POSTHARVEST INSTITUTE FOR PERISHABLES

JAMAICA SOLAR DRYING

AND

FOOD PRESERVATION TRAINING SESSION

JANUARY 8 - 10, 1986

Larry G. Williams
Robert J. Haggerty

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University of Idaho

in cooperation with
United States Agency for
International Development

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AND

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In Collaboration With
The College of Arts, Science and Technology's
Energy Centre (CAST)

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Executive Summary

The USAID Mission in Kingston, Jamaica requested that the Postharvest Institute for Perishables (PIP) present a workshop in Kingston, Jamaica 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 Mr. Bob Haggerty, M.S., Food Scientist, College of Agriculture - both of the University of Idaho - responded to the request.

The two instructors slightly modified the instructional manual used in the PIP Eastern Caribbean Solar Drying and Food Preservation Workshop in late 1985. Upon arrival in Jamaica they assembled materials necessary for the construction of two solar dryers that would provide hands-on experience for the trainees. Due to the limited time frame of the workshop, the two dryers were prefabricated, leaving only the final assembly for the participants themselves. Mrs. Mardell Williams was invaluable in lending her woodworking skills to the preparation, making it possible to be ready on time for final assembly by the participants.

The demonstration-style training session on solar drying and food preservation was part of a larger course conducted from January 7 through 9, 1986 at the College of Arts, Science and Technology's (CAST) Energy Centre in Kingston, Jamaica. The CAST Energy Centre course consisted of two components. One was large-scale, high technology, and industry oriented and the other focusing on small-scale low technology for individual farmers or families. The course had both joint and divided sessions each day of the program. The large-scale group consisted of an average of 17 participants and was taught by Dr. Franklin Matthews, a consultant assigned to the CAST Energy Centre. The small-scale group also consisted of 17 participants and was taught by Williams and Haggerty. The joint sessions attended by all participants were conducted by Haggerty, dealing with applicable principles of food preservation and human nutrition. The small-scale group assembled the prefabricated dryers, prepared, and dried selected local perishable crops in laboratory-like sessions. All of these participants gained hands-on experience during the training session. A post-training session survey of the participants

indicated they profited from the experience but that the three day program was too short in duration.

The local coordination of the training session was led by Dr. Franklin Matthews, CAST Energy Centre consultant, and Mr. Brian Silvera, Head of the CAST Energy Centre, with valuable support from Mrs. Gloria Hamilton, Vice-Principal of CAST, and Miss Sharon Smith, CAST Energy Centre Administrative Assistant.

JAMAICA SOLAR DRYING AND FOOD PRESERVATION TRAINING SESSION

by

Robert J. Haggerty and Larry G. Williams

Background

Ms. Janette Lawrence of the Ministry of Industry and Commerce, Storage and Infestation Division determined that there was a need to provide training and practical applications of solar drying and food preservation of tropical crops in Jamaica. Ms. Lawrence was familiar with PIP at the University of Idaho and had used the PIP Information Center in her work in the past. Ms. Lawrence made contact with USAID/Kingston which in turn came in contact with Dr. Franklin Matthews, consultant working at the CAST Energy Centre. Dr. Matthews' program at The CAST Energy Centre had a component dealing with the use of solar energy in the drying of food crops and lumber on an industrial scale. Dr. Matthews had also determined the need for a training session on solar drying and food preservation to meet the goals of the program at CAST. USAID/Kingston linked Dr. Matthews with PIP in an effort to combine CAST Energy Centre and PIP resources to conduct a training session designed to meet the needs expressed both by Ms. Lawrence and by Dr. Matthews in the CAST Energy Centre program. Dr. Matthews determined through surveys of potential participants that three days was the maximum time participants had available to attend a training session (see Appendix A). After discussions between PIP and Dr. Matthews, PIP was requested to conduct a training session on solar drying. This targeted small-scale, low technology uses, emphasizing principles of food preservation as part of a larger workshop which also covered industrial scale drying. Larry G. Williams, P.E., Agricultural Engineer in the Department of Agricultural Engineering and Robert J. Haggerty, M.S., Food Scientist in the College of Agriculture, were asked to present and instruct the training session. The training session was scheduled for January 8 to 10, 1986 to be held at the CAST Energy Centre in Kingston, Jamaica.

Preworkshop Coordination - University of Idaho

In planning the solar drying and food preservation training session, Williams and Haggerty reviewed the educational materials that were prepared for the PIP/Peace Corps Eastern Caribbean Solar Drying and Food Preservation Workshop held in late 1985. Only very few minor changes were made to make them more applicable for the Jamaica training session. The educational materials consisted of a 136-page notebook including the course objectives, a course outline, and a class evaluation form.

Additional research conducted on the existing dryers in the Department of Agricultural Engineering by Williams led to a slight modification of the existing dryer plan. Williams prefabricated certain small portions of the dryers to carry to Jamaica. Through the PIP Information Center, Haggerty surveyed various resources to obtain necessary information about the agricultural crops of particular importance in Jamaica. Haggerty, with the help of Marilyn Swanson, University of Idaho Extension Food and Nutrition specialist, gathered relevant visual aids used in previous solar drying courses.

Several telephone conversations with Dr. Franklin Matthews improved understanding of the facilities, participants and expectations of the CAST Energy Centre in Kingston. It was determined that the training session would have a maximum duration of three contact days due to the time limitations of the prospective participants. Because of the time limitations, it was agreed that PIP's portion of the workshop would be conducted in more of a demonstration format rather than the participatory, interactive format used in other solar drying courses. Williams and Haggerty would prefabricate the dryers leaving only the final assembly to the participants themselves. To the degree possible, certain food items would be dried in advance to show the final product in the event time limitations made full scale drying trials impossible.

Preworkshop Coordination - Jamaica

Dr. Franklin Matthews arranged a survey to be conducted in advance of organizing details of the workshop in order to determine the number of possible participants and the optimum duration and timing of the workshop. The survey determined that the maximum duration of the workshop desired by about 40 prospective participants was three days. The workshop was advertised in a Kingston newspaper (see Appendix B), which also instructed prospective participants how to register. Some participants learned of the workshop by word of mouth.

All the participants came from the local area and therefore were able to commute from their own homes. Snacks and a midday meal were provided by the CAST Energy Centre. Mr. Brian Silvera, Technical Director of the CAST Energy Centre, with the assistance of Miss Sharon Smith, coordinated the scheduling of facilities on the CAST campus for lecturing, dryer construction, food preparation/packaging and food drying. Mr. Alvin Savage provided the use of CAST's woodworking shop during the training session. Miss Geraldine Hodelin and Miss Veronica Wright of Home Economics, provided the use of CAST's Home Economics teaching laboratory/kitchen during the training session.

The in-country pre-training preparation done by Williams and Haggerty began on December 30, 1985. This included orientation meetings with Dr. Franklin Matthews and a visit to USAID/Kingston. Because of the New Year's holiday, it took until January 2, 1986 to begin contacting professionals who would be involved in the training, surveying the actual field site and training facilities, evaluating food products to be dried, purchasing dryer construction materials and constructing the dryers.

Training Session Participants

The training session commenced January 7, 1986 at the College of Arts, Science and Technology (CAST). Forty participants from the Kingston area participated in the solar drying and food preservation training session. Government and private organizations represented by the participants were:

Ministry of Industry and Commerce/Food Storage and Infestation Division, Scientific Research Council, CAST, University of the West Indies, Bureau of Standards, Cocoa Industry Board, Coconut Industry Board, Inner City Enterprises, EMKAY Limited, and Steel Craft Limited. A complete list of participants is attached in Appendix C.

Course Objectives

The course objectives of the small-scale drying, three-day training session were as follows:

1. To provide training in the principles of solar dryer construction and operation using supplemental heat sources.
2. To provide training in the principles and practices of food preservation and nutrition as specifically related to solar drying.
3. To provide course participants with an opportunity to assemble a solar dryer with a supplemental heat source, following a construction plan and allowing flexibility of certain design details.
4. To provide course participants with an opportunity to design and conduct an experimental drying trial utilizing food items of their choice comparing drying rates and pretreatment methods.
5. To provide course participants with an opportunity to learn about solar dryer designs currently in use at CAST Energy Centre.
6. To provide participants with an opportunity to discuss and evaluate potential local uses of solar drying and food preservation.

Course Organization

The class of 40 participants was divided into two groups: a large-scale, high-technology, industry oriented group, taught by Dr. Matthews; and a small-scale, low-technology, individual oriented group taught by Williams and Haggerty. Both groups attended joint lecture sessions presented by Haggerty on principles of food preservation and human nutrition. Otherwise, the two groups worked separately. Only the small-scale drying group assembled dryers and conducted drying trials under Williams and Haggerty. Principles of drying

and the application of solar radiation to food drying were covered in lecture sessions.

The small-scale drying group was divided into subgroups for final assembly of the solar dryers, each responsible for a different section of the dryer units. The course schedule is shown in Appendix D.

Dryer Construction

Two solar dryers were prefabricated by the Williamses and Haggerty with the help of the woodworking shop supervisor. The final assembly and painting was accomplished by the participants themselves. Prefabrication of the dryers was necessitated by the acute shortage of time available for participants to attend the training session.

Food Drying

After construction of the dryers was completed, each participant conducted a drying trial as a member of a one to three person team. Teams were formed on the basis of common choice of a particular fruit or vegetable to be dried. In the interest of time and relevance to lecture topics, the pretreatments for given commodities were suggested to each sub-group by Haggerty. Paula Blake and Mrs. Matthis from Home Economics, Gloria Hamilton from CAST, Andria Clark and Brian Silvera from CAST Energy Centre, and Janette Lawrence from Food Storage & Infestation Division were all instrumental in acquisition and preparation of food for drying.

A wide variety of products were dried during the trials including paw-paw (papaya), calaloo (type of spinach), ackee (Blighia sapida), banana varieties, breadfruit, pineapple, candied pineapple, Scotch Bonnet peppers (Capsicum var.), avocado and Otaheiti apples (Spondias spp.). For each of the products dried there was always at least one control and at least one treatment. Experimental variables included blanching versus non-blanching, steam blanching versus boiling water blanching, ascorbic acid dip, citric acid dip, salt solution dip, and sulfiting. The food products were evaluated after drying for physical and sensory qualities.

The closing ceremony for the course was held on Thursday afternoon January 9, 1986. Certificates of participation were presented by Mr. Brian Silvera and Larry and Mardell Williams.

Conclusions and Recommendations

This training session was a successful endeavor based on interest by the participants. The wide mix of educational and agency background of participants allowed much interchange of ideas as well as the opportunity to utilize local resources (particularly CAST Energy Centre) to provide additional instruction and background for each other. The instructors were able to function as facilitators in the training session to encourage the interchange of ideas.

Because of uncertainty as to availability of certain tools and supplies in Kingston before departing Idaho, most of the tools and hardware for the dryers were provided by the instructors. The materials needed to construct the dryers were purchased locally. Equipment already available in the CAST woodworking shop streamlined many of the repetitive steps in the prefabrication of the dryer units.

Assembly of the dryers went slower than expected. The dryer cabinets were not completely painted by the time drying trials had to begin. Still their performance during the drying trials was good. Since drying trials had to continue through the night, it was necessary to rely on supplemental heaters. They performed very well, burning up to 14 hours using hardwood charcoal. Empty 5 gallon, rectangular-shaped cooking oil cans served as charcoal recepticals. The charcoal cost about U.S.$0.50 per load and burned for about 14 hours.

A bill of materials was developed for the dryers and alternate building materials were discussed with the class. The calculated cost for each of the dryers built was J$1215 (U.S.$225). Lumber, especially plywood, is very expensive in Jamaica. Sheet metal may be a more economical building material. If a dryer were built with second-hand or other locally available

lower cost materials, it is quite likely that the costs could be reduced to less than U.S.$100.

The participants seemed very well pleased with the training and offered many positive comments. However, it was clear from participant evaluations that three days was inadequate duration for the training session. Because time was limited, many participants felt rushed. Since the dryers took half a day longer to assemble than planned, the drying trials themselves could not be adequately monitored to completion for all commodities placed in the dryers. This detracted from adequately meeting the training session objectives. The Jamaica training session was intended to be a demonstration format rather than a full-fledged workshop such as those conducted by PIP in the Philippines, Indonesia and Grenada. All of the participants responded that more time was needed to adequately meet the training session's objectives. This is somewhat ironic because the results of the pre-training session survey of prospective participants conducted by the CAST Energy Centre overwhelmingly indicated that three days was the maximum duration the participants themselves could manage to attend the training session.

The practical, hands-on, highly interactive nature of the dryer construction/assembly and food preparation was particularly popular with the participants. As shown by their initial slowness and awkwardness in the woodworking shop, most of the participants had never had the opportunity to work with their hands as required by this training session. Once they gained confidence, they became competent and more motivated. As stated in the evaluations by one participant: "Assembling the dryers and actually drying the fruit one felt a sense of achievement because the dryers worked quite well." It is very likely that the experience these people had during the training session caused them to change their minds about how much time they could afford for a similar workshop in the future. Many of them said that a follow-up workshop concentrating more on monitoring several drying trials, packaging, and methods of reconstitution of dried produce would be very beneficial. The PIP instructors recommend 7 to 10 contact days with the participants is necessary in future solar drying and food preservation workshops. In other words, it is best to stay with the proven full workshop format and avoid demonstration formats in the future.

Other suggestions were to change the design of the solar dryer itself. In the Jamaican context it would be appropriate to have a solar dryer design of an intermediate scale. This would be a dryer that could accommodate up to 1000 lbs. of wet product. This scale would make such a dryer useful to cooperatives or small scale industrial operations. PIP should consider designing another type of dryer which could meet this need.

The local coordination and communications for preparation of this training session were impaired by the timing so close to the New Year holiday. However, once the holiday was over and people returned to work, preparations moved along briskly. The facilities were quite satisfactory and the CAST staff led by Brian Silvera, Sharon Smith and Gloria Hamilton was wonderful to work with. Dr. Matthews was helpful despite the many demands on his time during preparation and teaching the training session.

The workshop was a worthwhile experience for the instructors and for the participants judging by their comments. The opportunity to work with the Jamaicans was rewarding and the instructors would welcome working in Jamaica again in the future.

APPENDIX A

CAST ENERGY CENTRE

237 Hope Road, Kingston 7

SOLAR AUGMENTED CROP DRYING

WORKSHOP

JANUARY 7 - 9, 1985

As the first of its training course offerings for 1986 CAST has prepared a three day workshop in solar crop drying. This is in response to the need for improved crop preservation and the need for creative use of Jamaican energy resources.

The course will run from 9:00 to 4:30, Tuesday, Wednesday and Thursday, January 7, 8 and 9 at the Energy Centre in the CAST Engineering Building. Participants will receive hands-on experience in aspects of food drying technology relating to food preparation, preservation of color texture and flavor and reconstitution of various foods, coupled with the design and construction and operation of appropriate driers. Participants will have the choice of a course sequence for small-scale, inexpensive, multi-purpose driers or a course sequence for large scale, special-purpose, industrial driers for products such as lumber, coffee, coconut or grains.

Participation is being encouraged from the industrial, academic and farming communities. The fee for the entire course is $150 including lunches and snacks. A reduction is available for two or more persons from the same organization receiving a single manual. A certificate from CAST and from a U.S. university will be issued to those participants completing the course.

Kindly let us know how many members of your organization will attend by contacting the Energy Centre at the above address (Telephone 927-6154, 927-6681/3) or Telephone 92-68208 at the Ministry of Mining, Energy and Tourism. If you know that you cannot attend, please fill out and return the enclosed questionnaire. Registration deadline is Monday, January 6. We hope you will be able to attend.

Registration
CAST ENERGY CENTRE
CROP DRYING WORKSHOP
JANUARY 7, 8, 9, 1986

Name: .....

Address: .....

Tel. No. (if available) .....

Please indicate your status and interest from the following:

☐ private citizen

☐ government agency (which) _____

☐ industrial organization (which) _____

☐ co-operative (which) _____

☐ wish to participate in small inexpensive multi-purpose drier program.

☐ wish to participate in large, industrial special purpose drier program.

☐ Registration fee ($150.00) enclosed

Registration deadline: Monday, January 6, 1986

Registration is limited to the first forty paid applications

Solar Crop Drying Workshop Questionnaire

1. How would you describe yourself? A member of the:
   _____ Industrial Sector
   _____ Academic Sector
   _____ Farming Sector (Farm Size: _____ acres)

2. Why are you unable to attend the workshop?
   _____ I am not interested
   _____ The workshop is too expensive. (What is the highest fee you can afford? $_____)
   _____ Transportation is unavailable. (Where do you live? _____)
   _____ I am not free during the days the workshop is being given. Why?
      _____ I am occupied weekdays between 9:00AM and 5:00PM and cannot leave to come to workshop.
      _____ Tuesday ,Wednesday, and/or Thursday are bad days for me to come. (What days are good for you to attend? _____)
      _____ I had something else planned.
   _____ Other reason for not attending workshop. Please explain:
   _____
   _____

3. Check all of the following that interest you.
   _____ Food preparation for drying
   _____ Post-drying food handling and storage
   _____ Small-scale solar crop dryers (100-1000lbs.)
   (Specifically check the following:)
      _____ Construction
      _____ Local materials substitution
   _____ Large-scale solar crop dryers
      _____ Construction
      _____ Blower/Blower control choice
      _____ Supplementary heat systems
      _____ Heat storage and recovery

4. Which crops are you interested in drying? (List most important first)
   _____
   _____
   _____

5. Please provide your name and address.
   _____
   _____
   _____

Thank You!

pesticides, officials said today.

The chemicals could cause respiratory, ne... and skin damage, said Jose Ochoa, a senior hygienist for the Los Angeles County Health Department.

No reported injuries were caused by the dolls, which smelled of kerosene, said county spokesman Laverne Vosburg. Nearly all the dolls had been recovered, said Ochoa.

The dolls come in two varieties: One looks like a "cabbage patch" doll with a different type of head and no name, and the other, called "little prince," said Vosburg.

the contents, ...

"It seems that someone tried to do ... good and unfortunately it didn't work out that way," Vosburg said.

Tests showed the dolls had a residue of toxic pesticides, including lindane, heptachlor, and phenol, said Ochao. "We have a pretty good handle on this shipment, though 50-150 dolls are still missing out of 7,000," he said.

Documents will be presented to the city attorney's office for investigation, Ochoa said.

CAST ENERGY CENTRE

237 Hope Road, Kingston, 7

SOLAR CROP DRYING WORKSHOP

JANUARY 7, 8, 9, 1986

During 1986 the CAST ENERGY CENTRE will be offering a variety of workshops and short courses in many areas of ENERGY TECHNOLOGY. The first in this series is a three-day workshop in SOLAR CROP DRYING technology, including the necessary FOOD TECHNOLOGY and a choice either of hands-on experience in the building of small, inexpensive MULTI-PURPOSE DRIERS or the design of LARGE SPECIALIZED DRIERS for lumber, coffee, coconut, grains or the like.

The workshop will be held at the ENERGY CENTRE in the CAST ENGINEERING BUILDING, from 9:00 to 4:30, Tuesday, Wednesday and Thursday, January 7, 8 and 9. Cost of the workshop is $150, including lunch and snacks. Course completion certificates will be awarded.

For further information, or to register, call

92-76154, 92-68208 or 92-76681/3.

Registration deadline is January 6.

Only 40 paid registrations will be accepted.

APPENDIX C

CROP DRYING WORKSHOP

REGISTRATION LIST

NAME	ADDRESS/COMPANY
NICHOLAS SPAULDING	1 KIRKLAND CLOSE, RED HILLS, P.O. BOX 48
ANDRE SPAULDING	1 KIRKLAND CLOSE, RED HILLS, P.O. BOX 48
WINSTON CHEVANNES	COCONUT INDUSTRY BOARD 18 WATERLOO ROAD, KINGSTON 10
BASIL BEEN	COCONUT INDUSTRY BOARD
ADOLPH BROWN	STEEL CRAFT LIMITED 123½ CONSTANT SPRING ROAD, KINGSTON 8
GEORGE WILLIAMS	KELLITS P.O. CLARENDON
WINSTON BOX	5 WEST ARMOUR HEIGHTS, KINGSTON 8
JOHNATON LAMEY	COLLEGE OF AGRICULTURE BOX 170, PORT ANTONIO, PORTLAND
JOHN ALLEN	COCOA INDUSTRY BOARD MARCUS GARVEY DRIVE, P.O. BOX 68, KINGSTON 1
LUDLOW CUFF	6 TWICKENHAM DRIVE, GREENDALE, SPANISH TOWN
MARCIA BROWN	SCIENTIFIC RESEARCH COUNCIL P.O. BOX 350, KINGSTON 6
HEATHER ORMSBY	SCIENTIFIC RESEARCH COUNCIL
DORREEN LEWIS	SCIENTIFIC RESEARCH COUNCIL
RICHARD McKENZIE	ABOVE ROCKS P.O., ST. CATHERINE
WINSTON SERVICE	EMKAY LIMITED 2 RIPON ROAD, KINGSTON 5
MADHAV VAIDYA	EMKAY LIMITED
NEVILLE THOMAS	DEPARTMENT OF PHYSICS, UWI, MONA, KNG. 7
ANGELLA BURKE	7 FAIRBOURNE ROAD, KINGSTON 2
SHIRLEY BURKE	7 FAIRBOURNE ROAD, KINGSTON 2
GLORIA HAMILTON	C.A.S.T.
JANET LAWERENCE	FOOD STORAGE & INFESTATION DIV. 15-17 GORDON TOWN ROAD, KINGSTON 6
SONIA SCOTT	INNER CITY ENTERPRISES 52 SPANISH TOWN ROAD, SHOP 9, WEST KINGSTON
JULIET ANDERSON	INNER CITY ENTERPRISES
ELAINE BLAIR	INNER CITY ENTERPRISES
FITZROY McLEOD	BURRAU OF STANDARDS 6 WINCHESTER ROAD, KINGSTON 10

NAME	ADDRESS/COMPANY
CHARLIE GERKE	3 MUSGRAVE AVENUE, KINGSTON 10
JAMES CLARKE	MANDEVILLE. (c/o DR MATTHEWS)
NORMAN DODD	USAID
LUPANA CAMPBELL	ENERPLAN LIMITED
PERRY HUDSON	C.A.S.T. ENERGY CENTRE
ANGELA WILLIAMS	MMET, ST. LUCIA AVENUE
SHARON SMITH	C.A.S.T. ENERGY CENTRE
MILTON BENNETT	C.A.S.T. ENERGY CENTRE
LARRY WILLIAMS	
BARBARA CHEVANNES	MMET
OSWALD MARTIN	STEEL CRAFT LIMITED 123½ CONSTANT SPRING ROAD, KNG. 8

APPENDIX D

TIME

TUESDAY JANUARY 7, 1986

9:00	I N T R O D U C T I O N	
9:15	PRINCIPLES OF FOOD TRCHNOLOGY : GOALS AND METHODS OF FOOD PRESERVATION	
10:15	B R E A K	
10:30	PRELIMINARY SOLAR DRYER DESIGN CONSIDERATIONS	LARGE SCALE DRIERS LT 23 SESSION 1
11:00	PLANNING DRYING TRIAL #1	
11:30	PLANNING SOLAR DRYER CONSTRUCTION	
12:00	L U N C H	
1:30	CONSTRUCTION OF SOLAR DRYER	LARGE SCALE DRIERS LT 23 SESSION 11
2:45	B R E A K	
3:00	CONSTRUCTION OF A SOLAR DRYER	LARGE SCALE DRIERS LT 23 SESSION 111
4:30		

WEDNESDAY JANUARY 8, 1986

IME	SMALL SCALE DRYERS	LARGE SCALE DRYERS
9:00	INITIATE & MONITOR DRYING TRIAL #1 (FRUITS)	LARGE SCALE DRYERS SESSION 1V LT 23
10:30		
	B R E A K	
10:45	DRYING PRINCIPLES & PRACTICES - FRUITS	
11:30	MOISTURE LOSS - PSYCHOMETRICS	LARGE SCALE DRYERS SESSION V LT 23
12:00		
	L U N C H	
1:30	MONITOR DRYING TRIAL #1	LARGE SCALE DRIERS SESSION VI LT 23
2:30		
	B R E A K	
2:45	PACKAGING, STORING & USE OF DRIED FOODS	
3:30	FUNDAMENTALS OF DRYING	LARGE SCALE DRIERS SESSION VII LT 23
4:15	PLANNING DRYING TRIAL #2 SUPPLEMENTAL MEAT	
4:30		

THURSDAY JANUARY 9, 1986

TIME	SMALL SCALE DRIERS	LARGE SCALE DRIERS
9:00	INITIATE & MONITOR DRYING TRIAL #2 : VEGETABLES	LARGE SCALE DRIERS SESSION VIII LT 23
10:15	B R E A K	
10:30	DRYING PRINCIPLES & PRACTICES : VEGETABLES	
11:15	EVALUATION OF DRYING TRIAL #1	LARGE SCALE DRIERS SESSION IX LT 23
12:00	L U N C H	
1:30	SOLAR COLLECTOR DESIGN	LARGE SCALE DRIERS SESSION X LT 23
2:15	NUTRITIONAL CONTRIBUTIONS OF DRIED FOODS	
3:15	B R E A K	
3:30	AVAILABILITY OF SOLAR RADIATION	LARGE SCALE DRIERS SESSION XI LT 23
4:00	CONCLUSION/EVALUATION	
4:30		