

PN-AAP-109/
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Postharvest Institute for Perishables

WORKSHOP ON POSTHARVEST HANDLING OF TROPICAL CROPS

Presented by

Indonesian Department of Agriculture
Indonesian Department of Trade and Cooperation
Indonesian Bureau of Logistics
and
Southeast Asia Cooperative Post-Harvest
Research and Development Programme

by
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for the
Postharvest Institute for Perishables
University of Idaho
Moscow, Idaho

GIS Report
PIP/Indonesia/September 1983/No. 11



in cooperation with
United States Agency for
International Development

Project Title: Storage and Processing of Fruits and Vegetables
Project No. AID/DSAN-CA-0265
Washington, D.C., U.S.A. 20523

A. Introduction

The Government of Indonesia Postharvest Working Group requested the assistance of USAID/Jakarta in obtaining the services of a consultant/lecturer to participate in a workshop on postharvest handling of tropical root and tuber crops. In response to cable Jakarta 13595, Dr. Gary Beaver, from the University of Idaho, spent the period of September 17 to 28, 1983 in Jakarta where he presented training sessions on various phases of postharvest tropical root and tuber crop management.

The workshop was held at the BULOG facility in Tambun, Java, Indonesia and was presented to 32 members of the Bureau of Logistics (BULOG), the Government Agricultural Cooperatives and Extension workers from throughout Java, Indonesia. These individuals work with farmers and the Agricultural Cooperatives or are members of the administrative staff at BULOG. The course was taught by lectures and a two-day field tour to the cassava growing areas of Java and included stops at tapioca processing plants.

The course was designed to familiarize working members of the cassava industry with the more modern techniques of cassava storage and processing. The Indonesian nation is the second leading producer of cassava in the world and its production exceeds its internal consumption. About 20% of its total production of cassava is exported. If production can be increased, there is a market for additional export. In order to increase production, however, the processing and storage capabilities as well as field culture techniques must be improved.

The topics covered in Dr. Beaver's presentation are shown in Section B. Following the presentation, a comprehensive examination comprising ten questions was given to all students.

B. Workshop Topics

I. Introduction

II. Postharvest Pathology of Tropical Tuber Crops

A. Principles of Disease Suppression by Handling Practices

1. Physiology in Relation to Disease
 - a. Food source, i.e. sugars
 - b. Respiration - CO_2 , H_2O
 - c. Climacterics
 - d. Fruit/tuber vigor
2. Resistance to Fungal Attack
 - a. Skin or peel
 - b. Surface injury
 - c. Maturity
 - d. Biochemical defenses
 - e. Wound healing
3. Temperature Effects on Disease/Rots
 - a. Pathogen requirements
 - b. Growth patterns and measurements
 - c. Pathogen reaction to cold temperatures
4. Modified and Controlled Atmospheres
 - a. Control of O_2
 - b. Control of CO_2
 - c. Control of CO
 - d. Combinations
5. Humidity
 - a. Control
 - b. Free moisture

III. Control of Postharvest Diseases in Tropical Tuber Crops

A. The Pathogen

1. The Fungal Spore

2. Spore Germination
 - a. Moisture
 - b. Temperature
 - c. Atmosphere
 - d. Fungicides
 3. Spore Dissemination
 4. Host Penetration
 - a. Direct
 - b. Indirect
 5. Invasion of Tissues
 6. Tissue Deterioration
 7. Sporulation
 8. Control
- IV. Postharvest Handling Systems for Tropical Tuber Crops, Roots, Tubers and Corms
- A. Field Techniques
 - B. Curing
 1. Where
 2. When
 3. How
 - C. Storage and Storage Facilities
 1. Cooling
 2. Grading
- V. Review of Commercial Postharvest and Storage Systems in the U.S.
- A. Potato Systems
 1. Correlations with tropical crops
 2. Comparisons of storage principles
- VI. Postharvest and Storage of Cassava
- A. Historical
 - B. Current
 - C. Possibilities for Future
- VII. Questions and Review

C. Summary and Conclusions

Rice has traditionally been the crop towards which all research and development efforts were directed in Indonesia. The government is now beginning a program for development of secondary crops. These include the tropical tuber crops of cassava, sweet potato, yam and taro. At this time, the stage of development of these secondary crops and much of the expertise for program design and implementation will have to come from outside Indonesia.

An attempt is currently being made to develop on-farm storage facilities for cassava. This crop is extremely perishable after harvest and typically deteriorates beyond use after as few as two to four days. Much research will be needed before a suitable method of on-farm storage can be developed for the rural areas. It should be remembered that these rural areas typically have no electricity and the educational level of the farmers is extremely low. Therefore, any system that is developed must be of a simple nature. Storage facilities would be adequate if they were capable of extending the life of a harvested crop by as little as four to eight weeks, however, a longer period would be desirable.

Tuber crops such as yam and sweet potato are less demanding in their requirements for storage, and taro is somewhat of an unknown quantity.

In addition to development of storage facilities it is most probable that some cultural modifications will also have to be made. This will require additional training and research, again a role which will require input from outside Indonesia.

In support of these efforts, PIP could send consultants to the area if requested, but an equally important educational program could be developed where individuals interested in working in Indonesia could obtain classroom experience in Idaho or other areas of the U.S. and then conduct their required research for a degree directly on site in Indonesia under the guidance of joint U.S./Indonesia professors.

APPENDIX I
Travel Schedule

Travel Boise to Jakarta	LV September 16, 0855 AV September 18, 2130
Meet with Ernesto Lucas, USAID	Sept. 19 0800-0900
Meet Mr. Halim, Dept. of Agriculture	Sept. 19 0930-1000
Meet Mr. Silitonga, BULOG	Sept. 19 1030-1100
Return to AID	Sept. 19 1130-1230
Attend opening ceremonies	Sept. 20 0745-1300
Root Crop Workshop - Tambun	
Return to hotel - Prepare papers for workshop presentation	Sept. 20 1400-1900
AID office, copy papers for workshop	Sept. 21 0800-1400
Complete paper for presentation	Sept. 21 1500-2100
Day long presentation workshop - Tambun	Sept. 22 0630-1900
Meet Ernesto Lucas, AID	Sept. 23 0900-1130
Meet Diane Barrett, RMI	Sept. 23 1300-1730
Meeting with Harry van Ruiten	Sept. 24 0630-0800
Meeting with Salmet Zubaidy	Sept. 24 0900-1200
Attend workshop	Sept. 24 1330-1700
Write report	Sept. 25 1300-1500
Meet with van Ruiten, Halim and Soepani	Sept. 25 1930-2200
Meet with van Ruiten	Sept. 26 0800-0900
Return to U.S.A.	Sept. 27 0800
Arrive Boise, Idaho	Sept. 29 1600

APPENDIX II
Persons Contacted

USAID Office	Ernesto Lucas
Indonesian Ministry of Ag	A. Halim and Mr. Soepani
BULOG	K. Silitonga
BULOG	Salmet Zubaidy
Resources Management International, Inc.	Diane Barrett
	Harry van Ruiten
BULOG	Dr. Sodig Ismail
BULOG	Dr. Sapuan
BULOG	Dr. Soemardi

APPENDIX III

JADWAL PELAJARAN LATIHAN TEKNOLOGI PASCA PANEN
DI TAMBUN, BEKASI, JAWA BARAT
TGL. 19 s/d 28 SEPTEMBER 1983

Lampiran : 4.

Hari/tanggal	Waktu	Mata Pelajaran/Fraktikum	Dosen/Pengajar
1	2	3	4
Selasa, 20 - 9 - 1983	06.00 - 09.00	Pendaftaran Peserta (Registration of participants)	Panitia (OC)
	09.00 - 10.15	Pembukaan (Opening Ceremony) : - Laporan Panitia Penyelenggara - Pengarahan sekaligus Pembukaan Latihan.	A. Halim M.Sc.
	10.15 - 10.30	I S T I R A H A T (Coffee break)	Ir. Chrisman Silitonga M.Sc. Kapus Litbang Sislog.
	10.30 - 11.15	Penjelasan Masalah Pasca Panen Palawija (Information of secondarycrop post harvest technology).	Ir. Soe p a n i
	11.15 - 12.00	Kebijakan dalam pengembangan produksi palawija. (Government policy on development of secondary crop production).	Dit. Eina Produksi
	12.00 - 12.45	(C o n t i n u a t i o n)	
	12.45 - 14.00	I S T I R A H A T (Lunch Break)	
	14.00 - 14.45	Kebijaksanaan pangan pemerintah dalam Pelita III dan Repelita IV (Government policy on food in 5 year development program III & IV).	Karogari Bulog (Ir Sapuan)
	14.45 - 15.30	(C o n t i n u a t i o n)	
	15.30 - 15.45	I S T I R A H A T (Coffee break)	
	15.45 - 16.30	Kebijakan stabilisasi harga, pengadaan dan penyaluran (Government policy on price stabilization, procurement and stabilization)	Karogasar Bulog (Drs. Sodik Ismail)
	16.30 - 17.15	(C o n t i n u a t i o n)	
	17.15 - 19.30	I S T I R A H A T (Coffee break))	
	19.30 - 21.00	Kebijakan Pemerintah Dibidang Perkoperasian (Government Policy on Cooperative)	Ditjen Binus Koperasi

1	2	3	4
R a b u , 21 - 9 - 1983	08.00 - 08.45	Agribis . dan Peraturan ² Perusahaan Tapioka (Agribis and Tapioca Mill Regulation)	Ir. Sugianto/ Ir. Hanan Zacc
	08.45 - 09.30	(C o n t i n u a t i o n)	
	09.30 - 10.15	Agronomi ubikayu dan ubi-ubian lain (Agronomy of root crops)	Wargiono B.Sc.
	10.15 - 10.30	I S T I R A H A T (C o f f e e B r e a k)	
	10.30 - 11.15	Agronomi ubi kayu dan ubi-ubian lain (Agronomy of root crops)	sda
	11.15 - 12.00	Anatomi dan sifat fisis dari ubi-ubian (Anatomy and physiology of root crops)	sda
	12.00 - 12.45	(C o n t i n u a t i o n)	sda
	12.45 - 14.00	I S T I R A H A T (L u n c h B r e a k)	
	14.00 - 14.45	Perhitungan kehilangan Pasca Panen ubi-ubian (Assessment of root crop post harvest losses)	Ir. Soenardi/ Dr. Diana Barrett
	14.45 - 15.30	(C o n t i n u a t i o n)	sda
	15.30 - 15.45	I S T I R A H A T (C o f f e e B r e a k)	
	15.45 - 16.30	Perhitungan kehilangan Pasca Panen ubi-ubian.	sda
	16.30 - 17.15	(C o n t i n u a t i o n)	sda
	17.15 - 19.30	(D i n n e r B r e a k)	sda
K a m i s , 22 - 9 - 1983	08.00 - 08.45	Perlakuan Pasca Panen ubikayu, Ubijalar Sagar ditingkat Petani Post Harvest Handling of Fresh and sweet potato and village level storage.	Dr. Beaver
	08.45 - 09.30	(C o n t i n u a t i o n)	sda
	09.30 - 10.15	(C o n t i n u a t i o n)	sda
	10.15 - 10.30	I S T I R A H A T (C o f f e e b r e a k)	sda
	10.30 - 11.15	(C o n t i n u a t i o n)	sda
	11.15 - 12.00	(C o n t i n u a t i o n)	sda

1	2	3	4
	12.00 - 12.45	(Continuation)	Dr. Beaver
	12.45 - 14.00	ISTIRAHAT (lunch break)	
	14.00 - 14.45	(Continuation)	sda
	14.45 - 15.30	(Continuation)	
	15.30 - 15.45	ISTIRAHAT (Coffee break)	
	15.45 - 16.30	DEMONSTRATION	sda
	16.30 - 17.15	(Continuation)	sda
	17.15 - 19.30	ISTIRAHAT (Dinner Break)	
	19.30 - 21.00	Pengendalian hama-gudang ubi-ubian (ubikayu dll) di tingkat petani (Pest control of root crop at the farmer level).	Ir. Kasmo
Jum'at 23 - 9 - 1983	08.00 - 08.45	Kualitas ubikayu dan ubi-ubian lain (Quality of cassava products and others)	Ir. Soemardi / Dr. Diana Barret
	08.45 - 09.30	(Continuation)	sda
	09.30 - 10.15	(Continuation)	sda
	10.15 - 10.30	ISTIRAHAT (Coffee break)	
	10.30 - 11.15	Kualitas ubikayu dan ubi-ubian lain (Quality of cassava products and others)	sda
	11.15 - 12.45	Shalat Jum'at	
	12.45 - 14.00	ISTIRAHAT (Coffee break)	
	14.00 - 14.45	Pemanfaatan ubikayu dalam industri Pertanian (Utilization of cassava in agricultural industry)	Dr. Dardjo Soemadadja
	14.45 - 15.30	(Continuation)	sda
	15.30 - 15.45	ISTIRAHAT (Coffee break)	

1 2	2	3	4
	15.45 - 16.30 16.30 - 17.15 17.15 - 19.30 19.30 - 21.00	Penyelidikan Hama ubi-ubian di daerah tropis (pest control in tropical countries) (C o n t i n u a t i o n) I S T I R A H A T (Dinner break) Masalah ubi kayu daerah transmigrasi (Problems of cassava in Transmigration area.	Rudiawati Bulog Ir. Tarkinan Kasman sda Ditjen Transmigrasi Ir. A. Saubari.
Sabtu, 24 - 9 - 1983	06.00 - 08.45 08.45 - 09.30 09.30 - 10.15 10.15 - 10.30 10.30 - 11.15 11.15 - 12.00 12.00 - 12.45 12.45 - 14.00 14.00 - 14.45 14.45 - 15.30 15.30 - 16.15 16.15 - 17.00 17.00 - 17.45 17.45 - 18.30	The production of pellets from dried cassava in Indonesia. (C o n t i n u a t i o n) A General overview of cassava chips cube and pellets processing technology as applied in South East Asia. I S T I R A H A T (Coffee break) (C o n t i n u a t i o n) The production of Tapioca from fresh cassava in Indonesia Traditional methods - Modern method. (C o n t i n u a t i o n) I S T I R A H A T (Lunch break) The production of tapioca from fresh cassava in Indonesia - Continuation - Review by Participant. - Review by Participant. 15.30 - 16.15 16.15 - 17.00 17.00 - 17.45 17.45 - 18.30	Harry Th. L van Ruiten sda

1	2	3	4
K i n g g u , 25 - 9 - 1983	08.00 -	F I E L D T R I P	Panitia (OC)
S e n e n , 26 - 9 - 1983		sda	sda
S e l a s a , 27 - 9 - 1983	08.00 - 08.45	Keragaman Pasca Panen sederhana ditingkat petani (Post Harvest Equipment at the farmer level).	Dr. Djatruko
	08.45 - 09.30	(C o n t i n u a t i o n)	sda
	09.30 - 10.15	Demonstrasi / Demonstration	sda
	10.15 - 10.30	I S T I R A H A T (Coffee break)	
	10.30 - 11.15	Demonstrasi / Demonstration	sda
	11.15 - 12.00	Tapioka sebagai komponen dalam pembuatan roti dari gandum dan usaha pengembangannya. (Tapioca as component of bread processing and its improvement).	Ir. Poedjo Tjiptono
	12.00 - 12.45	(C o n t i n u a t i o n)	sda
	12.45 - 14.00	I S T I R A H A T (Lunch break)	
	14.00 - 14.45	Masalah gizi dan hasil olahan ubi-ubian (Problem of gizi and root product)	Dr. H e r n a n
	14.45 - 15.30	(C o n t i n u a t i o n)	sda
	15.30 - 15.45	I S T I R A H A T (Coffee break)	
	15.45 - 16.30	Pemasaran ubi-ubian dan hasil olahannya. (Marketing of cassava and root product).	Drs. Rustan Gani
	16.30 - 17.15	(C o n t i n u a t i o n)	

1	2	3	4
R a b u , 28 - 9 - 1983	08.00 - 08.45	Metoda dan cara-cara mengajar. (Teaching method)	Drs. Suwono (EPIPP)
	08.45 - 09.30	(C o n t i n u a t i o n)	sda
	09.30 - 10.15	Evaluasi (Evaluation)	Panitia (OC)
	10.15 - 10.30	I S T I R A H A T	
	10.30 - 11.15	Evaluasi (Evaluation)	sda
	11.15 - 12.00	Evaluasi (Evaluation)	sda
	12.00 - 12.45	Penilaian oleh Panitia	sda
	12.45 - 14.00	I S T I R A H A T (
	14.00 - 14.45	Penilaian oleh Panitia	sda
	14.45 - 15.30	Penilaian oleh Panitia	sda
	15.30 - 15.45	I S T I R A H A T	
	15.45 - 16.30	Penutupan (Closing ceremony)	sda

Tambun, September 1983

P a n i t i a