

PIPX 105

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# Reduction of Postharvest Losses in Perishable Crops

August 23 - September 26, 1987

## Final Report

GTS Report No.  
PIP/UC Davis/California/August 87/No. 94



Postharvest  
Institute for Perishables  
University of Idaho/Moscow



International Programs  
University of California Extension  
University of California/Davis

in cooperation with:

the United States Agency on International Development  
the Inter-American Institute for Cooperation on Agriculture  
the United Nations Food and Agriculture Organization

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**F I N A L   R E P O R T**

**Reduction of  
Postharvest Losses in Perishable Crops**

**August 23 - September 26, 1987**

**Date: November 6, 1987**

**Postharvest Institute of Perishables  
University of Idaho  
Moscow, Idaho**

**International Programs  
University Extension  
University of California, Davis**

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### Attachments

1. Roster
2. Schedule
3. Evaluations
4. Project Profiles

## **Final Report**

### **Reduction of Postharvest Losses in Perishable Crops**

#### **I Introduction**

On August 23, 1987, twenty-two people arrived in Davis, California, to begin a five-week educational program entitled "The Reduction of Postharvest Losses in Perishable Crops." This program was developed and administered cooperatively by the Postharvest Institute for Perishables (PIP) at the University of Idaho (UI), and the International Programs Unit, University of California Extension, Davis (UC Davis). This program worked with and utilized staff from the Postharvest/Pomology Department at UC Davis, and the College of Agriculture at UI. Individuals from the Caribbean Island offices of the Inter-American Institute for Cooperation on Agriculture (IICA) and the UN Food and Agricultural Organization (FAO) contributed significantly to the training.

Twenty-one trainees from the Caribbean were funded by FAO/Barbados, USAID/Barbados, the World Bank/Grenada, and the Institute for International Education/St. Vincent. Island countries represented by trainees were Antigua, Barbados, Trinidad, St. Lucia, Dominica, St. Vincent, and Grenada (see Attachment 1 for a list of trainees, country and present position.) There was an additional trainee from Mauritius sponsored by the African-American Institute. At various times during the program, people from Spain, China, Costa Rica, Saudi Arabia, and the Philippines joined selected activities, enriching the dialogue among the participants.

#### **II Program Design**

An original model for the course was developed by PIP and UC Davis in late 1986, and was modified in early 1987 to meet a request from FAO and IICA. IICA and FAO postharvest specialists from the Caribbean approved the conceptual framework for the course. They indicated they would be interested in contracting the course for participants from the Caribbean region if it could be modified to be specific to their needs. PIP and UC Davis readily agreed to orient the course to priority commodities from the Caribbean and to include agricultural development specialists from IICA and FAO as trainers in the program. The resulting program included a mix of postharvest technology and agricultural economics theory and applications from the two universities with practical commodity development programs from the Caribbean.

The final program consisted of three interrelated segments. Weeks one through four were held in central California, and the last week was in southwest Idaho. The first two weeks of the course were devoted to the study of the theory, applications, and economics of postharvest losses and loss reduction technologies for perishable fruits and vegetables. Trainees were given information by experts in the postharvest field. They also observed laboratory exhibits, field examples, and were introduced to library systems in order to develop skills for pursuing their own research and questions.

The second two-week segment was devoted to a systematic analysis of the selected commodity systems in the Eastern Caribbean islands. The analyses were made in interactive workshops facilitated by the five trainers from the Caribbean. Building on the more theoretical basis of the first two weeks, the participants studied the effects of activities and decisions in the macro-environment, pre-production planning, production, harvesting, postharvest handling, and marketing of mango, citrus, breadfruit, soursop, avocado, papaya, dasheen, and sweet potato. Four priority commodity systems--dasheen, mango, breadfruit, and sweet potato--from four of the islands were described in detail and evaluated for major problems in the system. Solutions to the problems were identified and profiles of potential projects with costs were prepared.

The third segment of the program was a week spent in southwestern Idaho studying decision-making in commodity systems. The apple, onion, and potato commodity systems were described by specialists, after which the participants met with farmers, processors, and marketers to discuss how all aspects of the system, especially the consumers, must be considered when making decisions about the implementation of postharvest technologies.

### **III Program Goals, Objectives and Assumptions**

The goal of this program was to train agriculturalists from developing countries to evaluate postharvest problems and to determine potential solutions applicable under different socio-economic conditions.

Objectives for the participants were the following:

- to learn methods of assessing postharvest losses and their solutions;
- to develop a theoretical understanding of postharvest losses which result from biological, institutional, economic, and social causes;
- to learn appropriate technologies and management techniques for reducing postharvest losses;
- to learn how to identify and select appropriate goals and technologies to develop projects for the solution of postharvest problems;
- to design and write project profiles based on the four items above.

The assumptions of the program were as follows:

- that the trainees had an educational and professional background -- preferably Bachelor's level in agriculture -- to allow them to absorb course information;
- that the trainees had specific goals, or problems that they wished to solve, or questions to be answered;
- that the trainees were capable of extrapolating information and ideas from models, commodity systems and/or levels of technology different than those available in their home environment.

#### **IV Program Methodology**

The goals of the program were accomplished through lectures, laboratory demonstrations, one-on-one discussions with professionals, field experiences, library research, small group interactions and program development, and visits to on-site locations.

#### **V Program Description**

Please see Attachment 2 for a daily/hourly subject matter schedule.

#### **VI Program Administration**

This program was unusual in that ten professionals from four institutions collaborated in the development and implementation -- three from UC Davis (Beth Greenwood, Leonard Morris, Bruce Winner), two from Idaho (Tom Dechert, Richard Schermerhorn), two from FAO (Steve Harris, Cornelius Schuur) and three from IICA (Jerry La Gra, Rafael Marte, Gonzalo Estafanel). In addition, Larry Laird from USAID/Barbados, Harvey Neese from PIP, and Adel Kader from UC Davis provided valuable input to the design of the course.

As the program was originally designed, one person from UC Davis (Leonard Morris) and one person from UI (Richard Schermerhorn) were responsible for subject matter coordination, with administrative support from PIP and the International Programs administrative staff at UC Davis. Because of the cooperative nature of the training with its various segments, quality for the course was maintained through regular meetings by the trainers and administrative staff to discuss goals, methods, and content. Thus, while the ten people involved often had different points of view and goals, a positive spirit of cooperation existed throughout the program such that daily program goals and segment goals were achieved through the understanding and support of all involved. The concluding feeling of the training team members was in favor of continuing to work together with the participants from the Caribbean.

#### **VII Evaluations**

The success of the program in accomplishing its objectives was measured by the evaluations of the three groups involved in the course:

- Trainee evaluations during and at the end of the program with a subsequent 3-6 month follow up.
- Agency personnel evaluations (FAO and IICA).
- University personnel evaluations (UI and UC Davis).

## **A. Trainee Evaluations:**

(See Attachment 3). Trainees were given three kinds of evaluation instruments to complete during the program.

1. The first set of evaluations was of daily activities, speakers and field trips, with possible ratings of excellent, very good, good, poor, and very poor. Of the sixty items evaluated by the twenty-one participants, almost all responses fell into the categories of good to excellent. Several "poors" were noted on the Central Valley and Idaho field trips. These were at sites that were not in operation (a melon packing shed, small farm pepper processor, and an onion drying operation). The professional staff felt that these operations could demonstrate useful principles. However, the conclusion was drawn that some trainees could not understand the principles without seeing the machinery in operation. It is important to be aware of this in planning future programs. Still, the large majority of the participant responses to the daily activities were positive, leading to the conclusion that the participants were satisfied with the level of the information presented, that the materials made sense to them, and that they felt they were learning things that related to their own experiences.
2. The second evaluation instrument consisted of an open-ended series of questions asking trainees about their goals and expectations, pre-departure information, and goal achievement/satisfaction. One group of participants had received a pre-departure orientation by Steve Harris of FAO/Barbados. This group seemed to have had more realistic expectations for the program. These participants were advised before leaving the Caribbean that "even if the crops or examples given were not exactly the ones we deal with, the main thing is to understand the principles of dealing with perishable commodities." In fact one of the participants commented on the evaluation that: "The principles portrayed (in the program) to a certain extent can be modified to fit into my situation. The exposure was of immense value."

In relation to the question as to whether students felt they achieved their goals, most of the participants responded in the affirmative. One student noted, "...I can honestly say that my expectations have been met, even surpassed. The information available has been disseminated, the contacts both here and regionally that have been created were well worth it. I can now go back with 100% more knowledge and information than when I came." Indeed, according to yet another trainee, "Other benefits not even thought of were also attained by attending this course - social interaction with the group from the Caribbean, as well as the organizers and lecturers" (perhaps the basis of an ongoing network).

3. A third evaluation instrument with 29 items was used. A copy with the tallies is attached. Once again, trainee responses were dominantly in the adequate to extremely effective range. A few exceptions are worth noting. For example, a greater distribution was indicated in response to the question, "How well were these losses related to losses in your region/country?" The responses included a few "inadequately". Regarding the question as to whether the course helped the trainees to identify losses occurring in the system in which they work in their countries, two answered "inadequately." Later, in response to the question "To what degree did you discuss the types of agricultural systems in which these methods might be appropriate?," once again several trainees indicated "inadequately covered." Finally, in response to the question "How much of the information presented will you use in your home country?," responses consisted of 10 "most", 10 "some", and 1 "will not use most information."

### Summary of trainee evaluations

The evaluations of the participants by and large were positive. Many of the comments recorded on the evaluations expressed this upbeat attitude. One trainee related that the program was, "Highly rewarding technically. It provided a step to bridge the gap between farmer and consumer." Another trainee remarked that it was, "Highly effective. For such a short course it definitely covered a great deal efficiently."

Based on these evaluations, several areas that might be improved in future courses were noted. One would be to make sure that all participants had realistic and adequate pre-departure information and orientation. A second would be to have ongoing opportunities to process information and to assist trainees in drawing connections between what they were hearing, seeing and learning, and their home environment. The third and fourth week provided one major opportunity for all the trainees to process information in this way. Still, there should have been more. It should also be noted that trainee background and expectations/goals were diverse. We are pleased that so many of the trainee goals and expectations were met and we view trainee responses as positive.

It is our intention to follow-up with another evaluation in three to six months to measure trainee attitudes toward their program and to find out how information from the course was used.

## **B. Agency Evaluations:**

It was clear from individual interviews that representatives from FAO, and IICA had somewhat differing goals and objectives for the course. Nevertheless, the third and fourth weeks of the program went extremely well and participants (as indicated above) rated the commodity system analysis highly -- a tribute to the way in which the the trainers from the Caribbean worked well as a team. General evaluations of the course by these members were good with some recommendations to be used in future programs. Some suggestions were:

1. clarification of leadership and roles of staff;
2. secretarial support services available evenings;
3. Earlier information about course content;
4. need for speakers to tie in more to the region's needs (more processing);
5. developing an information network with the Caribbean;
6. more collaboration among the trainers before the beginning of the course.

## **C. University Personnel Evaluations:**

The five professional staff of PIP and International Programs, UC Extension, also had diverse goals and expectations for the training course. Nevertheless, this group also worked very well as a team. While the five-week course was judged overall to be effective by the trainees, and agency input was generally positive (with additional useful feedback), the university groups learned a number of things from developing and administering the program. These included:

1. the necessity for built-in processing time and opportunities to help trainees make connections;
2. the need to clarify goals at the beginning and throughout the program;
3. the need to not overprogram -- giving trainees more opportunities to work on their own and develop their own agendas;
4. the need for trainees to be involved in more hands-on activities;
5. the need to integrate assessment and technical components whenever possible;
6. the need to clarify, for all involved, the duties and responsibilities of those in leadership positions (particularly important in cooperative ventures);

7. the need for trainees to focus on a particular problem commodity and/or country need and to work individually on this project throughout the program;
8. the need for better background information on the trainees before the beginning of the course.

Even while noting all that the university staff learned in giving the course (after all, universities should put a lot of effort into learning to teach better), the general consensus is that the course was successful in accomplishing its goals. The evaluations by the participants and collaborating institutions are positive. The project profiles developed by the four island groups clearly demonstrate that the participants assimilated the technical materials and can apply them, at least in theory. We will know more about how much of the information is being applied when we do the next evaluations in three to six months. PIP and UC Davis have concluded that the course has much to offer, and we intend to offer it for other groups from other regions of the world.

### VIII Conclusion

It was a pleasure and a challenge to develop and administer this program. Complexity occurred because four organizations and 10 people were working cooperatively to implement various aspects of the program. Nevertheless, in spite of the diverse goals and ideas of these people, the trainees by and large judged the program a success. In spite of differences, the attitude of these individuals was largely upbeat and very cooperative. We feel extremely lucky to have worked with such interesting and fine colleagues.

At the same time, the trainees were also fine people. It was a pleasure to watch them begin to know each other as colleagues and as individuals. While physically close, the islands of the Caribbean provide natural barriers to close communication and it took the five weeks for some of these barriers to break down.

We would like to express our appreciation to FAO, USAID, the World Bank, and the Institute for International Education for the generous funding of this program; to Dr. Leonard Morris for his superb technical leadership; to Bruce Winner for his long hours and interest in the success of the hour-to-hour activities of the course; to Dr. Adel Kader for the support of the Postharvest Department at UC Davis; to Dr. Richard Schermerhorn for his support and technical leadership; to Jerry La Gra for his considerable efforts in coordinating inputs from the Caribbean; to Dr. Steve Harris for his time and effort in coordinating and orienting the trainees and assisting them with their transportation problems; and the other trainers and trainees in the Caribbean, Idaho, and California.

Beth Greenwood  
International Programs  
University Extension  
University of California  
Davis, California

Thomas Dechert  
Postharvest Institute for Perishables  
University of Idaho  
Moscow, Idaho

POSTHARVEST LOSSES IN PERISHIBLE CROPS  
University of California, Davis

M	ALEXANDER, Leopold	Saint Lucia	FAO	Sunshine Harvest Co-op
M	BEST, Stephen	Saint Lucia	FAO	Ministry of Ag. (SFAD)
M	CARBON, Winston	Dominica	USAID	Ministry of Ag.
M	CLARKE, Luther	Saint Kitts	FAO	Ministry of Ag.
M	DE FREITAS, Douglas	Saint Vincent	USAID	Eastern Caribbean Exporter
M	EVANS, Ernest	Saint Lucia	USAID	Exporting Company
F	FLAX, Kathleen	Antigua	FAO	Mgr. Bethesda Irrig. Project
M	GRAHAM, Paul	Grenada	USAID	Plant Quarantine Officer
M	HENRY, Francois	Saint Lucia	USAID	Small Farmers Ag. Dev. Project
M	LOUISON, Chester	Grenada	World Bank	Mkt. & Natl Importing Board
F	MARECHEAU, Theresa	Grenada	USAID	Ministry of Ag.
F	MARTIN, Debbie	Dominica	USAID	IFAD Project
F	MOOTOO, Audine	Trinidad	FAO	PH Research/Min. Food Product
F	NOEL, Monique	Grenada	FAO	Ministry of Ag.
F	O'GARRO, Heather	Dominica	FAO	Hucksters Assoc.
M	PHILIP, Michael	Barbados	FAO	Plant Pathologist
M	PHILLIPS, Hugh	Saint Vincent	USAID	Ministry of Ag.
M	SAMUEL, Norris	Saint Vincent	FAO	Org. for Rural Devel.
M	SIMON, Conrad	Saint Vincent	FAO	Min. of Trade Ind/Ag.
M	ST. JEAN, Jonathan	Dominica	FAO	Export/Import Agency

OBSERVERS

M	AMBROSE, Everton	Saint Lucia		
M	NAIDU, Sandrasagarren	Mauritius	Af-Am. Inst.	

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UNIVERSITY EXTENSION

DAVIS, CALIFORNIA 95616

**REDUCTION OF  
POSTHARVEST LOSSES IN PERISHABLE CROPS**

**Postharvest Institute for Perishables - University of Idaho  
University Extension - University of California, Davis**

Final

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## Trainers

### University of California

M. Cantrell, Extension Specialist, Department of Vegetable Crops, Davis  
R. Cook, Marketing Economist, Department of Agricultural Economics, Davis  
I. Eaks, Professor, Department of Biochemistry, Riverside  
J. Echert, Professor, Department of Plant Pathology, Riverside  
A. Kader, Chairperson/Professor, Department of Pomology, Davis  
R. Kasmire, Marketing Specialist, Vegetable Crops Extension, Davis  
J. Labavitch, Associate Professor, Department of Pomology, Davis  
C. Lizada, Visiting Assistant, Biochemist, Laguna, Philippines  
F.G. Mitchell, Marketing Specialist, Pomology Extension, Davis  
L. Morris, Professor Emeritus, Department of Vegetable Crops, Davis  
K.E. Nelson, Professor Emeritus, Department of Viticulture and Enology, Davis  
J. Ogawa, Professor, Department of Plant Pathology, Davis  
H.K. Pratt, Professor Emeritus, Department of Vegetable Crops, Davis  
M. Reid, Professor, Department of Environmental Horticulture, Davis  
M. Saltveit, Assistant Professor, Department of Vegetable Crops, Davis  
J. Sherlock, Assistant Librarian, Biological and Agricultural Sciences, Davis  
N. Sommer, Lecturer, Department of Pomology, Davis  
J. Thompson, Unit Contact Specialist, Agricultural Engineering Extension, Davis  
S.F. Yang, Professor, Department of Vegetable Crops, Davis

### University of Idaho, Moscow

G. Beaver, Extension Potato Specialist  
M. Colt, Extension Horticulturist  
T. Dechert, Postharvest Institute of Perishables  
R. Schermerhorn, Chair, Department of Agricultural Economics  
W. Simpson, Professor Emeritus, Extension Pathologist

### Caribbean Training Specialists

G. Estafanell, Regional Projects Specialist, Inter-American Institute for  
Cooperation on Agriculture  
S. Harris, Postharvest Specialist, F.A.O.  
G. La Gra, Marketing Economist, Inter-American Institute for Cooperation on  
Agriculture  
R. Marte, Fruit Production Specialist, Inter-American Institute for Cooperation on  
Agriculture  
S. Schurr, Agriculture, Engineering and Marketing, F.A.O.

FINAL

Monday, August 24

**INTRODUCTORY SESSION**

**26 Wellman**

7:45am Bruce Winner to escort participants to 26 Wellman

8:00am Arrival at 26 Wellman

8:15am Welcome to campus ...A. Kader

8:30am Introduction of participants

9:00am Introduction of departments:  
Pomology, Viticulture, Vegetable Crops and Environmental  
Horticulture...Department representatives will give short  
descriptions of their department.

10:00am Bruce Winner to escort participants to Mrak Hall for  
administrative and financial matters (bring passports)

12:00pm Lunch

**MARKETING**

**26 Wellman**

1:00pm Introduction to problems and constraints with typical  
marketing systems in developing countries ...R. Schermerhorn

2:00pm The role of marketing in agricultural development ...R. Schermerhorn

3:00pm Break

3:30pm Conditions required for effective marketing-  
Support services ...R. Schermerhorn

5:00pm Adjourn

6:00pm Dinner

Tuesday, August 25

**MARKETING SYSTEMS**

**26 Wellman**

- 8:00am The evolutionary process of fruit and vegetable marketing systems. ...R. Schermerhorn
- 10:00am Break
- 10:30am Critical factors affecting marketing system interventions ...R. Schermerhorn
- 12:00pm Lunch
- 1:00pm The Caribbean Basin Economic Recovery Act and the potential for expanded CBI fruit and vegetable exports to the U.S. ...R. Cook
- 2:00pm Commodity systems approach to reduction of postharvest losses  
Need for systems approach. ...T. Dechert
- 3:00pm Break
- 3:30pm Analysis process for systems approach to identification of postharvest losses ...T. Dechert
- 4:30pm Discussion of day's topics
- 6:00pm Dinner
- Study

**Wednesday, August 26**

**BIOLOGY and TECHNOLOGY**

**26 Wellman**

- 8:00am Postharvest behavior of the living commodity:  
An Overview. ...L. Morris
- 9:00am Control of deterioration - Underlying concepts ...M. Saltveit
- 10:00am Break
- 10:30am Maturation and maturity indexes ...M. Reid
- 11:00am Harvesting systems - trends and developments ...J. Thompson
- 12:00pm Lunch

**TEMPERATURE MANAGEMENT**

**26 Wellman**

- 1:00pm Temperature: Responses and requirements ...L. Morris
- 2:00pm Temperature management: Precooling ...J. Thompson
- 3:00pm Break
- 3:30pm Temperature management during transport, storage,  
distribution and retail marketing ...R. Kasmire
- 4:30pm Discussion of day's topics



**Friday, August 28**

**LOCAL FIELD TRIP**

7:30am	Depart Davis -- meet at Lot 47, Tercero Hall	
8:00am	Raley's Produce Warehouse, West Sacramento	...G. Rodgers
9:00am	Depart Raley's	
9:15am	Arrive General Produce, Sacramento	...T. Chan
10:15am	Depart General Produce	
10:30am	Arrive Pacific Farms, Honeydew melons	...T. Bates
11:30am	Depart Pacific Farms	
11:45am	Arrive Davis	
12:00pm	Lunch	

**DISEASE CONTROL**

**26 WELLMAN**

1:00pm	Postharvest pathology	...N. Sommer
2:00pm	Postharvest treatments for decay control	...J. Ogawa
3:00pm	Break	

**DEMONSTRATIONS**

3:30pm	Postharvest diseases	...N. Sommer
4:30pm	Treatments for disease control	...J. Ogawa
5:00pm	Adjourn	
6:00pm	Barbeque	<b>Putah Creek Lodge</b>

Saturday August 29

**STOCKTON FIELD TRIP**

- 7:30am Depart -- meet at Lot 47, Tercero Hall
- 9:00am Arrive Stockton Farmers' Market  
Background information on Market  
View Market  
Emphasis on Asian and tropical vegetables and fruits  
...S. Arasasingham
- 10:30am Arrive Stockton Farmers' Co-op  
Background information on Co-op and related activities  
Details concerning operation
- 12:00pm Lunch
- 1:00pm Visit grower(s)
- 2:30pm Visit Philips Farm Roadside Market  
...Mrs. Philips
- 5:00pm Arrive Davis
- 6:00pm Dinner

SECOND WEEK

Sunday, August 30

California State Fair (optional field trip)  
Special attention is called to the "County" exhibits showing  
diversity of kinds and varieties of horticultural  
commodities.

**Monday, August 31**

**PREPARATION, TRANSPORTATION, and QUALITY DESCRIPTION**

**26 Wellman**

- 8:00am Preparation and packaging ...G. Mitchell
- 9:00am Palletizing, loading, transporting and distribution ...R.F. Kasmire
- 10:00am Break
- 10:30am Quality: Its description and measurement ...A. Kader
- 11:15am Standardization and inspection - California Department of Agriculture
- 12:00pm Lunch

**COMMODITY CONSIDERATIONS**

**26 Wellman**

- 1:00pm Handling systems - tomatoes, peppers and eggplant ...M. Cantwell
- 2:30pm Melons, pumpkins and squash ...H. Pratt
- 3:00pm Break

**DEMONSTRATIONS**

- 3:30pm Measurement & description of quality attributes ...A. Kader
- 4:15pm USDA Grade standards ...L. Morris
- 5:00pm Adjourn
- 6:00pm Dinner

**Tuesday, September 1**

**COMMODITY CONSIDERATIONS** Cont'd.

**26 Wellman**

8:00am	Session A - Tropical fruits	...C. Lizada
9:00am	Session B - Tropical fruits	...M. Cantwell
10:00am	Break	
10:30am	Avocados	...I. Eaks
11:15am	Pineapples	...C. Lizada
12:00pm	Lunch	
1:00pm	Citrus - Commodity characteristics, requirements and responses - related technology	<b>26 Wellman</b> ...I. Eaks
2:00pm	Postharvest treatments in relation to control of decay of subtropical and tropical fruits	...J. Eckert
3:00pm	Break	
	<b>DEMONSTRATIONS</b>	
3:30pm	Commodity responses to environment	...L. Morris
4:15pm	Temperature and humidity measurements	...L. Morris
5:00pm	Adjourn	
6:00pm	Dinner	

Wednesday, September 2

<b>COMMODITY CONSIDERATIONS</b>		Cont'd.	<b>26 Wellman</b>
8:00am	Tropical root crops		...C. Lizada
9:00am	Immature vegetable fruits		...M. Cantwell
10:00am	Break		
10:30am	Grapes		... K.E. Nelson
11:00am	Temperate-zone fruits and berries		...G. Mitchell
11:45am	Discussion of above topics		
12:00pm	Lunch		
1:00pm	Ornamentals		...M. Reid
2:00pm	Leaves, stems and inflorescences		...M. Cantwell
3:00pm	Break		
3:30pm	Temperate zone root crops		...M. Cantwell
4:30pm	Discussion of day's topics		
5:00pm	Adjourn		
6:00pm	Dinner		

Thursday, September 3

**FIELD TRIP**

- 7:30am Depart Davis -- meet at Lot 47, Tercero Hall
- 9:30am Arrive American President Lines, Oakland
- 1) Services and equipment - trends and developments ...P. Brecht
  - 2) Problems of importing & exporting ...W. Hargraves
  - 3) Observe facility for container servicing and ship loading
- 12:00pm San Francisco Farmers' Market - Lunch at Market
- 2:00pm Air transportation of perishables - San Francisco Airport  
"Perishables by Air"  
"Flying Tigers"
- 5:00pm Arrive Salinas Area
- Overnight - Salinas (Motel 6)

Friday, September 4

FIELD TRIP            Cont'd.

8:00am	Observe harvesting and field packing, lettuce, celery, broccoli, cauliflower	
10:00am	Accumulation of mixed loads Observe cooling methods Strawberry cooling, modified atmospheres Lettuce preparation - trim and core	
12:00am	Barbeque Lunch ...hosted by Transfresh Corporation	...J. Lugg
1:30pm	Mangos and papayas	...S. Lakshminarayana
2:30pm	Bananas and plantains	...R. Woodruff
3:30pm	Break	
4:00pm	Lettuce marketing order program	...H. Bradshaw
5:00pm	Adjourn	
	Overnight: Asilomar	

Saturday, September 5

**FIELD TRIP**      Cont'd.

7:30am      Depart for 17-Mile Drive  
9:30am      Visit Carmel  
12:00pm     Lunch and shopping en route  
5:30pm      Arrive Fisherman's Wharf, San Francisco  
7:30pm      Depart Fisherman's Wharf  
9:30pm      Arrive Davis

THIRD WEEK

Sunday, September 6

Open

Monday, September 7

**COMMODITY CONSIDERATIONS PREPRODUCTION AND PRODUCTION,  
CARIBBEAN REGION**

**6 Wellman**

8:00am	Review of commodity systems approach	...J. La Gra
10:00am	Break	
10:30am	Review of commodity systems case studies from the Eastern Caribbean	...J. La Gra
12:00pm	Lunch	
1:00pm	Propagation and nursery management effect on quality	...R. Marte
3:00pm	Break	
3:30pm	Production of fruit crops (mango, citrus, breadfruit, soursop, sugar apple, avocado, papaya)	...R. Marte
5:00pm	Adjourn	
6:00pm	Dinner	

Tuesday, September 8

PRODUCTION AND MARKETING, CARIBBEAN REGION		6 Wellman
8:00am	Preproduction/Production of root crops	...S. Harris
9:00am	Harvest of fruits/vegetables/root crops	...S. Harris
10:00am	Break	
10:30am	Domestic marketing systems - case studies	...J. La Gra
12:00pm	Lunch	
1:30pm	Discussion of above	
2:30pm	Break	
3:00pm	Intra-Regional Trade - case studies	...C. Schuur
4:30pm	Discussion of above	
6:00pm	Dinner	

Wednesday, September 9

**PRODUCTION AND MARKETING, CARIBBEAN REGION**

**6 Wellman**

8:00am	Extra-Regional Trade - case studies	...J. La Gra
10:00am	Break	
10:30am	Discussion of above	
12:00pm	Lunch	
1:30pm	Introduction to Projects	...G. Estafanell
3:30pm	Laboratory: Demonstration of temperature and relative humidity measurement	
6:00pm	Dinner	

Thursday, September 10

**FIELD TRIP**

7:30am	Depart -- meet at Lot 47, Tercero Hall	
8:45am	Field packing of grapes - Mohr-Fry Ranch, Lodi	
9:45am	Stuart Nursery - French Camp	...E. Robers
11:15am	Melon packing - Turlock Fruit Co., Turlock	...D. Smith
12:15	Lunch	
1:00pm	Sweet potato production, harvesting, storage - Atwater	...J. Alvernaz
3:15pm	Tomato packing - Bianchi and Sons, Merced	
4:30pm	Small farm operation	...Y. Nishihama
6:30pm	Arrive Motel 6, Fresno	

Friday, September 11

**FIELD TRIP**      Cont'd.

7:30am	Depart	
8:00am	Pam Pak	
9:30am	USDA Horticultural Field Station Postharvest research programs Insect disinfestation treatments Film packaging Loading patterns - trailers and containers	...J. Harvey & C. Forney
12:00pm	Lunch en route	
1:30pm	UC Field Station -- Reedley	
3:00pm	Small Farm Operation	...F. Lucero
6:00pm	Overnight at Motel 6, Fresno	
7:00pm	Dinner, Basque Hotel	

Saturday, September 12

**FIELD TRIP**      Cont'd.

8:00am      Depart  
9:00am      Mariposa Grove of Big Trees, Yosemite National Park  
11:30am     Arrive Yosemite Valley  
2:30pm      Depart Yosemite National Park  
4:30pm      Merced  
8:30pm      Arrive Davis

**Fourth Week**

**Sunday, September 13**

Open

**Monday, September 14**

**PROJECT PLANNING**

**103 Wellman**

8:00am      Distribution of participants in small groups  
              Assignment of task to each group  
              Description of commodity system

10:00am      Break

10:30am      Working session #1 - (Rooms 27,101, 103,105,127,129)  
              Identification of major constraints                      Coordinator: ...J. La Gra

12:00pm      Lunch

2:00pm      Working session #2  
              Identification of major constraints

5:00pm      Adjourn

6:00pm      Dinner

Tuesday, September 15

**PROJECT PLANNING, Cont'd.**

**103 Wellman**

8:00am Continuation of identification of major constraints  
Working session #2 - (Rooms 27,101,103,105,127,129)

10:00am Break

10:30am Definition of projects, objectives and expected  
outputs

12:00pm Lunch

1:00pm Working session #3  
Continue definition of projects

3:00pm Break

3:30pm Working session #4 - description of project. Studies  
of alternatives

5:00pm Adjourn

6:00pm Dinner

Wednesday, September 16 --- PROJECT PLANNING, Cont'd. 103 Wellman

All day Working session #4 - (Rooms 101, 103, 105, 123, 127, 129)  
Description of project

Thursday, September 17 --- PROJECT PLANNING, Cont'd. 103 Wellman

All day Working session #5  
Preparation of project profiles

Friday, September 18 --- PROJECT PLANNING, Cont'd. 103 Wellman

A.M. Working session #6  
Presentation and discussion of project proposals

P.M. Visits

Saturday, September 19

A.M. Open

12:30pm Depart Davis, for Sacramento Airport

2:00pm Depart Sacramento for Boise, Idaho

6:07pm Arrive Boise - will be met by Dr. Mike Colt, Extension Horticulturist

Dinner - Boise

Overnight - Boise

**FIFTH WEEK**

**Sunday September 20**

am Open

6:00pm Evening dinners or barbeques with families of Boise Rotary  
Overnight - Boise

**Monday, September 21**

**APPLES**

9:00am Preharvest treatments, harvesting, transport, cooling processing  
... M. Colt, Extension Horticulturist, Coordinator

12:00pm Lunch

1:00pm CA Storage, humidity/temperature, economics, marketing,  
advertising, consumer demand growth, management decisions  
... M. Colt, Extension Horticulturist, Coordinator

6:00pm Dinner - Caldwell  
Overnight - Caldwell

**Tuesday, September 22**

**ONIONS**

8:00am Preharvest treatments, harvesting, transport, cooling,  
processing ... B. Simpson, Coordinator

12:00pm Lunch

1:00pm Storage - humidity/temperature, storage disease, varieties,  
consumer demand, postharvest management ... B. Simpson, Coordinator

6:00pm Dinner - Caldwell  
Overnight - Caldwell

Wednesday, September 23

**POTATOES**

- 8:00am Preharvest treatments - curing, harvesting, engineering harvesters  
12:00pm Lunch  
1:00pm Storage - humidity/temperature, sprout control, storage diseases, postharvest management ... B. Simpson, Coordinator  
6:00pm Dinner - Caldwell  
Overnight - Caldwell

Thursday, September 24

**POTATOES** Cont'd.

- 8:00am Processing, international marketing, agro-industry, seed potatoes, management ... B. Simpson, Coordinator  
12:00pm Lunch  
1:00pm Idaho (state & USDA (federal) regulatory facilities & actions - for quality control and sanitation ... B. Simpson, Coordinator  
Course evaluations  
6:00pm Dinner - Boise  
Overnight - Boise

Friday, September 25

- 7:30am Depart Boise  
11:42am Arrive Sacramento - Delta Airlines group flight  
5:00pm Meet in Hotel lobby for transportation back to Davis  
6:00pm Banquet & Closings **Faculty Club, UCD**  
--Overnight, Host International Motel, Sacramento

Saturday, September 26

- am Participants depart

## Reduction of Postharvest Losses in Perishable Crops

Course Evaluation - Part I

Lectures &amp; Demonstrations August 24 - September 5, 1987

This evaluation form is designed so that you may quickly assess each part of the lectures and demonstrations on a day-by-day basis as well as on an overall basis. This may be completed at your convenience and will be collected on the morning of Monday, September 7th. Specific comments and observations are encouraged. Please use the back side if more space is needed. Please use this evaluation to consider the subject matter of the lectures and their value to you. The comments section may also be used to comment on the style or other aspects of the presentation.

Monday, August 24

## I. Lectures

1. Introduction to problems in marketing systems (Schermerhorn)

2. Role of Marketing (Schermerhorn)

3. Conditions for effective marketing (Schermerhorn)

	Exc	Good	Fair	Poor	Very Poor	Comments
1. Introduction to problems in marketing systems (Schermerhorn)	13	4	1	-	-	
2. Role of Marketing (Schermerhorn)	13	4	1	-	-	
3. Conditions for effective marketing (Schermerhorn)	12	5	1	-	-	

Tuesday, August 25

## I. Lectures

4. Evolutionary processes of marketing systems (Schermerhorn)

5. Critical factors affecting marketing systems (Schermerhorn)

6. Trends in produce marketing (Cook)

7. Commodity systems approach (Schermerhorn)

8. Analysis process for systems approach (Schermerhorn)

	Exc	Good	Fair	Poor	Very Poor	Comments
4. Evolutionary processes of marketing systems (Schermerhorn)	11	7	1	-	-	
5. Critical factors affecting marketing systems (Schermerhorn)	13	6	-	-	-	
6. Trends in produce marketing (Cook)	7	11	1	-	-	
7. Commodity systems approach (Schermerhorn)	9	8	-	-	-	
8. Analysis process for systems approach (Schermerhorn)	8	8	3	-	-	

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Wednesday, August 26

**I. Lectures**

- 9. Postharvest behavior of commodities (Morris)
- 10. Commercial control of deterioration (Morris)
- 11. Maturation & maturity indexes (Reid)
- 12. Harvesting systems (J. Thompson)
- 13. Temperature: Responses and requirements (Morris)
- 14. Temperature management: precooling (J. Thompson)
- 15. Temperature management during transport & storage (Kasmire)

	Exc	Good	Fair	Poor	Very Poor	Comments
11	8	-	-	-	-	
8	10	-	-	-	-	
10	8	1	-	-	-	
4	15	1	-	-	-	
8	11	2	-	-	-	
7	12	-	-	-	-	
5	11	3	-	-	-	

Thursday, August 27

**I Lectures**

- 16. Sencence as a stage of development (Labavitch)
- 17. Fruit ripening & role of ethylene (Pratt)
- 18. Ethylene physiology (Yang)
- 19. Ethylene technology (Reid)
- 20. Modified atmospheres (Kader)
- 21. Sources of information (Kader)

	Exc	Good	Fair	Poor	Very Poor	Comments
4	10	4	-	-	-	
3	12	3	-	-	-	
8	14	2	-	-	-	
8	10	-	-	-	-	
8	10	-	-	-	-	
7	10	2	-	-	-	

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22. Library session  
(Sherlock)

Exc	Good	Fair	Poor	Very Poor	Comments
3	14	2	-	-	

Friday, August 28

I. Field Trip (Sacramento)

Raley's Distribution Center

Service Wholesaler

Honey Dew Packing

Exc	Good	Fair	Poor	Very Poor	Comments
10	6	3	-	-	
5	12	2	-	-	
11	5	3	-	-	

II. Lectures

24. Postharvest pathology  
(Sommer)

25. Postharvest treatments  
for decay  
(Ogawa)

III. Demonstrations

26. Postharvest diseases  
(Sommer)

27. Treatments for  
disease control  
(Ogawa)

Exc	Good	Fair	Poor	Very Poor	Comments
1	11	6	-	-	
6	11	1	-	-	
5	12	2	-	-	
4	10	5	-	-	

Saturday, August 29

I. Field Trip (Stockton)

Farmers Market

Grower's Coop

Farm visits

Exc	Good	Fair	Poor	Very Poor	Comments
6	6	5	1		
4	10	4	-	-	
4	11	3	-	-	

Monday, August 31

I. Lectures

29. Preparation & packaging  
(Mitchell)

30. Palletizing, loading,  
transport  
(Kasmire)

31. Quality: description &  
measurement  
(Kader)

Exc	Good	Fair	Poor	Very Poor	Comments
6	10	-	-	-	
9	8	-	-	-	
11	6	1	-	-	

	Exc	Good	Fair	Poor	Very Poor	Comments
32. California standarization and inspection (CDFA)	4	11	3	-	-	
33. Tomatoes, peppers & eggplant (Slatveit)	3	8	1	-	-	
34. Handling systems for above (Cantwell)	6	10	3	1	-	
35. Melons, pumpkins & squash (Pratt)	2	11	4	1	-	
II. Demonstrations						
36. Measurement & description of quality attributes	3	11	1	-	-	
37. Federal grade standards	5	10	1	-	-	

Tuesday, September 1

	Exc	Good	Fair	Poor	Very Poor	Comments
I. Lectures						
38. Session A - Tropical fruits (Lizada)	4	9	6	-	-	
39. Session B - Tropical Fruits (Cantwell)	7	8	3	-	-	
40. Avocados (Eaks)	-	7	11	1	-	
41. Pineapples (Lizada)	1	12	4	1	-	
42. Citrus (Eaks)	-	10	6	-	-	
43. Control of decay: tropicals & sub-tropicals (Eckert)	6	10	-	-	-	

II. Demonstrations

	Exc	Good	Fair	Poor	Very Poor	Comments
44. Commodity responses to environment	3	13	1	-	-	
45. Temperature & humidity measurements	3	11	2	-	-	

Wednesday, September 2

I. Lectures

	Exc	Good	Fair	Poor	Very Poor	Comments
46. Tropical root crops (Lizada)	1	16	1	-	-	
47. Immature vegetable fruits (Cantwell)	8	9	2	-	-	
48. Grapes (Nelson)	3	14	2	-	-	
49. Temperate - zone fruits & berries (Mitchell)	2	8	6	-	-	
50. Ornamentals (Reid)	12	7	-	-	-	
51. Leaves, stems and inflorescences (Cantwell)	7	8	4	-	-	
52. Temperate zone root crops (Cantwell)	6	7	5	-	-	

Thursday - Saturday September 3 - 5

I. Field Trip

	Exc	Good	Fair	Poor	Very Poor	Comments
San Francisco, Salinas	9	7	-	-	-	
53. American President Lines	11	8	-	-	-	
54. Produce Market	-	5	7	4	-	
55. Air transport	4	14	1	-	-	
56. Mangos and papayas (S. Lakshminarayana)	2	13	3	-	-	
57. Lnanas & plantains (R. Woodruff)	-	5	7	7	-	
58. Lettuce marketing order program (H. Bradshaw)	2	6	1	-	-	

REDUCTION OF POSTHARVEST LOSSES IN PERISHABLE CROPS

Course Evaluation Part 2  
September 7 - 18, 1987

	Excellent	Very Good	Satisfactory	Poor	Very Poor
<u>Monday, Sept. 7 -</u>					
1. Review of Commodity Systems in Eastern Caribbean (Jerry LaGra)	5	4	7	-	-
2. Propagation of Fruit Crops & Relation to Quality/propagation & Management Effect on Quality (Rafael Marte)	8	5	2	-	-
<u>Tuesday &amp; Wed., Sept. 8 &amp; 9 -</u>					
3. Preproduction/production of root crops (Steve Harris)	2	5	8	-	-
4. Harvest of fruits/vegetables/ root crops (Steve Harris)	1	6	8	-	-
5. Domestic Marketing Systems - Case Studies (Jerry LaGra)	2	8	5	-	-
6. Intra-Regional Trade - Case Studies (Steve Harris)	4	7	4	-	-
7. Extra-Regional Trade - Case Studies (Jerry LaGra)	2	4	9	-	-
<u>Thursday, September 10 -</u>					
8. Field Packing of grapes - Lodi	1	6	6	1	-
9. Stuart Nursery - French Camp	1	8	5	1	-
10. Melon Packing - Turlock	-	2	7	5	-
11. Sweet potato production, harvesting, storage - Atwater	12	3	-	-	-
12. Tomato packing - Merced	3	9	3	-	-
13. Small farm operation	-	4	6	4	-

REDUCTION OF POSTHARVEST LOSSES IN PERISHABLE CROPS

Course Evaluation Part 2  
September 7 - 18, 1987

	Excellent	Very Good	Satisfactory	Poor	Very Poor
<u>Friday, September 11 -</u>					
14. Pam Pack	-	4	8	1	-
15. USDA Horticultural Field Station, Postharvest Research Programs. Insect Disinfection treatments - Film packaging	2	10	3	-	-
16. Loading patterns - trailers and containers Reedley Station - Melon Production	-	2	8	3	-
17. Small farm operation, field packing UC Field Station (Frank Lucero)	5	8	2	-	-
<u>Sat., September 12 -</u>					
18. Yosemite	11	4	-	-	
18.a. Gonzalo's talk	2	6	1	-	
<u>Monday, September 14 - 18</u>					
19. Work Sessions - Coordinators					
a. LaGra	2	1	?	-	
b. Harris	-	-	1	-	
c. Marte	2	3	-	-	
d. Schuur	3	2	-	-	
	Yes	Maybe	No		
19. b Results applicable?	13	2	1		
19. c Useful?	12	2	-		
19. d Involved Communications?	7	4	3		

REDUCTION OF POSTHARVEST LOSSES IN PERISHABLE CROPS

Course Evaluation  
Part 3  
September 21 - 25, 1987

	Excellent	Very Good	Good	Poor	Very Poor
1. Apples & melons (John Trail)	-	14	6	-	-
2. Apples & Grapes (Ron Shurtleff)	-	6	13	-	-
3. Heneqqler Packing House (Joe Heneqqler)	2	10	7	2	-
4. Apple-grower (Chuck Marshall)	2	10	7	-	-
5. Presentation on Preharvest treatment, harvesting, transport, processing & storage (Dr. Mike Holt)	7	10	3	-	-
6. University of Idaho Experimental Station					
a. Karl Van Slike, Director	1	9	10	-	-
b. Onions growth (Gary Beavers)	4	12	4	-	-
c. Marketing Onions & Apples (Larry LInk)	-	9	10	-	-
7. Dickson Frozen Foods	6	4	9	1	-
8. Onion Field	3	12	5	-	-
9. Onion-drying Operation	-	5	13	2	-
10. Onion-packing Operation	-	9	9	1	-
11. Potato Production (Gary Beavers)	6	7	5	-	-
12. Nematodes (Saad Hafez)	7	8	4	-	-
13. Lunchtime Marketing Talk	3	5	9	-	-
14. Simplot - potatoe processing (Jim Davis)	8	8	3	-	-

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REDUCTION OF POSTHARVEST LOSSES IN PERISHABLE CROPS

Course Evaluation  
Part 3  
September 21 - 25, 1987

	Excellent	Very Good	Good	Poor	Very Poor
15. Evaluation of University of Idaho Experimental Station(Bill Simpson)	4	10	6	-	-
16. Postharvest Institute of Technology (Tom Dechart and Paulette Foss)	7	9	4	-	-
17. Idaho State Dept. of Agriculture; Quality & Grading Standards; Idaho Crop Improvement Association (Roger Vega)	1	5	12	3	-
18. Seed Pathology	7	6	5	-	-

POSTHARVEST LOSSES IN PERISHABLE CROPS

COURSE EVALUATION

The primary goal of this course was to develop an understanding of the framework needed to assess and reduce postharvest losses of perishables.

The following are secondary goals of the course. Please evaluate the course content based on these goals and the parameters for each.

1. Description of Food Systems

PH losses must be assessed in the context of the food or commodity system in which they occur. How well did the course describe the following:

	Very Well	Fairly Well	Adequately	Inadequately	Did Not Discuss
A. Social & Political Environment	4	7	8	2	--
B. Production Planning	7	14	-	1	--
C. Production Methods	6	11	3	1	--
D. Harvesting	14	5	2	-	--
E. Postharvest Handling	17	4	-	-	--
F. Infrastructure	4	9	7	1	--
G. Government & Private Institutions	5	6	10	-	--
H. Consumer Preferences	6	10	2	3	--
I. Market Preparation	9	7	2	2	--
J. Marketing	15	2	1	2	--

2. Identification of PH Losses and Their Magnitude

The magnitude of PH losses can be determined by direct observation or from individuals directly involved in the system.

A. How thoroughly were the various food systems involving fruits and vegetables in California and Idaho discussed and examined for the magnitude and types of losses occurring in them?

Very Well	Fairly Well	Adequately	Inadequately	Did Not Discuss
9	9	3	--	--

B. How well were these losses related to losses in your region/country?

Very Well	Fairly Well	Adequately	Inadequately	Did Not Discuss
2	5	9	4	--

C. Did the course help you to identify losses occurring in the systems with which you work in your own country?

Yes 19 No 1

To what degree?

In-Depth	Somewhat In-depth	Adequately	Inadequately	Did Not Help
6	7	5	2	--

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3. The Nature and Causes of PH Deterioration

A. How much did you learn about the following biological and physiological aspects of postharvest deterioration?

	Learned very Much	Learned Something	Didn't learn Anything	Wasn't Discussed
Physiological	17	4	--	--
Compositional	9	12	--	--
Morphological	8	11	1	--
Pathological	14	7	--	--

B. Please rate the following learning aids in terms of their effectiveness in discussion of the biological and physiological aspects of PH deterioration.

	Extremely Effective	Somewhat Effective	Adequate	Not Effective
Classroom Discussions	10	7	4	--
Demonstrations	13	7	1	--
Films & Video	14	5	2	--
In the Field	13	6	--	--
Proj. Profile Prep.	16	2	3	--

4. Presentation of Methods for Reducing PH Losses

The methods available for reducing PH losses in handling, processing and marketing range from simple, non-technical changes in management to highly complex, expensive changes in technology. The choice of the appropriate method for affecting a positive change in the food system must rely on the economic evaluation of the system.

A. Were basic concepts and principles underlying the practices and methods for controlling deterioration discussed?

Yes 21 No --

To what degree?

To A Great Degree	To an Adequate Degree	Inadequately Covered	Not Covered
10	8	2	--

B. How in-depth were your discussions and observations on methods for reducing PH losses?

In-Depth	Somewhat In-depth	Adequate	Inadequate	Not observed or Discussed
7	9	5	--	--

C. To what degree did you discuss the types of agricultural systems in which these methods might be appropriate?

To A Great Degree	To an Adequate Degree	Inadequately Covered	Not Covered
3	14	4	--

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5. Economic Evaluation of the Food System

In order to avoid the disasters that often result from the "quick technological fix", proposed changes in the food system must be evaluated as to the economic impact they will have on the system. In order to make a valid evaluation, the economic efficiency of the existing system must first be evaluated.

Based on what you learned in this course, will you now be able to recognize whether appropriate economic analyses have been completed and whether an examination of the marketing system for a particular commodity has been done?

Will be able to recognize	May Recognize	Not Sure	Will Not Recognized	Not Discussed
11	14	1	--	--

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6. Integration of Course Information

A. Did you understand the material presented in the course?

Understood Everything	Understood Most Material	Understood Some Material	Did Not Understand Most Material	Did Not Understand Any Material
3	16	2	--	--

B. How much of the information presented will you use in your home country?

Will use all information presented	Will use most information presented	Will use some information presented	Will not use most information presented	Will not use any information presented
--	10	10	1	--

7. General Course Comments

A. What features of the course did you think were most effective?

B. Which features were least effective?

C. What problems did you encounter with the course?

- D. What suggestions do you have for solving those problems?
- E. What was your general impression of the speakers?
- F. What was your general impression of the course content?
- G. Would you recommend this course, or a similar one, to your cohorts? If so, what level of education/experience should participants have?
- H. Please comment on the overall course.

I. What were your goals and expectations for this course?

J. What were you told to expect from this course before you left home?

K. Did you acheive your goals?

Best wishes on your return to the West Indies, we'll miss you!

Signed,

Tom Dechert  
University of Idaho

Beth Greenwood  
University of California, Davis

10993m

## I. DESCRIPTION OF THE PRODUCTION & MARKETING SYSTEM OF MANGO IN GRENADA

### PROPAGATION:

All mango cultivars presently grown in Grenada are propagated at the government nursery at Mirabeau using propagating material from a plant museum located in the vicinity. With the bias towards export oriented production (proposed by the Crop-Diversification and Rehabilitation Project), management at the nursery concentrate on producing mainly those cultivars meant for the export market - i.e. Julie, Ceylon, Peach, Bombay and Graham. Only negligible quantities of local varieties (long rose) are produced and these are normally used as windbreaks. No phytosanitary regulations are adhered to at the nursery. Distribution of plants begins in July with the onset of the heavy rains; only those plants remaining after orders have been fulfilled are sold freely.

### PRODUCTION:

Mango is not a cultivated crop in Grenada, and consequently there are no pure stands. In fact the plant benefits largely because of its location in a plot with other crops for which cultural practices are routine: for example, in a cocoa plantation. Lack of, or limited pruning has resulted in the evolution of trees with varying heights, lines and shapes. Since the implementation of the CDRP project, emphasis has been placed on improving all cultural practices with the eventual intention of producing greater quantities of high quality mangoes for identified extra-regional markets. Today CDRP employs a team to do periodic spraying of fruits to prevent anthracnose, and ten (10) cents is deducted from the revenue on every pound of mangoes sold to facilitate improved cultural practices - e.g. fertilizer application and pruning.

### HARVESTING:

There is presently no set criteria for determining maturity for mangoes in Grenada. In fact the parameters utilized only hold for specified cultivars. Hence, maturity is more a trial and error practice which improves with experience. The method of harvest depends largely on the eventual market in which the fruit finds itself. For the local market, stoning, shaking and the pick and catch methods are popular. For the individual market, more care is taken because of the heavy losses that may be incurred if the fruit is not handled properly from this stage. Here, a picking stick containing a ring, blade and a bag is used for harvesting table varieties whereas fruits for Chutney are handled with slightly less care. Finally for the extra regional market, since greater care is required, a number of picking devices have been tried with varying degrees of success. Because mangoes are harvested during daylight hours, and sometimes before senescence begins, there is usually a continuous latex ooze shortly after picking. To remove it from the fruit, a wet cloth or bucket of water may be used for fruit destined for the local or regional market. In the case of mangoes for the extra-regional market, fruits are dipped in Genlate solution and immediately packed into field boxes. Traffickers often use bags, boxes and old banana crates for the same purpose.

### POSTHARVEST:

In an attempt to reduce field heat, vital heat and minimize ethylene production, all mangoes for the extra-regional markets are transported from the field in refrigerated trucks and eventually brought to a packing house to await grading and packaging. Eventually, the boxes are packed into a cold zone (55) whence they are transported to British Airways (Point Salines) at the time of shipment. For the regional market however, after latex has been cleaned off, the fruits are kept in shade and packed in crates at the edge of the field or brought to the docks where they are cleaned and packed into boxes. Crates or baskets are subsequently lifted by a block and tackle

system and lowered either into the hold where temperature and relative humidity average 95 F and 95% respectively - or they may be kept on deck and be subject to splashing from waves. Sailing time to Trinidad averages twelve hours.

Postharvest treatment for locally consumed mangoes varies, depending on the distance between producer and final consumer. Here, since fruits are generally harvested mature, they are either consumed immediately, kept in boxes awaiting display in local markets and shops, or sold by special arrangements to hotels and supermarkets when only little cooling is done before final consumption.

#### MARKETING:

The marketing arrangements for Grenadian mangoes exported extra-regionally remains an interesting issue. Only the Julie variety is exported for which there are two buyers in the UK. Payment is not based on the FOB value of a consignment, but rather on the quantity that results after postharvest losses, then payment is up to the buyer after this has been discussed. Payment for a consignment occurs one month afterwards.

The regional market also has features that make it unique. In some cases, the trafficker is the wholesaler and retailer, in which case he travels by air facilitating early sale for his produce. Otherwise, fruits may be sent to relatives by boat, with an accompanying letter; products (consumers items) are almost always bought with the proceeds and shipped back with an accompanying letter also. As a third alternative, traffickers take their mangoes to Trinidad and leave them solely with relatives who do the marketing.

Domestically the mango market is handled by two groups of farmers. Those farmers having farms one acre or less sell their own produce to the local market using an ad hoc grading system and price discontinuation to differentiate quality. However, as farm size increases, so does the level of husbandry, hence in an attempt to obtain better prices for quality mangoes, the main selected outlets are supermarkets, hotels and restaurants.

#### PRICING POLICY:

A three-man team within the management hierarchy of MNIB determines prices fair to farmers selling mangoes to the institution. For shipments on consignments, however, the buyer in the UK often quotes the best price he can pay. On the local and regional markets, the consumer is king, hence price is primarily determined by supply and demand and the multiplicity of factors that affect them. In 1985, the value of tropical fruits to Trinidad made a greater contribution to GNP than the aggregate of the three traditional crops. Julie mango makes a valuable contribution to the figure. Agricultural exports declined substantially when shipments were prohibited due to the presence of the seed weevil in certain Eastern Caribbean states.

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LIST OF CONSTRAINTS TO MANGO DEVELOPMENT IN GRENADA

1. Lack of awareness/interest/of farmers in using nursery
2. Suitability of cultivars
3. Labour/high/lack of back
4. Disease problems
5. Transportation/distribution/extension
6. Inadequate extension work
7. Inadequate cultural practices
8. Research spraying/pruning/fertilizing
9. Inappropriate harvesting methods
10. Short storage life
11. Exposure to environment on decks
12. Lack of maturity index
13. Transport product
14. Uneven stacking on ship
15. Inadequate transport crates
16. Seasonality in product
17. Timely input for propagation/polyethelene bags/potting mixture
18. Lack of control over market
19. Lack of good market information
20. Low supply for export market
21. Absence of grades and standards
22. Limited utilization of common varieties of mangoes
23. Inadequate collecting and packaging centers
24. Lack of statistical information
25. Infrasturcture
26. Lack of pure stand
27. Topography
- 28.
29. Location of nursery
30. Market to Trinidad
31. Lack of technical knowledge in mango production/
32. Postharvest losses, etc./ see 6
33. Climate condition
34. Lack of contact between extension/farmers
35. Political (in)stability
36. Low priority
37. High postharvest losses

GRENADA

GENERAL OBJECTIVE

To increase the availability of mangoes in Grenada for export at competitive price

SPECIFIC OBJECTIVE

To increase production/productivity of high quality mangoes for export

OUTPUTS

1. Better distribution of carefully selected plant material including an increase in acreage of pure stands.
2. Controlling incidences of pests and diseases by integrated pest management.
3. Well trained labour
4. Better trained farmers especially in top working
5. Better trained and equipped extension service
6. Improved linkage between research and extension

LOGICAL FRAMEWORK  
VERIFIABLE INDICATORS & GOALS

	1985	1987	Goal
Reg	300 tonnes	-	(1994+7)
Ex Reg	40 tonnes		400 tonnes
		200	600 tonnes

Increase in Quantity per acre > 100%

Utilization of at least two improved cultivars. Julie and Imperial.

>% increase in farmers using better planting material

% reduction in mango damage due to pests and diseases

% increase in quantity of trained labour

ASSUMPTIONS & CONDITIONING FACTORS

1. Mango project be one priority of government for 5 years.
2. Demand on export market remains high
3. Trinidad market opens again
4. Other regional markets

1. Assuming postharvest problems, (poor handling, inadequate facilities, inappropriate transport and crates) be covered by postharvest project.
  2. Postharvest project (FAO) should take care of disorganized collection by hucksters.
  3. Assuming marketing project (CIDA) and government solve the problems which lead to uncertainty in the market and establish a system of grading, standardization and quality.
  4. Climate
  5. Cultivar "mango" have always a seasonality.
- 
1. Improve the interest of labour in Agriculture
  2. Improve credit system (World Bank Project)
  3. Pest & disease programme is not sufficient

<u>INPUTS</u>	<u>AMOUNT \$ EC</u>	<u>ACTIVITIES</u>	<u>OUTPUT</u>
(5) Satellite distribution nurseries 1 pick up New cultivars/ plant material	5 x 20,000 \$50,000 5,000	Utilize full capacity of existing plant propagation with labour/equipment -- inc propagation Transport Renovation of 5 outlets Top quality product - selection of appropriate cultivars/planting material Efficient unit -- good price Awareness program through extension services and farmers' organizations Radio programs Priority price planting material for farmers who go to pure stands	Better distribution of carefully selected plant material including an increase in acreage of pure stands
Equipment for nursery spraying/pruning	\$20,000	Utilize existing resource information to formulate appropriate pest control programme for mangoes	Controlling incidences of pest & disease by integrated pest management
Revolving fund for chemicals	12,000	Consultancy with CARDI, U.W.G., other research institutions	
Labour (cost) Nursery (2) Extension (1)	2 x 10,000/yr 18,000/yr	Extension services for training farmers on methods of application, etc. Purchase of chemicals, equipment, etc. - revolving scheme through tree crop farmers association Improved cultural practices, e.g. field sanitation, pruning, spraying.	
Utilization of existing training centers and extension offices - equipment	see outlets	CARDI & CARDATS - programmes in training workers & farmers Specialists - Role of extension offices Set up training program, equipment, information	Well-trained labour Better trained farmers, especially in topworking
Training materials Propaganda Resource material Training farmers & labour	\$10,000		

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INPUTS

Audio visual materials	\$10,000
Research cost	50,000
Equipment, materials salaries	

ACTIVITIES

Training programs for extension officers  
Joint sessions between research and extension

OUTPUT

Better trained and equipped

Ongoing evaluation and post evaluation

Improved linkage between extension and research

Cooperation with postharvest project and marketing project

TOTAL COST  
of project

\$255,000 + 38,000/yr

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## I. DESCRIPTION OF THE PRODUCTION & MARKETING SYSTEM OF BREADFRUIT IN ST. LUCIA

### COUNTRY LEVEL:

#### A Organizational structure and macro-environment.

St. Lucia is a country in the Windward Islands in the Eastern Caribbean located at latitude and longitude . The climate is tropical:

Mean annual rainfall - 68.3 in

Relative humidity - between 60 - 90%

Annual mean temperature - 24.6 C

Wind - subject to threat by hurricanes during June-November, however since the 1900's only a few hurricanes have done significant damage.

Soil and topography - generally throughout the island there is deep loamy-clay soil. Slopes vary from less than 5% to over 20% slope. Most cultivable land is within the range of 5% slope to over 10% slope. Natural forests are found in over 20% slope.

Land use - from the total land area of St. Lucia, there is 4.7% with limitations for cultivating agricultural crops while 83% is under pasture and tree crops and permanent tree crops.

Breadfruit has been identified as a priority crop

due to: (i) its market potential

(ii) the possibility of increasing its production & productivity

(iii) its suitability to the environment conditions

### **POLICIES AND AGREEMENTS**

At the national level, duty free concessions have been granted for exporting of Breadfruit along with most other crops.

At the Regional level there are no restrictions for exporting Breadfruit. Internationally, there are no restrictions due to formal agreements such as CBI-USA and for Europe and Canada, the agreement between EEC and the ACP states.

### **ORGANIZATIONAL STRUCTURE**

#### **PRIVATE SECTOR:**

The private sector includes the farmers and farmers' organizations as well as exporters and agroprocessors.

The main producers of Breadfruit are small farmers: average farm size - 5.2 acres. Production is scattered: average number of trees per acre - 19.

There are 12 farmers organizations of which 5 are involved in marketing of perennials.

There are several large farms of over 50 acres which are not important producers of Breadfruit but which have potential for future planting.

Of the 9 general exporters of agricultural produce, 6 are involved in the export of Breadfruit.

There are 14 agroprocessors but none of these process Breadfruit (there is therefore much potential for processing of Breadfruit).

### **PUBLIC SERVICES:**

There are several institutions which impact on agricultural development; these include:

- (i) Extension Services - provided by CARDI, CAEP, MDA, SLBGA, Winban, Staff co-op.
- (ii) Credit - SLDB which provides secured credit for production and marketing as well as various commercial banks and credit unions. Credit is however not effectively utilized because the farmers do not have adequate security.
- (iii) Research - some of the institutions conduct research on specific crops, e.g. Winban on bananas; the MOA UWI and TDRi on various fruit crops, however, the amount of research done on Breadfruit is nil.
- (iv) Training - In service training for agricultural extension agents and farmers, is done by the aforementioned institutions. Training for banana farmers supercedes other fruit crops due to the current importance of bananas to the economy of St. Lucia. Training on Breadfruit production specifically is not done.
- (v) Marketing information - is made available through the following institutions CARDI; through the MOA. The marketing information on bananas given by the SLBGA is adequate. The information on vegetables and fruit crops is moderate but on Breadfruit specifically is low.

### **B. Preproduction, Production and Harvesting**

#### **Preproduction:**

- (i) Infrastructure - there are three nurseries with adequate capacity but condition needs to be improved as facilities are inadequate for the propagation of Breadfruit.
- (ii) Propagation at present is by traditional methods but this is inadequate for mass production of Breadfruit plants.
- (iii) planting material - there is no selection of genetically superior cultivars but the amount to choose from is abundant.
- (iv) Distribution systems are based on first come first served.

### **C. Postharvest handling**

- (i) Grading is done manually by visual assessment. Grading for maturity and size are done. For the local market variable sizes are used whereas for the export market fruit must weigh more than 2 lbs. Maturity is determined by skin colour and the size of the "eyes." Grading standards used are not documented but are widely accepted.
- (ii) Selection for mechanical damage, general defects, e.g. galling is also done. For the export market, the fruit must have its peduncle attached as well.
- (iii) Packaging in baskets and sacks is done for the domestic market. Cardboard cartons are used in the export market.
- (iv) Transport of Breadfruit is done manually from the tree to the collection point. From the collection point to the packing house, by pickups or trucks, from the packing house to the airport by pickups or trucks and from the airport to the final destination by aircraft.
- (v) Storage in the shade of a tree is done at the farm for not more than 2 hours. At the packing house storage is for approximately 2 hours or less in the shade. Storage for 2-3 hours in the sun occurs at the airport. Total storage of harvested Breadfruit is therefore less than one day.
- (vi) There is no cooling done for this commodity.

- (vii) Physical treatment includes trimming of the peduncle and washing in cool water. There are no chemical treatments.
- (viii) Delays occur at the airport due to the regulations in terms of times of acceptance of cargo by the airlines; flight delays are however infrequent.

D&E: Marketing:

Exports - at the airports, the facilities with regard to the number of scales and holding area are inadequate - this is being corrected presently. Airline regulations stipulate that each carton be weighed for documentation purposes. Information required verifies tonnage and number of cartons exported per shipper.

The tonnage allocation by air to Europe is insufficient with respect to the total production and demand for Breadfruit. Export intra regionally is minimal. Facilities, regulations and transport at the seaport are adequate. No experience with seashipment of Breadfruits.

Domestic:

Fresh marketing in towns and villages is good; this is done mainly by the farmer. Marketing at hotels and supermarkets is also good and farmers and intermediaries are involved. Cruise ships are usually good markets for many crops but for Breadfruit it is nil. Breadfruit is not used in agroprocessing.

F. Regional organization:

Organizational structure: institutions involved in regional trade of agricultural commodities are Caricom, OECS and Winban. Policies and agreements made by these institutions influence regional trade. Regional handling of breadfruit is limited.

Demand:

Extra regional: During the peak period (June - July) the UK market can be swamped with Breadfruit (experienced in 1985/86 when 80 tons/week was too much). There is however, an unsatisfied demand during the rest of the year in the UK. Volume demanded in Europe and Canada is unknown. The U.S. requires approximately 35,000 lbs per week. St. Lucia can therefore supply the UK market during peak period but for the rest of the year the supply is inadequate.

The quality supplied by the St. Lucian farmers is high and this quality is demanded by the export markets; the quality at the port of delivery however is usually poor.

Prices available to the farmer is approximately U.S. .38/unit whereas FOB is U./S. .29/lb to the exporter. Prices are therefore relatively good.

Regional demand is unknown and should be explored.



Storage

Improper holding conditions i.e. refrigerated trucks, shed (not necessarily refrigerated)

Delays at airport due to slow documentation

Delay because of individual weighing

Treatments

Short shelf life of breadfruit

no removal of field heat

no control of ethylene release (Vacuum pack - Shrink wrap)

general damage (pest & disease, physical)

D. Preproduction Shortage of good planting material

Infrastructure - inadequate facilities for propagation of breadfruit

Propagation - inadequate propagation techniques for massive production

Planting Material - no selection/variable quality

lack of dwarf planting material

lack of uniformity

lack of quality

Distribution System - lack of organized distribution

MACRO ENVIRONMENT

Topography - steep slopes make difficult harvesting

Policies & Agreements NATIONAL

There is not a clear policy for the role of breadfruit in import substitution

Same for breadfruit with respect to crop diversification

No clearly defined method of stimulating private sector exports

No clear policy for research on breadfruit

Policy for agroprocessing of breadfruit is undefined

Organizational Structure

Private Sector

Farmers - not readily receptive to changes in production techniques

Exporters - no organization among exporters

lack of bargaining power (insufficient incentives)

Agroprocessors - (needs to be developed) no processing of breadfruit

SK

IV. Logical Framework

Breadfruit St. Lucia

General Objective

Increase foreign exchange earnings

Indicators

Farmers's income from sales of Breadfruit increase 50% by year 8

Assumption

No major currency devaluation

Specific Objective

I. Increase production/tree of high quality B/fruit and extend the harvest season

Increase tonnage of B/fruit from x to xy by year 8

That no new outbreak of pest & disease

Outputs

Adequate quantity of planting material available

System of distribution in place and operating

Trained personnel on plant propagation & nursery management

25 persons trained on plant propagation and nursery management  
# of courses  
# in service training  
# of demonstrations

High quality & clean plants released

improved local clones available  
introduced selected clones  
described standards for the release of plants

Reduced risk of spread of pests & diseases

10 farmers trained in prophylactic measures

persons follow instructions

the sterilization of the media

Production season extended

selected early & late local clones  
introduced early & late clones

farmers willing to participate that planting material can be Obtained (intro)

increase in the availability of out of season Breadfruit

That results from research are implemented

Technical Packages  
on proper crop  
management practices

Tech. packs available  
# of extension officers trained  
# of farmers trained  
# of demonstration plots  
# of inservice training  
seminars  
# of courses  
# of field days

Farmers  
attitude positive  
Farmer  
participation

Incentive to farmers

Subsidized inputs  
# of farmers participating  
premium price to top  
quality produce  
Increase on quality of  
B/fruit being produced  
(Award)

Favourable  
Government policy  
on incentives

Specific Objective

II. Reduce high postharvest losses

Indicators

x% reduction in poor quality B/F by year 5

Assumptions

- That cargo facilities are provided by other project currently being executed
- Government policy is positive
- Road conditions are improved
- Tech-pack for rehab is available
- Positive farmers attitudes
- Research has been conducted
- Positive farmers attitude

Outputs

Proper rehabilitation and harvesting techniques available

# of trees rehabilitated  
appropriate harvest tools available  
# of farmers using tools

Adequate packages available

% spoilage reduced  
standardized packages  
# of exporters using packages

positive attitude of users

Breadfruit handlers trained in proper handling techniques

# of handlers trained  
- harvesters  
- selectors  
- packers  
- others

Techniques recommended to extend shelf life of Breadfruit available

less handling  
precooling  
(removal of field heat)  
shrink wrap or vacuum pack  
appropriate time of harvesting in use

That ripening can be controlled to an economical level  
Importance of marginal/subtle chilling is not known  
Accurate maturity standards have not been established

V. Project Activities and Costs (Breadfruit)

1. Propagation and Nursery Management
2. Selection of outstanding clonal material
  - introduction
  - local selection
3. Training
4. Research
5. Incentives
6. Rehabilitation programme

ACTIVITY COSTS (US\$)

1. Propagation and Nursery management
  - (i) Infrastructure - \$ 50,000.00
    - mist system 5,800.00
    - satellite nursery 3,500.00
    - nursery tools 2,000.00
    - nursery equipment 6,000.00
    - other inputs 20,000.00
  - (ii) production of plants
  - (iii) maintenance
  - (iv) distribution
2. Selection of outstanding clonal material \$55,000.00
  - A. Introduction - \$30,000.00
    - (i) identify sources
    - (ii) screening sources
    - (iii) introduction
    - (iv) testing
    - (v) selection
    - (vi) distribution
  - B. Local Selection - \$25,000.00
    - (i) preselection
    - (ii) selection
    - (iii) propagation
    - (iv) distribution
3. Training - \$150,000.00
  - (i) propagation & nursery management
  - (ii) use of tech. pack
  - (iii) rehabilitation of plants
  - (iv) harvesting
  - (v) handling
  - (vi) packaging
4. Research - \$250,000.00
  - (i) testing selection
  - (ii) development of tech. pack
  - (iii) determination of location
  - (iv) improvement programme
  - (v) harvesting
  - (vi) packaging

- (vii) extended shelf life
- 5. Incentives - \$150,000.00
  - (i) input and tool subsidies
  - (ii) awards
  - (iii) premium price
- 6. Rehabilitation programme - \$150,000.00
  - (i) transport
  - (ii) equipment

Personnel	\$	500,000.00
Operational costs		300,000.00
Subtotal		\$1,605,000.00
Others 10%		160,000.00
	US\$	\$1,765,000.00

# I. DESCRIPTION OF THE PRODUCTION & MARKETING SYSTEMS OF SWEET POTATOES IN ST. VINCENT

1.1. Ipomea batatas, sweet potato is a perennial herb which is grown as an annual for its starchy tuber. The age at which cultivars mature varies between 3-5 months. It is an essential staple in the diet of most Vincentians. There exists a healthy domestic & regional market and enough is produced to supply to the extra regional market as well.

## 1.2. Background

Production of sweet potatoes is concentrated in the south central zone of the island (agricultural districts 4 and 5). This zone is characterized by annual rainfall of 2159-2540 mm. The sweet potato is produced mostly on the low level yellow earth soil along the coastline.

Production is concentrated on farms less than five (5) acres in size. In fact, this crop is considered to be a smaller farmer crop. Most holdings are located within three (3) miles of the farmers, scattered and in terrain ranging on gently sloping to rugged topography. Accessibility is variable and renders transport and production difficult in some localities.

Tenureship varies from holding to holding. The largest number of holdings being occupied free hold while annual rental (crown land) share cropping and use of family land occur in descending order of prominence.

There are about sixteen (16) different cultivars of sweet potatoes found on these holdings.

## 1.3. Farming systems

### 1.3.1. Land preparation

Ridge and furrow (4 ft wavelength) system on the contour

Mounds

Manual predominantly

mechanical constraint

-tractors

-availability

-constraint

Fertilizer application - preplant organic & some inorganic

-insecticide - Primid Furidan

-Herbicide - Aldrin and various

inter cropping consideration — acreage consideration

## Planting material & practice

-vine tips (4 to 5 inter nodes)

-planting material from previous crop  
sharing with other farmers

-1-3 persons in planting operation

-vine at angle to the soil (45°)

-propagation of new material through the ministry

-1-2 weeks needed for vines before planting

-better performance

-root initiation

-wound healing of vines needed — quicker response

- Planting in accordance with lunar phases
  - \*timed to response of rainfall
  - \*lesser incidence of pest and disease
  - \*effect on production
- Seasonality of planting w.r.t. anticipated harvest period (high price) e.g. T'ded mkt —effect of rain in T'ded.

Cultural practices

- Weed control, molding & turning of vine
- manual/hoe/slash hoe/1 to 2 weeding

Pest controls - army worms  
moth rats

- Herbicide on lange estatis
- pruning for planting and feed
- fertilizer at first weeding in no mitial
- manure
- stray animals/monkeys

Intercrop - primarily corn & peas  
-banana

Harvesting

Tool - stick cutlass fork hoes/containers  
boxes  
baskets  
bags

Method - hoe/fork - side lifting with fork  
stick - pulling

culls to workers

Trafficers grade/pregrade & field pack  
semi curing needed  
how long in field before assembly  
time from planting

Maturity indicies  
appearance of vine  
random sampling  
size and number  
texture  
sop  
cracks in the soil around roots  
immaturity due to market pressure

- harvesting in rain if necessary
- wash right after harvest and pack without drying
- wash 8 days after harvest & dry for 4 hours
- pack in boxes with benlate soaked coconut coir/shipped at 55 F.

Fielding & packing houses

Laborer

- Land preparation -specified skill
  - farm labor exchange
  - farmers immediate family
  - employee & family

Man agreement of labor - not set systems

Casual practices - farmers and casual labour

Harvest - include all categories

does not               trafficer laborer

Currently no formal standard but situation seems to be changing

- Two systems - regional and domestic
  - extra regional market

- Standards
  - no cut physical immediate problems
  - worms/rot
  - limited cracks
  - immature..shrinkage
  - Act to address grade standards passed but regulation not in place

- Packaging
  - traffickers - sacks and overfilled cartons
  - extraregional 30 - 40 lbs
  - N.A - UK

- Transport
  - from field to roadside - donkey, on head, little by vehicle
  - from roadside vehicle (badly stacked)
  - ... packaging shed on wharf - busses, trucks and pickups
  - packaging shed to port area - same vehicle and hand carts

- Seaport
  - regionally - non refrigerated badly stacked
  - extra regionally - container in palleting (controlled temp)

- Airport
  - Ambient temp. Break bulk intermediate connecting point and then container rinsed and ambient temp

Marketing

Farmer                               Assembly

Trafficers

Intermediaries/transp

Retailers

Extra regional exporter

    ECA

    Gunsam

    Sq. Deal

Marketing Distribution  
Facilities storage  
Transcription - Documentation and other requirements

Final Destination  
-short term storage  
-repackaging  
-wholesale  
-direct distribution  
-retail

Transshipment - by air through Barbados St. Lucia  
regular passenger flight when space available  
charter service when available  
inadequate facilities for handling and holding

Documentation - policy of documentation and customs procedures delay

Final Destination - documentation - relatively simple & organized  
Canada -- 1 week to present documents - leeway given for late presentation of documents

U.K. -- Duty charged refundable upon presentation of documents  
Reception handling & holding satisfactory

Canada -- Agricultural examination prompt and knowledgeable examination  
in warehouse to facilitate importer - communication satisfactory

Repackaging - if there are major symptoms of defects  
Transport - by truck to wholesalers and retailers  
- pick up by wholesalers at importers warehouse  
- pick up by retailers at importers warehouse

### The Macro Environment

#### Agencies and Organizations

Ministry of Agriculture	DEVCO
Traffickers Association	CAEP, UWI, MUCIA
ORD-(IVS) (Univ of Calg)	NFU
CARDI	CARICOM & OECS
CARDATS	
Marketing Corp?	
Donor Agencies	
a) USAID	
b) FAO	
c) CIDA	
d) CDB	
e) EEC	
f) WB	
g) IICA	
h) OAS	
ECA et al	
Shipping Agencies (T	etc.)

Policies and Agreement

- Government Land Settlement Programme for small farmers.
- Government initiated negotiations with regional importing countries on behalf of exporters (traffickers).
- Negotiating landing rights for air freight carriers at trans-shipment points (St. Lucia, Barbados, Trinidad).
- Removal of restrictive trade practices within the OECS.
- No import duties on agricultural inputs
- Provide credit through DEVCO
- Research and development within the MTIA
- Producers Exporters Act - regulating standards, shipping policies, licensing of exporters
- Traffickers Association adoption of policy to regulate trade
- Provide Extension Service - Officers, communication through Farmers' Magazine
- Trinidad's policy with respect to the landing and sale of Caribbean produce.
- Foreign exchange policy
- Trade restrictions in the U.S.A.
- Standards of extra-regional importing countries
- Tourism Incentive Act
- Export Development Strategy

\*\*\*\*\*

CROP PRIORITIES

- Market - Trinidad, Barbados, Canada, U.K.
- Production - Potentially can produce 3 times present production.
- Expansion - Limited by viable enterprises - e.g. banana and ginger production

PRE-PRODUCTION PLANNING

- Market intelligence - demand, in terms of volume, price, variety, regularity of shipment
- Shipping Ports - U.K., Canada, Trinidad and Barbados
- Need to define markets
- Location, acreage, inputs

The farmers plan their production according to their experience. Marketing Information System is informal and opaque. Some information from Trinidad market price (wholesale) broadcasted on radio Antilles 17.10 Thursdays. Extra-regional exporters obtain information via telex every 2-3 days - forwarded to the Ministry of Agriculture.

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## II. St. Vincents Constraints to Sweet Potatoes Development

### Preproduction Planning

- Lack of adequate formal intelligence in current & potential markets
- Lack of market definition
- Lack of perception of need on part of the farmer
- Inaccuracy and inadequacy of current production and marketing data
- Lack of information for farmers to respond to
- Little or no contractual arrangement with farmers
- Responsiveness of farmers to extension
- Cost of production relative to market price
- Availability of labour and inputs
- Lack of proper infrastructure
- Short supply of preferred planting material

### Production

#### Preplanting/Planting

- Lack of timeliness of land preparation
- Shortage of: skilled labor
  - planting material
  - organic fertilizer
- Unsuitability of present land for mechanization
- Soil conservation consideration
- Lack of irrigation in dry season
- Cost, suitability and availability of herbicides and pesticides
- Misuse of chemical due to lack of knowledge on proper usage
- Intercropping - problems caused by: growth & development
- Untimeliness of cultural practices due to: ignorance
  - week-end farmers
  - lack of labor
  - crop competition for farmers resources
- Competition for nutrients between crop/intercrop, harvest and postharvest handling
- Little or no curing time immediately after harvest to minimize possibility of bruising
- Topography limits mechanization and field pack, preparation
- Harvesting of immature tubers due to market pressures
- Improper containers for transportation from the field
- Harvesting is laborous (not attractive to workers)
- Accessibility & condition of feeder roads limit volume and quality of produce to be transported
- Little or no grading at field level
- No formal grades and standards
- Farmers not paid at farm gate by traffickers
- Lack of credit for traffickers
- Improper handling techniques & postharvest treatment
- Poor stacking/handling/during transportation
- Inefficient storage conditions during transportation and at regional destination and air trans-shipment ports
- Unnecessary handling of produce
- The poor quality of sea transportation
- Inadequate protection for produce from the elements - especially at ports
- No direct air lifts to extra-regional outlets

Marketing

- Fluctuation of price on regional markets affects produce availability for extra-regional outlets
- Seasonability of production available for export (vol & qual)
- Little or no contractual arrangement with farmers - farmers sell to highest bidder, etc.
- No effective Traffickers Association, hence no incentive to join
- Condition in which produce is delivered at regional market
- Presence of unethical traffickers and the illicit trade
- Dumping and unfair competition from other suppliers on extra-regional markets (e.g. subsidized air rates, etc.)
- Lack of resources in MTIA to assist in market thrust
- Lack of market intelligence including crop forecasting
- Lack of promotion of commodity in markets
- Inefficient distribution to retailers i regional markets
- Lack of "honest" brokers - need for trade commissioners
- Postharvest losses are not quantified. What economic impact?
- Lack of marketing expertise at all levels and in institutions (cardi/cadats, etc.)
- Lack of training in marketing and handling at all levels
- Lack of marketing credit for market penetration/policy still largely production oriented (government and donor institutions)

\*\*\*\*\*Lack of Systems Approach\*\*\*\*\*

- Lack of coordination between government/donors/institutions
- No access to U.S. Market
- Increased production in regional markets (Barbados & Trinidad & Tobago) leading to protectionism
- Trinidad's policy regarding Caricom traders in fresh produce does not include provision of proper marketing facilities at P.O.S. central market or elsewhere!

### III. Summary of Project Profile, St. Vincent

#### Project Title:

Improvement of Production and Marketing Systems for Sweet Potato in St. Vincent and the Grenadines.

#### GOALS:

- Increase marketable volume of sweet potato
- Increase efficiency of regional marketing system

#### Specific Objectives:

1. Minimize production constraints caused by seasonality
2. Improve farm management efficiency
3. Improve postharvest handling and treatment of sweet potato
4. Strengthen the Traffickers Small Business Association
5. Strengthen the capability of M.T.I.A. to generate, coordinate and disseminate market intelligence

#### OUTPUTS:

1. Statement on the feasibility, or otherwise of introducing irrigation into the new land settlement areas and the areas with moderately sloping terrain.
2. Farm leaders in villages trained in improved production practices for sweet potato; and in basic record keeping.
  - Establish demonstration plots
  - A supply of planting material of improved sweet potato cultivars; suitable for St. Vincent conditions
3. A set of defined grade standards and recommendations for packaging of sweet potato tailored for the regional market
  - Extension workers and farm leaders at village level trained in grading and packing of sweet potato to the defined standards
  - Increased on-farm storage and curing facilities for sweet potato
4. Traffickers trained in grading and packaging of sweet potato to the defined standards.
  - Traffickers trained in record keeping and accounts, and documentation relevant to the needs of the regional trade
  - A supply of packaging material in the Traffickers Association for its members at discounted prices
  - A revolving credit fund established within the Traffickers Association for future provision, at discount to its members, of packaging and other services.
  - Technical assistance for the executive activities of the Traffickers Association.
5. The establishment of a market information unit within the planned Agricultural Planning Division of MTIA (UNDP funded)
  - Regular production of marketing intelligence to farmers, traffickers and general public relevant to the domestic, regional and extra-regional markets through various media devices.

## ACTIVITIES

1. Identification of acreage to be planted with sweet potato within the new land settlement programme.
2. Through the MTIA Extension Department to hold regular village-level training in record keeping for targeted farm lenders.  
Establishment of demonstration plots of sweet potato in strategic areas.  
Through the MTIA Extension Agent to hold regular group meetings (seminars) for dissemination of information and news at the village-level.  
Establish a revolving loan fund for production credit to farmers.  
Identify those varieties more favourable to the market and seasonal environment and to make planting material available to farmers through the MTIA Extension Department.
3. Assist the Grades and Standards Committee in providing a defined set of standards and grades for sweet potato suitable for the domestic, regional and extra-regional markets.  
Through the MTIA Extension Department emphasizing to farmers the need for improved handling and packaging techniques and to demonstrate these techniques.  
Design and demonstrate construction and use of single sheds for on-farm storage and curing of sweet potato. Sheds to be constructed from freely available renewable materials such as poles and thatch.
4. Provide training to traffickers on improved packaging, grading and handling techniques.  
Provide training to traffickers in financial and marketing management  
Provide technical assistance to the Traffickers Small Business Association (TSBA) in the form of an executive secretary.  
Provide financial assistance to the TSBA in support of the executive secretary and their general operating and miscellaneous expenses.
5. Provide financial and technical assistance for the establishment of a market information unit within the proposed Agricultural Planning Division of the MTIA and for which funds are already committed by UNDP.  
Hold a training workshop for Extension officers on the generation, coordination and dissemination of market intelligence and its application to production planning.  
Provide financial assistance for publication and dissemination of market intelligence through the media (both newsheets and radio.)

## VERIFIABLE INDICATORS

- 1.1 Report on farming systems for land settlement program
- 1.2 Finished document of Feasibility study
- 2.1 Number of farmers exposed who have adopted practice (x%)
- 2.2 & 2.3 " " " " " "
- 2.4 Target number of farmers who require credit assistance
- 2.5 Increase in market acceptance of S.P.
- 3.1 Adoption and implementation of regulations
- 3.2 Number of farmers who have improved techniques
- 3.3 Number of sheds erected by farmers
- 4.1 Number of traffickers utilizing improved techniques
- 4.2 Number of traffickers showing improved skill in management
- 4.3
- 4.4

I. DESCRIPTION OF THE PRODUCTION & MARKETING SYSTEM OF DASHEEN IN DOMINICA

1.1 MACRO ENVIRONMENT

1.1.1 MARKETS

Volumes Marketed

Total production of dasheen is estimated at 11,000 tonnes of which 413 are exported.

The balance (10,587 tonnes) is consumed by humans or animals or lost due to damage.

Import Restrictions

USA - Chemical residue controlled  
General - No soil on corms.

Primary Markets

- a. Ethnic groups in U.S., Canada and U.K.
- b. Local populations in the other Caribbean Islands
- c. Market penetration potential exists as Dominica's production is small percentage of total demand in U.K., U.S.A. and Canada.

Market Competitiveness is determined by:

- a. Price
- b. Quality
- c. Presentation and
- d. Volume

1.1.2 Natural Resources

Land in Dominica is characterized by the following:

- a. Very steep land
- b. Farms are marginally accessible
- c. High percentage of land is best suited for permanent crops
- d. Most crops are rain-fed. No irrigation used for the production of dasheen.

1.1.3 Land Use

Land tenure is characterized by the following:

- a. Family land - lack of clear title  
primarily short term crops cultivated including dasheens
- b. Communal ownership (Caribs)
- c. Tendency toward subdivision of farms

1.1.4 Climatic Considerations

- a. Marked by dry period
- b. High elevation farming  
-steep slopes  
-less accessibility

1.1.5 Infrastructure

Roads

- poor farm access roads

Communication

- Radio - principle means of communication
- Telephones (high rates)

Ports

- Remote from dasheen production areas
- Lack of facilities for storage, grading, packing and loading
- Interrupted quarantine services at the port
- Documentation not a problem

1.1.6 Socio-Economic Factors

- Agricultural sector is made up of small farmers
- High cost of living translates into demand for high prices from farmers
- Low educational level of farmers make it difficult to convince farmers to change production/market practices

1.1.7 Government Policies

Government policies which impact upon the production of dasheens in Dominica include the following:

- Crop diversification towards exports
- Estate land re-distribution
- Agricultural credit policy
- Natural resource management
- Infrastructural management (Feeder Road Programme)

1.1.8 National Institutions

Ministry of Agriculture provides:

- Extension Services
- Plant Quarantine Services
- Forestry services
- International Fund for Agricultural Development (IFAD)

Project includes:

- Credit
- Extension Services
- Infrastructure Development

Dominica Export Import Agency (DEXIA) provides:

- Price Information
- Market Information

Agricultural and Industrial Development Bank (Aid Bank) provides:

- Credit

1.1.9 Private Sector

Dominica Hucksters Association (DHA) facilitates:

- Credit
- Market information
- Packaging
- Training

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- Farm To Market (FTM) provides:
  - a. Training
  - b. Marketing
- 1.9.3 Other Exporters
  - a. Cecil Joseph
  - b.
- 1.9.4 Dominica Banana Marketing Corporation (DBMC) supplies:
  - a. Inputs
- 1.10 Regional Institutions
- 1.10.1 Association for Caribbean Transformation (ACT) provides:
  - a. Market information
  - b. Training
- 1.10.2 Caribbean Agricultural Research and Development Institute (CARDI) provides:
  - a. Research (postharvest life)
  - b. Training
  - c. Sourcing planting material
- 1.10.3 Caribbean Agricultural Trading Company (CATCO) has carried out:
  - a. Test marketing
- 1.11 International Institutions
- 1.11.1 Tropical Development Research Institute (TDRI) carries out:
  - a. Pesticide residue analysis
  - b. Packaging research
- 1.11.2 Food and Agriculture Organization (FAO) is involved with:
  - a. Infrastructural development (Port)
  - b. Storage (ventilation of schooners)
  - c. Packaging
- 1.11.3 USAID finances
  - a. Infrastructure (Roads)
- 1.11.4 European Development Fund (EDF) finances
  - a. Roads
- 1.11.5 Caribbean Development Bank (CDB) finances
  - a. Roads

## II. PRODUCT FLOW DIAGRAM

<u>ACTIVITY</u>	<u>TYPE FUNCTION</u>	<u>OBSERVATION</u>
1. <u>Pre-production</u>		
a. Land preparation		Manual
b. Collection of planting material		Farm family or hired labour
c. Transportation		From collection point to site
d. Selection		Farm family/hired labour
<hr/>		
2. <u>Production</u>		
a. Planting		Farm family/hired labour
b. Weeding		2 months after planting
c. Fertilizing		Soon after weeding
<hr/>		
3. <u>Harvesting</u>		
a. Maturity indices		Yellowing of leaves, appearance
b. Selection for harvest		of corms on surface, age of crop 7-9 months
c. Uprooting		Loosening of soil using cutlasses, forks or stakes
d. Selection		Discarding of damaged corms
e. Cutting leaf stalks		Use of cutlass
f. Scraping excess soil from corms		Back side of cutlass
g. Bagging		Fertilizer bags and sacks
4. <u>Postharvest</u>		
a. Transportation		From field to road-manually
b. Storage		From road to home
c. Cleaning		Ambient temps. in fertilizer sacks
d. Selection		Scraping, rubbing, washing
e. Packaging		Grading for market
f. Transportation		Bags, cartons - Depending on market
		From home to market
5. <u>Marketing</u>		
<u>Domestic Marketing</u>		
a. Retail		Small heaps at fixed price
b. Wholesale		Institutions, vendors,

ACTIVITY

TYPE FUNCTION

OBSERVATION

Regional Marketing

- a. Purchasing
- b. Documentation
- c. Transportation
- d. Temporary storage
- e. Transportation to port
- f. Loading
- g. Transportation to islands

From farm and public market by bags  
Agents or private/public institutions  
From farm or home to port  
Ambient temperature in bags  
Hired vehicle (mixed loads)  
Manual/cranes  
By air or boat

Extra Regional Marketing

- a. Farm/home to exporters pack
- b. Trim stalk
- c. Wash off dirt
- d. Mix Ridomil/Benlate (mbc 60 wp)  
Dip in fungicide mix
- e. Drain/dry
- f. Place plastic in carton
- g. Pack corms in carton
- h. Label boxes
- i. Documentation
- j. Transport cartons to port
- k. Load on ship
- l. Telex to buyer

a. transported in bags in public/private vehicles to collect mixed loads  
b. 2-3 inches left, cut by employees of exporter  
c. in running water/cut drums  
d. 1/2 oz (4tsp) Ridomil in 6 gal water in cut drums, corms held with gloves  
e. on a rack in pack house  
f. maintain humidity  
g. fibreboard, 40 lbs  
h. consignee, product, address  
i. done by exporter, phytosanitary and shipping agent  
j. private or hired vehicle  
k. cranes, Geest boat. Shipment fortnightly. Reifers/lockers. Loading supervised by Geest. Done by exporters, hired vehicles  
l. States: quantity, date shipped to small scale buyer in U.K.

### III. LIST OF CONSTRAINTS TO THE DEVELOPMENT OF DASHEEN PRODUCTION AND MARKETING

#### 1. Macro Economy Constraints

- Credit limited to land reform farms
- Farmers don't have enough security to obtain credit
- High cost of living
- Lack of incentive for large estates to get into production
- Lack of sufficient education to farmers
- Scarce estate land divided into small plots
- Lack of clear policy as to who should generate production information
- Distinct dry period limits production
- Lack of sufficient farm access roads
- Lack of proper land ownership documents
- Low standard of living
- Steep land
- High cost of road construction

#### 2. Pre-Production

- Poor hole preparation tools and consequently hole preparation (use of pointed stick)
- Lack of plant material at nurseries
- Lack of production planning

#### 3. Production Constraints

- Lack of enough pure stand production
- Not enough selection of planting material for desirable characteristics
- Not enough weeding
- Not enough fertilizer
- Spacings too wide (planting)
- Not enough research
- Too many small plots
- High cost of production
- Low yields
- Credit not easily accessible
- Lack of proper fertilizer mix
- High rate of erosion on steep land

#### 4. Harvest

- Lack of marketing information
- Lack of adequate field packages

5. Postharvest Constraints

- Short shelf life when not treated soon after harvest
- Transport - bruising
- Packaging - bags permit bruising
- Mud on dasheen - facilitates disease penetration
- Ridomil is expensive and containers (gal) are too large for farmers needs
- Lack of appropriate measurements of Ridomil for farmers use
- Difficulty in collecting produce due to scattered plots
- Lack of grading practices and facilities
- Difficulty for farmers to treat with Ridomil soon after harvest
- Toxic (itching) nature of dasheen makes transport difficult
- Lack of water resistant package
- High cost package
- Standard carton not always available

6. Domestic Marketing

- High price - not enough volume year round
- Glut in main harvest season
- Lack of production information
- High collection cost (scattered farms)

7. Export Constraints

- High prices (farm gate)
- Not enough volume
- No high volume year round
- Not enough transport (sea/air)
- Not enough port facilities
- Not enough market penetration and promotion
- No ventilation on schooners
- No regulation on stacking on schooners
- Lack of production forecasting information
- Interrupted plant quarantine services

## ACTIVITIES - DASHEEN PROJECT

### DOMINICA

1. Training
  - 1.1 Field Demonstration
    - a. Hole preparation
    - b. Use of fertilizer
    - c. Spacing
    - d. Selection
    - e. Weed control
  - 1.2 Workshops
    - a. Cultural practices
    - b. Production planning
    - c. Postharvest handling
  - 1.3 Field Trips
    - a. Visits to traditional farms
    - b. Visits to improved farms
    - c. Visits to assembly centers
2. Research Toward Generation of Appropriate Technology
  - a. Irrigation (cost/benefit analysis)
  - b. Tools (for making holes, ploughing)
  - c. Improved varieties
  - d. Toxic nature of Dasheen
  - e. Postharvest handling
3. Organize and Strengthen Small Farmer Groups (e.g. Co-operatives)
  - a. Motivate and organize
  - b. Training (management, administration, marketing)
  - c. Develop services (information, input, supply, access to credit, marketing, planting material)
4. Infrastructure Development
  - 4.1 Identification of suitable assembly points
  - 4.2 Motivation of farmers
  - 4.3 Design of washing/packing sheds
  - 4.4 Construction
  - 4.5 Search of funds
  - 4.6 Training of farmers in operations

**RESOURCES**

**DURATION OF PROJECT 3 YEARS**

ACTIVITIES	HUMAN RESOURCES		DASHEEN Items	Finance
	National	International		
1. Training	X	--	Transportation, food, training aids, materials, others	(\$US) \$ 30,000.00
2. Research	X	X	Chemicals, tools equipment, trans- portation, per diem, motor/pump, others	\$ 100,000.00
3. Organize Farmers Group & Cooperative	X	--	Training, services revolving funds, others.	\$ 150,000.00
4. Infrastructure	X	X	Consultant, transportation, per diem, construction equipment. Vehicle & maintenance Miscellaneous Inflation	\$ 200,000.00 \$ 40,000.00 \$ 50,000.00 \$ 50,000.00
<b>TOTAL PROJECT COST</b>				<b>\$ 620,000.00</b> (\$US)

## LOGICAL FRAMEWORK

### DEVELOPMENT OF DASHEEN PRODUCTION FOR EXPORT

<u>GENERAL OBJECTIVE</u>	Verifiable Indicators	Assumptions
Increased availability of Dasheens for export	Volume of Dasheens for export	
<u>SPECIFIC OBJECTIVES</u>		
1. Increased production and productivity of Dasheen	1. x tonnes by year 19  x lbs/acre by year 19	1. CARDI and MOA will be successful in developing pure-stand production  2. CARDI & MOA will continue working on spacing research
2. Reduce postharvest losses	<u>Volume of exports</u> National production	1. Adequate packaging material will become available through the efforts of FAO, DHA, BDD, & HIAMP  2. FAO, through MOA, DHA and DEXIA will develop grading and packing facilities and practices  3. MOA and AIDB will continue developing smaller packages of fungicides  4. MOA will provide quarantine services

<u>PRODUCTS</u>	<u>VERIFIABLE INDICATORS</u>	<u>ASSUMPTION</u>
1. Improved Cultural Practices	X % Farmers utilizing cultural practices	
2. Improved Production Planning	Continuity of supply throughout the year	
3. Lower Costs of Inputs	Evaluating relative net cost of inputs to farmers	
4. Improved Support Services	% Farmers receiving Services	
5. Easier Access to Credit	% Farmers receiving credit through cooperatives	

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6. Improved handling procedures in harvest, grading, transportation, packaging and storage

Comparison of Postharvest Losses between Project and Non-Project participants

7. Construction of Packing Sheds

Number of Packing sheds