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POSTHARVEST INSTITUTE FOR PERISHABLES

EASTERN CARIBBEAN SOLAR DRYING AND FOOD PRESERVATION WORKSHOP

NOVEMBER 24 - DECEMBER 5, 1985

Marilyn A. Swanson
Larry G. Williams

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University of Idaho

in cooperation with
United States Agency for
International Development

EASTERN CARIBBEAN

SOLAR DRYING AND FOOD PRESERVATION

WORKSHOP

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In Collaboration With
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Executive Summary

The Eastern Caribbean Peace Corps requested that the Postharvest Institute for Perishables present a workshop in Grenada on the construction and use of a solar dryer with supplemental heat for perishable food preservation. Mr. Larry Williams, P.E., Agricultural Engineer in the Department of Agricultural Engineering and Ms. Marilyn Swanson, R.D., Extension Food and Nutrition Specialist, School of Home Economics - both in the University of Idaho - responded to the request.

The two instructors prepared an instructional manual prior to departure from the U.S. Upon arrival in Grenada they assembled materials necessary for the construction of two solar dryers that would provide hands-on experience for the trainees. There were 27 participants in the workshop, representing Grenada, Dominica, St. Lucia, St. Vincent and Carriacou.

The 10-day course was held from November 25 to December 5, 1985 at the Grenada Teacher's College in St. Georges, Grenada. The participants were taught the details of construction and proper use of solar dryers, and all gained hands-on experience during the course. A wide variety of local crops were dehydrated in the dryers and a post-workshop survey of the participants indicated that they profited from the experience.

The local coordination for the workshop, under the leadership of Mary Silewski, Grenada Peace Corps Coordinator, was exceptional.

EASTERN CARIBBEAN SOLAR DRYING AND FOOD PRESERVATION WORKSHOP

by

Marilyn A. Swanson and Larry G. Williams

Background

The Eastern Caribbean Peace Corps determined that there was a need to provide training and practical applications of solar drying and food preservation of tropical crops in the Eastern Caribbean. Mary Silewski, Associate Peace Corps Director in Grenada, requested that the training be held in St. Georges, Grenada.

The Postharvest Institute for Perishables (PIP) at the University of Idaho was requested to conduct the course. The University of Idaho had previously conducted solar drying/food preservation workshops and follow-up evaluations in the Philippines, Indonesia, and Burundi. In addition PIP had conducted a three-credit graduate level course on Solar Drying and Food Preservation at the University of Idaho in the summer of 1985. The two faculty members who conducted the course, Larry G. William, P.E., Agricultural Engineer in the Department of Agricultural Engineering and Marilyn A. Swanson, R.D., Extension Food and Nutrition Specialist, School of Home Economics, were asked to present and instruct the Eastern Caribbean Solar Drying and Food Preservation Workshop. The workshop was scheduled for ten days from November 18 to December 6, 1985 and was held in St. Georges, Grenada.

Preworkshop Coordination-University of Idaho

Prior to planning the solar drying and food preservation workshop, Williams and Swanson reviewed the educational materials that were prepared for the summer school solar dryer course as to applicability to the Grenada workshop. Numerous changes in the written materials were made and additional educational materials to facilitate and provide an appropriate technology base training suitable for Eastern Caribbean participants were prepared. The educational materials were provided in a 136-page notebook which included, along with the educational materials, the course objectives, a course outline and a class evaluation.

Additional research was conducted on the existing dryers in the Department of Agricultural Engineering by Williams. Swanson surveyed various resources to obtain necessary information about the agricultural crops of the Eastern Caribbean with emphasis on Grenada and surrounding islands.

Several telephone contacts were initiated through the PIP to Barbados and Grenada offices of the Peace Corps to help the faculty obtain a better understanding of the facilities, participants and expectations of Peace Corps personnel in Grenada.

Preworkshop Coordination-Grenada

Mary Silewski, with the cooperation of Mr. Vaughn Renwick from the Energy Unit, Ministry of Works, Grenada, sent letters describing the solar drying and food preservation workshop to key personnel in agricultural related agencies throughout Grenada and the surrounding islands. This letter suggested that each agency recommend the names of two potential participants to enroll in the ten-day training session. Upon receipt of potential applicants for the course, a letter of invitation was sent to 25 participants which also provided them with additional course information.

The Eastern Caribbean Peace Corps sponsored the training and provided participants with lodging, meals and remuneration for transportation to and from Grenada. The planned training site was the Grenada Teachers' College in Tanteen, St. Georges. Additional facilities for dryer construction and testing were provided by Dr. Peter Radix from the Science and Technical Laboratory located in Tanteen. Mr. Anthony Alexander, the head of the Grenada Teachers' College arranged for classroom facilities. Mrs. Bernadette Francis from the Domestic Arts Institute in Tanteen was responsible for providing meals and food items for breaks. Additional facilities were made available for the construction of the dryer in the handicraft shop and vocational woodworking shop at Tanteen.

The in-country pretraining preparation done by Williams and Swanson began on November 19, 1985. This included purchasing dryer construction materials, evaluating food products to be dried, contacting professionals who would be involved in the training, and surveying the actual field site and training classroom to set up educational materials and displays.

Training Workshop

The training workshop commenced November 25, 1985 at the Grenada Teachers' College with an opening presentation by Dr. Peter Radix of the Science Laboratory. Twenty-seven participants representing Grenada, Dominica, St. Lucia and St. Vincent participated in the solar drying and food preservation workshop, including five Peace Corps volunteers from Grenada, St. Vincent, St. Lucia, Dominica and Carriacou. The governmental and private agencies represented were the Grenada Ministry of Agriculture, St. Georges Home Economics Center, the Produce Chemical Laboratory, home economics teachers, Save the Children Impact Area-Dominica, the Department of Fisheries, Minor Spices Cooperative, Grenada Food and Nutrition Council, Mirabeau Farm School, Women's Bureau-Dominica, the Grenada Homemakers Association, CARDATS, Bremclag-St. Vincent, the Grenada Cooperative Nutmeg Association, the Productive Farmers Union and St. Andrews High School from Grenada. A complete list of participants is attached as Appendix A.

The course objectives of the ten-day training were as follows:

1. To provide course participants with training on the principles of solar drying and the addition of supplemental heat.
2. To provide course participants with an opportunity to construct a solar dryer with a supplemental heat source, follow a construction plan and allow flexibility of certain design details.
3. To provide course participants with training on the principles of food preservation and nutrition specifically related to solar drying.
4. To provide course participants with an opportunity to design and conduct two experimental solar drying trials utilizing various food items and comparing drying rates and pretreatment methods in up to four different dryer designs.
5. To provide course participants with an opportunity to learn about existing food preservation solar drying projects currently underway in the Eastern Caribbean with an emphasis on Grenada. (This also involved the refurbishing of two available solar dryers.)
6. To provide participants with an opportunity to discuss and evaluate potential local uses of solar drying and food preservation.

In order to meet the above objectives, the course outline (see Appendix B) as presented in the drying manual was generally followed with some minor deviations to accommodate changes in room assignments, rain, and to meet specific needs of participants.

Two solar dryers were constructed by the participants following the blueprints developed at the University of Idaho. In addition, one solar dryer from the Grenada Food and Nutrition Council and one dryer from the Agricultural Produce Chemist's Laboratory were refurbished.

The class of 27 students was divided into two groups. Each group elected a working foreman. The groups were then divided into five sub-groups, each sub-group being responsible for a separate construction phase. By placing a mix of participants in the two construction groups and also by re-dividing the participants into smaller groups to conduct the solar drying trials much information was exchanged between group participants.

After construction was completed, each trainee participated in two drying trials. In the drying trials, each group was assigned to design its own experimental food drying trial choosing a food product or products of particular interest and utilizing the methodology and procedures presented.

A great variety of products were dried during the trials including sorrel, papaya, candied papaya, papaya fruit leather, mango, mango fruit leather, candied citrus peel, candied citrus rind, sweet potato, cassava, fish, eggplant, cabbage, breadfruit, golden apples, christophene, pumpkin, yams, turmeric and bananas. For each of the products dried, at least one experimental treatment was prepared. Experimental variables included blanching versus non-blanching, steam blanching versus boiling water blanch, ascorbic acid dip, citric acid dip, sulfiting and sulfuring. The food products were evaluated after drying for physical and sensory qualities. Two of the dried products, breadfruit and banana, were ground into flour for further use.

A field trip to evaluate commercial application of solar drying technology, both existing and for future planning, was designed through the help of three participants. (See Appendix C for Field Trip itinerary.)

Applications of solar drying technology were observed at the Grenfruit Women's Cooperative in Palmiste. At Douglaston Estates, examples of cocoa, nutmeg and mace drying were observed. At the Mirabeau Farm School, the use of biogas as a potential supplemental heat source for a solar dryer was reviewed. The technology for cocoa drying and processing at the Carlton Cocoa Station was also observed.

The closing ceremony for the course occurred on the tenth day of training, Thursday, December 5, 1985. Local resource persons and facilitators were invited to attend. The Honorable George Brizan, Minister of Agriculture, gave a presentation and distributed certificates to the participants. The closing ceremony also included presentations by class participants and the University of Idaho faculty, observation of the dryers, a display of the dried foods as well as an opportunity to taste some dried food items.

Conclusions and Recommendations

This workshop was a successful endeavor based on interest by the participants. The wide mix of educational and agency background of participants allowed for much interchange of ideas and the opportunity to utilize local resources to provide additional training and background for each other. The trainers were able to function as facilitators in the training and encourage the interchange of ideas.

Because the availability of tools and supplies is limited in Grenada most of the tools and hardware for the dryers were brought from the U.S. The materials needed to construct the dryers and some tools were purchased locally.

Construction of the dryers went reasonably well and they were completed on schedule. Their performance during the drying trials was good. Since it was raining much of the time, it was necessary to rely on the supplemental heaters. They performed very well, burning up to 14 hours using hardwood charcoal which cost about U.S. $0.50 per load and burned for about 12 hours.

A bill of materials was developed for the dryers and alternate building materials were discussed with the class. The cost of the dryers was calculated with the assistance of the class. The calculated cost for a dryer was $540.00 EC (U.S. $203.00). If a dryer were built with second-hand or other locally available low-cost materials, it is quite likely that the costs could be reduced to less than U.S. $50.00.

The participants seemed very well pleased with the training and offered many positive comments. In addition, the evaluations indicated that 86% of the participants felt that the training was excellent. A majority felt that the training was the correct length of time, although several participants asked for a slightly longer training session. A majority of the participants also felt that the educational level presented was about right. Several participants asked to be included in a follow-up evaluation and requested additional comparable training in one to two years.

Excellent publicity for the training was gained through the use of a twenty-minute radio broadcast on the national radio station by Swanson. In addition, both the local and national newspapers were represented and published articles on the course. At the closing ceremony, favorable comments were made by selected representatives from the class, the Minister of Agriculture and five members of the Ministry.

The local coordination for this training, under the leadership of Mary Silewski, Grenada Peace Corps Coordinator, was exceptional. The facilities were adequate and with the exception of some unavoidable problems (lack of electricity, rain) the training session went very well. Although the rainy weather presented somewhat of a complication during the training, it was valuable to have the rain to illustrate the importance of supplemental heat.

The workshop was a worthwhile educational experience for the instructors. They appreciated the hospitality, cordiality and interest shown to them by the people of the Eastern Caribbean.

APPENDIX A.

WORKSHOP PARTICIPANTS

1. Ann Austin - Grenada Food and Nutrition Council
2. Kent Auguiste - Field Coordinator, Save the Children Impact Area Carib Territory, Dominica
3. Veta Bowman - Project Leader, Bremclag Agro Base, St. Vincent
4. Patricia Branch - Food Technologist, Peace Corps Volunteer, St. Vincent
5. John E.R. Cadore - President, Minor Spices Cooperative, Grenada
6. Joy Celestine - Extension Officer, Western Agricultural District, Grenada
7. Lanthie Christopher - Birchgrove Homemakers Association, Grenada
8. Sharon Clancy - Peace Corps Volunteer, Crop Extension Worker, CARDATS, Grenada
9. Simeon Collins - Food and Nutrition Education Coordinator, Grenada
10. Cynthia Dunn - Peace Corps, 4-H Organizer, Carriacou
11. Milton Edwards - Agriculture Officer, Ministry of Agriculture, Dominica
12. Dolly M. Francis - Project Leader for Agro-Industry, St. Vincent
13. Theophilus George - Grenada Cooperative Nutmeg Association, Grenada
14. Sara Joseph - Productive Farmers Union, Homemakers Association, Grenada
15. Valerie Lendor - Laboratory Technician, Produce Chemists Laboratory, Grenada
16. Michael Neckles - Agricultural Instructor, Eastern Agricultural District, Grenada
17. Allison Parke - Principal, Home Economics Center, Domestic Arts Institute, Grenada
18. Michael Pascal - Mathematics Teacher, Dominica
19. Miranda Peters - Public Relations Officer, Artisnal Fisheries, Grenada
20. Albinus C. Powlette - Grenada
21. Patrice Pritzl - Peace Corps Volunteer Program Officer, Women's Bureau, Dominica
22. Cecilia Prosper - Coordinator of Women's groups, Save the Children Fund, St. Lucia
23. Roderick Rolle - Agricultural Engineer, Dominica
24. Julien Stuart - Laboratory Technician, Produce Chemists Laboratory, Grenada
25. Cecil Wells - Field Inspector, Grenada Cooperative Nutmeg Association, Grenada
26. Mary Jo Wertz - Peace Corps Volunteer, Home Economics Teacher, St. Lucia
27. Brendaly Wildman - Grenada

APPENDIX B.

COURSE OUTLINE

Monday	Nov. 25	am	Introductions and Course Objectives	Swanson
			Goals of Food Preservation	Swanson
			Solar Drying - An Overview	Williams
		pm	Preliminary Dryer Design Consideration	Williams
			Requirements for Supplemental Heat	Williams
			Evaluation of Existing Resources and Foods	Swanson
			Selecting Materials for Solar Drying	Williams
Tuesday	Nov. 26	am	Factors of Food Preservation	Swanson
			Planning the Construction Project	Williams
			Solar Dryer Construction	
		pm	Solar Dryer Construction	
Wednesday	Nov. 27	am	Methods of Food Preservation	Swanson
			Solar Dryer Construction	
		pm	Solar Dryer Construction	
Thursday	Nov. 28	am	Drying Principles and Practices: Fruits	Swanson
			Solar Dryer Construction	
		pm	Solar Dryer Construction	
			Plan for Drying Trial #1	
Friday	Nov. 30	am	Initiate Drying Trial #1	
			Moisture Loss: Psychrometrics	Williams
		pm	Fundamentals of Drying; Equilibrium Relationships	Williams
			Monitor Drying Trial #1	
			Packaging Dried Foods	Swanson
Saturday	Dec. 1	am	Monitor Drying Trial	
			Solving Drying Problems	Williams
			Drying Principles and Practices: Vegetables	Swanson
		pm	Complete Drying Trial #1	
			Evaluation of Drying Trial #1	
			Plan for Drying Trial #2	
Monday	Dec.3	am	Field Trip to see Commercial Applications of Drying Procedures	
Tuesday	Dec. 4	am	Initiate Drying Trial #2	
			Class Reports of Drying Trial #1	
		pm	Monitor Drying Trial #2	
			Solar Collector Design	Williams
			Storage and Use of Dried Foods	Swanson
Wednesday	Dec. 5	am	Monitor Drying Trial #2	
			Nutritional Contributions of Dried Foods	Swanson
			Availability of Solar Energy	Williams
		pm	Solar Dried Speciality Items	Swanson
			Complete Drying Trial #2	
			Evaluation of Drying Trial #2	
Thursday	Dec. 6	am	Class Reports of Drying Trial #2	
			Implementing Solar Drying Projects	Swanson/ Williams
		pm	Summary and Conclusions	Swanson/

APPENDIX C.

Field Trip Itinerary: Monday, December 2, 1985

8:30 a.m.	Leave Tanteen
9:15 a.m.	Arrive at Palmist - See Solar Energy, Food Processing
9:45 a.m.	Leave Palmiste
10:00 a.m.	Arrive at Douglaston - See Cocoa, Nutmeg and Mace Drying
10:45 a.m.	Arrive at Gouyave - See Grenada Cooperative Nutmeg Association - Gouyave Processing Station (Nutmeg & Mace Drying and Processing)
11:30 a.m.	Leave Gouyave on way to Grenville via Clozier
12:10 p.m.	Arrive at Mirabeau
12:15 p.m.	Lunch at Mirabeau Farm School
1:00 p.m.	Visit to Biogas Digester, Propagation Plant and Banana Boxing Plant
2:00 p.m.	Leave for Grenville
2:15 p.m.	Arrive at Grenada Cooperative Nutmeg Association, Grenville - See further drying and preparation for export.
2:50 p.m.	Leave for Cocoa Processing Station at Carlton
3:00 p.m.	Arrive at Carlton Cocoa Station - See Cocoa Drying and Processing
3:20 p.m.	Leave for Grand Etang
3:45 p.m.	Arrive at Grand Etang - See Lake
4:00 p.m.	Leave Grand Etang
4:20 p.m.	Arrive at Annandale Falls
4:45 p.m.	Leave Annandale Falls
5:10 p.m.	Arrive at Tanteen