution of horticultural crops, e.g. citrus juices, seed potatoes, onion, grapes, apples, and the export promotion of crops such as tomatoes, potatoes, finger bananas, soursop, mango, and chico. Both import substitution and export promotion will increase the demand for technical assistance in proper pre and postharvest handling of fresh horticultural produce. One of the key points for improved pre and postharvest handling of fresh produce is at the farm level.

Objectives: The general objective of this proposed project is to provide extension agents with the minimum training they need to advise farmers in the proper pre and postharvest handling of their agricultural produce.

The specific objectives are the following:

- 1) Develop a training manual which will allow extension agents to identify priority pre and postharvest problems.
- 2) Provide in-service training for 10-15 extension agents at the PSL level and 10-15 extension agents at the PSM level.
- 3) Conduct field trials to identify and prioritize pre and postharvest problems of small farmers in a sub-district and propose various alternative solutions.

Strategy: The strategy to be used in the execution of this project is the following:

- 1) The manual "Identification of Causes and Solutions for Postharvest Losses" prepared by IICA/PIP/ASEAN FHB will be translated from English and adapted into Indonesian.
- 2) One extension sub-district will be selected and the local extension agents will be trained in the use of the manual and in the basic concepts of postharvest handling of horticultural crops.

- 3) Under the guidance of supervisors already trained and experienced in the use of the manual, each of the extension agents will be designated one crop for study and will have a fixed length of time to generate the data as outlined in the manual.
- 4) The results of the research on pre and postharvest constraints of the particular crop studied will be presented in one or more technical workshops held within the region.
- 5) A planning committee will evaluate the results of the research in an attempt to identify priority constraints and to identify and formulate project ideas to eliminate the constraints.
- 6) Project ideas will be summarized in the form of project profiles and submitted to decision makers for evaluating the feasibility of formulating and implementing the final project.
- 7) The results of the first phase of the Project will be evaluated to determine whether they are satisfactory and whether the project should move into the second phase.
- 8) If determined feasible, the same basic strategy will be executed in the remaining sub-districts.

Project components:

- 1) Manual translation: The manual would be translated into Indonesian by an Indonesian expert in the area of pre and postharvest.
- 2) Formal training: Short term consultants would be required to provide the initial training in food systems and the use of the manual.
- 3) In-service training: During the collection of the field data expenses will be incurred by the extension and postharvest specialists. These will be mainly for materials, transportation, per diem, etc.
- 4) Workshops: A series of workshops will be held to analyze and evaluate the results of the in-service (field trials) training/research. Costs will include materials, travel expenses, specialized consultants and others.

Duration: The project will be divided into two phases: The first phase will last six months and the second phase will have a duration of 18 months. Note: The first phase will be evaluated for any improvements or innovations which will be integrated prior to the next phase.

Costs: Project costs will consist of approximately six months of short term technical assistance, travel expenses for international experts and the operational costs as outlined above.

Source of funding and technical assistance: To be determined.

APPENDIX G

Persons Contacted in the Philippines

1. Mrs. Rasabel A. Roncal, Assistant Director
Food Development Center
National Food Authority/Food Terminal, Inc.
Bicutan, Taguig
Metro Manila, Philippines
Tel: 828-0076, 828-0077
Tlx: 45684 FTI PN
2. Mrs. Felinda Macasaet, Section Chief-Standards
Food Development Center
National Food Authority/Food Terminal, Inc.
Bicutan, Taguig
Metro Manila, Philippines
Tel: 828-0076, 828-0077
Tlx: 45684 FTI PN
3. Mrs. Estelita M. Payuma
Nutrition Foods Processing Research Program
Food & Nutrition Research Institute
Pedro Gil St.
Manila, Philippines
Tel: 580707
4. Ms. Cecile Castro
Food Management Research Program
Food & Nutrition Research Institute
Pedro Gil St.
Manila, Philippines
Tel: 580707
5. Dr. Dely P. Gapasin, Deputy Executive Director for Research
Philippine Council for Agriculture and Resources Research and Development
(PCARRD)
Los Banos, Laguna
Philippines
 - a. Manila Liaison Office
Miramar House, Airport Rd
Pasay City
Tel: 8323-773/337
Cable: AGRESPHIL
 - b. Los Banos Secretariat
Tel: 50015-19
Tlx: 40860 PARRS PM
Res: RCARRD Housing
Los Banos, Laguna
Philippines
6. Dr. Crisanto R. Escano, Director, Crops Research Department
Philippine Council for Agriculture and Resources Research and Development
Los Banos, Laguna, Philippines
 - a. Manila Liaison Office
Miramar House, Airport Rd.
Pasay City
Tel: 8323-773/337
Cable: AGRESPHIL
Tlx: 40860 PARRS PM
 - b. Los Banos Secretariat
Tel: 50015-19
Res: PCARRD Housing
Los Banos, Laguna
7. Richard Juanilio, Science Research Specialist II
Philippine Council for Agriculture and Resources Research and Development
Los Banos, Laguna, Philippines

8. Joselito Payot, Science Research Specialist
Crops Research Department
Philippine Council for Agriculture and Resources Research and Development
Los Banos, Laguna, Philippines
9. Lolita N. Ragur, Assistant Director
Crop Research Department
Philippine Council for Agriculture and Resources Research and Development
Los Banos, Laguna, Philippines
10. Mrs. Flordeliz D. Tramzen, Commodity Specialist for Vegetables
Crops Research Department
Philippine Council for Agriculture and Resources Research and Development
Los Banos, Laguna, Philippines
11. Dr. Eufemia T. Rasco, Jr., Team Leader, Vegetables
Institute of Plant Breeding
University of Philippines at Los Banos
College, Laguna 3720 Philippines
Tel: 2298, 3304, 3305
12. Leo Basco, Project Officer
National Food Authority
101 Matimyas Building
E. Rodriguaz Sr., Avenue
Quezon City
Tel: 62-23-57, 61-96-46-49
Loc. 289
13. Eleno A. Magno, Jr., Project Manager
Agroprocessing & Marketing Project Directorate
101 Matimagas Building
E. Rodriguiz Sr., Avenue
Quezon City, Manila, Philippines
Tel: 62-23-57, 61-96-46-49
Loc. 289
14. Dr. David G. Cummins, Agriculture Research Advisor
Agriculture Development Division
Office of Rural & Agriculture Development
USAID/Manila

Office: Ramon Magsaysay Center
1680 Roxas Blvd., Manila
Tel: 521-71-166 Loc. 2424/2439
521-5254

International Address: USAID/MANILA
APO San Francisco, CA 96528

Residence: 31 Homonkon Street
Magallanes Village
Makati, Metro Manila
Tel: 833-51-54
15. Ms. Presilla Rubio, Project Officer
Agriculture Development Division
Office of Rural & Agriculture Development
USAID/Manila
Ramon Magsaysay Center
1680 Roxas Blvd., Manila
Tel: 521-71-166 Loc. 2424/2439, 521-5254
16. Dr. Emiliana Bernardo, Director
Philippine Root Crop Research & Training Centre
Visayas State College of Agriculture
Baybay, Leyte, Philippines
17. Dr. Fernando Bernardo, Director, SEARCA
Southeast Asian Regional Center for Graduate Study and Research in
Agriculture
University of Philippines at Los Banos
Los Banos, Laguna, Philippines

18. Dr. Ernesto Pantastico
c/o Postharvest Horticulture Training and Research Center (PHTRC)
University of Philippines at Los Banos
Los Banos, Laguna, Philippines
19. Dr. Cesar Jesena, Assistant Director
Southeast Asian Regional Center for Graduate Study and Research in
Agriculture (SEARCA)
College, Laguna 3720
Tel: 2317, 2290, 2477
Telex: (ITT) 40904 SEARCA PM
20. Ms. Lydia C. Crisostono, Chief, Laboratory Services Division
Bureau of Plant Industry
San Andres, Malate
Metro Manila
Tel: 50-07-08 (office), 695-1756 (residence)
21. Dr. Ofelia K. Bautista
Postharvest Horticulture Training and Research Center
Department of Horticulture
University of the Philippines at Los Banos
College, Laguna 3720
Tel: 3259, 2444
Telex: 2435 UPLBPU
22. Dr. Ma Concepcion Lizada
Postharvest Horticulture Training and Research Center
Department of Horticulture
University of the Philippines at Los Banos
College, Laguna 3720
Tel: 3259, 2444
Telex: 2435 UPLBPU
23. Ms. Corazon F. Azucena, Training Specialist/Extension Coordinator
Postharvest Horticulture Training and Research Center
Department of Horticulture
University of the Philippines at Los Banos
College, Laguna 3720
Tel: 3259, 2444
Telex: 2435 UPLBPU
24. Ms. Rufina R. Ancheta, Chief Home Economics Programs Division
Bureau of Agriculture Extension
Ministry of Agriculture & Food
Quezon City, Manila, Philippines
25. Mr. Resma, Chief, Agriculture Programs Division
Bureau of Agriculture Extension
Ministry of Agriculture & Food
Quezon City, Manila, Philippines
26. Dr. Lourdes Tupas, Home Economics Extension Specialist
Bureau of Agriculture Extension
Ministry of Agriculture and Food
Quezon City, Manila, Philippines
27. Mr. Emiliano P. Gianzon, Director, Bureau of Plant Industry
San Andres, Malate
Metro Manila, Philippines
28. Mr. Merino
Plant Quarantine Division
Bureau of Plant Industry
San Andres, Malate
Metro Manila
Tel: 50-07-08 (office)
695-1756 (residence)
29. Mr. Rafael T. Otones, Plant Quarantine Officer-in-Charge
Port of Manila
Metro Manila, Philippines

0613r