

Postharvest Handling and Transportation Training of Trainers Workshop Report

August 25-September 5, 2002
La Palm Hotel
Accra, Ghana

Submitted to:

Market Access Working Group
U.S.–Ghana CCARD

Submitted by:

U.S. Postharvest Training Team
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Summary

The postharvest handling “train the trainers” workshop, funded through the Market Access Working Group of CCARD, was successfully held from September 2-4, 2002 in Accra, Ghana. Through effective collaboration between employees of the U.S. Department of Agriculture, Ghana’s Ministry of Food and Agriculture, AMEX International, the University of California in Davis, and Extension Systems International, the program met its goals by providing detailed information specific to 34 growers and exporters of fresh fruits and vegetables and public sector participants in Ghana. The workshop was made successful also by the selection of eager, knowledgeable, and willing participants. The highest priority now is to determine the most effective way to maintain the enthusiasm of the participants and assist these new trainers in getting the information they have gained to other producers in Ghana.

Background

During the week long assessment by Dr. Kitinoja and Mrs. Reichert in March 2002, three topic areas emerged as key problems and the source of bottlenecks and high costs during the movement of produce from farm to market or port in Ghana:

- Preparation for market
- Cooling practices
- Transportation

These three topic areas are closely related to one another, and a study of one reinforced the others. The overall training goal was to introduce an integrated post-harvest handling system that will assist exporters to:

- Reduce physical losses
- Protect produce quality
- Ensure food safety
- Maintain economic value
- Reduce handling costs
- Increase profits

The key commodities chosen for focus during the seminar were:

- | | |
|----------------|---------------|
| • Pineapple | • Eggplant |
| • Papaya | • Okra |
| • Mangoes | • Ginger |
| • Yams | • Avocado |
| • Chilies | • Green beans |
| • Sweet potato | • Watermelon |

The training was designed to “train the trainers” so that the information could be extended throughout the export-oriented farming zone. The training team consisted of four postharvest and transportation specialists, along with an in-country specialist on food safety. The Market Access Working Group for CCARD chose the participants and training venue (La Palm Hotel) and handled the in-country logistics. Participants are current growers and exporters of key commodities, key trade association representatives, and MOFA employees who work directly with the above growers, exporters, and associations. ([Appendix A](#) has the complete list of the 34 training participants.)

Training Procedures

In order to provide as much practical information as possible during the three days of training, various training methods were used, including lectures, audio-visual presentations, hands-on demonstrations, and site visits. The training was organized into three modules:

Module 1: Harvesting and Preparation of Fruits and Vegetables for Market

Module 2: Cooling Practices and Relative Humidity Management for Fresh Produce

Module 3: Improving the Transportation of Fruits and Vegetables in Ghana

See [Appendix B](#) for the full agenda from the training.

Prior to the training, the training team spent three days making site visits, including farms and packing houses, set up by MOFA, in order to meet growers and farm managers and observe their current operations. The team also traveled around Accra searching for locally available training and demonstration materials (plastic bags, containers, thermometers). Demonstrations were set up using coolers at the Ghana Standards Board.

The training began with a formal opening ceremony, attended by the Market Access Working Group and MOFA officials. After a tea and coffee break and photo session, Module 1 of the training began. See [Appendix B](#) for details. The trainers maintained a fast-pace in order to keep the training on schedule and to make sure all areas were addressed. At the close of day one, the training team set up the demonstrations for day two.

The demonstrations included fruit held at various temperatures and vegetables kept in various packaging at ambient temperature during the days prior to the training. The morning of day two allowed the participants to gather data about the fruit and vegetables in the demonstration, calculating weight loss which translates directly in to reduced value. Demonstrations were also done on how to measure pulp temperature using a digital thermometer probe, how to measure relative humidity using a sling psychrometer, how to measure quality characteristics such as soluble solids content and firmness, and how to use chlorine bleach for wash water sanitation.



The afternoon session included more calculations on the benefits of using the cooling and storing methods described in Modules 1 and 2. Trainees worked together in small groups at round tables in the workshop. All of the examples participants selected for their cost/benefit calculations were determined to be profitable either immediately or within a

very short time period. This reinforced one of the key messages of the program: “Any type of cooling, using any method, that lowers temperature by even a small amount, is always better than no cooling”.

After the conclusion of Module 3 on day three, the trainees indicated that they would be interested in forming a “Postharvest Working Group” and arranging to meet with one another periodically as they make plans to conduct future training programs in Ghana. A simple closing ceremony was then held at which Mr. Gary Pergl, Deputy Chief of Mission of the United States Embassy, distributed the certificates.

Each participant received a copy of “Small-Scale Postharvest Handling Practices: A Manual for Horticultural Crops (4th Edition),” written by Lisa Kitinoja and Adel Kader, and updated this summer based on the March assessment in Ghana. The participants also received a copy of USDA’s “Marine Container Transport of Chilled Perishable Produce,” and a draft CDROM with electronic versions of the Small-Scale Manual, other USDA transportation handbooks, the assessment report, U.S.-Ghana trade information, key commodity handling and harvesting information, and much more. [Appendix C](#) contains a complete list of all materials that will be available on the final copy of the CD (to be completed before October 1.) This training CDROM is expected to be a key component of any successful training programs offered by trainees in Ghana. The materials can be copied as needed, printed out, used to make overhead projection illustrations, for performing new cost/benefit examples and to repeat demonstrations of handling practices.

In addition, the MOFA Postharvest Management Division took possession of a container of training materials used during the “training of trainers” program, including a digital probe, refractometer, firmness tester, quality measurement devices and harvesting tools, Microsoft PowerPoint presentation overhead projector sheets, textbooks and many other training aids. This container should be made available on a temporary basis to any of the trainees as they become ready to put on a training program.

Observations

- From the beginning, the training team recognized a very eager group of participants, ready to absorb any information offered. The participants were well chosen and took advantage of the opportunity provided them through the training. From beginning until end, the enthusiasm was high, as indicated by the amount and depth of the questions asked. Trainees arrived early and stayed late to ask follow-up questions and discuss handling options with the specialists. Examples of questions: “do the up and down variations in temperature caused by a broken cold chain cause problems?” and “what is the ideal packinghouse layout?”



- Specific problems identified during the program included the fact that maturity indices are not often used; there is a lot of damage during harvest, mechanical damage during handling, and poor loading practices. All of these issues were addressed in detail during the training, and participants learned of many ways to make improvements. Other problems include the lack of a cold chain, poor access roads, inappropriate vehicles, and a lack of proper packing sheds. These issues require major infrastructural investments, and while they were beyond the scope of this training program, the trainees are now aware of the proper practices and are ready to take advantage of any improvements made by Ghana in the future.
- Since the training was designed to train trainers, it was important to make sure the equipment needed for replicating the demonstrations for future training sessions is available in Accra. Everything except digital thermometers (with an appropriate temperature scale) was found at an office supply store or in a supermarket. However, the digital thermometer is a crucial element of the training demonstrations as well as for being able to apply the training immediately in their own operations. This was considered one of the more difficult issues to resolve by all trainers and participants. (See recommendation #1 below.)
- The demonstrations were beneficial in providing trainees with direct visual evidence of the effects of temperature management and simple packaging on produce quality. Participants were impressed that the use of a thin plastic bag could reduce water loss in chilies and eggplant even at ambient temperature, resulting in less weight loss and in better appearance (surface looking shiny and attractive rather than dull and shriveled). Vented plastic bags were recommended for handling all the vegetable commodities, either to be used as consumer packages or as carton liners.



- The flexibility of the participants and trainer scheduled allowed for the planning of a last-minute site visit to a pre-cooling/cold storage warehouse in Accra and to a potential packing house location on the day following the formal training. This allowed the postharvest specialists to observe actual facilities and provide specific technical assistance to the facilities' managers. The ad hoc "consulting session" was very beneficial to the participants and trainers.



- The La Palm hotel offered all the amenities necessary for the training, but was perhaps a little excessive for this type of training. However, any facility with electricity would have sufficed and would have saved money and allowed for more follow-up activities.
- Although the preparation for this training went very smoothly, better coordination and communication between the trainers and MOFA/Market Access Working Group prior to the training would have prevented a variety of mis-communications, such as the timing of site visit appointments and specific training equipment needs.

Evaluation Results (See also [Appendix D](#))

The participants filled out a short program evaluation form at the end of the workshop. On a scale of 1 to 5 where 1= poor and 5= excellent the trainees rated the program as highly satisfactory.

Evaluation question	Average Rating (n=)
Were the goals of the training program clearly defined?	4.40
Did the workshop meet your expectations?	3.71
How would you rate the overall quality of the training materials?	4.43
How would you rate the overall quality of the training?	4.40
How applicable was the training to your job responsibilities or business?	4.57

The presentations that were cited as “providing the most utility for your work” included almost all of the topics covered. The following were listed most often:

- Causes and sources of postharvest losses (17)
- Costs and benefits calculations (13)
- Food Safety (12)

There were three major factors participants cited as what they liked most about the program:

- The program presentations were clear, concise, self-explanatory, practical and systematic. All the materials were well supported by documents, references, manuals, photos and illustrations, which will make recall easier and future training efforts more successful.
- The demonstrations of the effects of temperature and pre-cooling and simple packaging were much appreciated—participants reported that they can now understand just how important plastic liners and cooling can be for Ghana’s products.

- Trainees appreciated the free, frank and open discussions that were encouraged by the resource persons.

When asked what they liked least about the program, nine trainees reported that the duration was too short or that there was too much information packed into the three days provided for the program. They would have appreciated more time to study the manuals, more time for breaks between sessions to hold discussions, and more time for demonstrations. The only other major complaint had to do with the selection of commodities covered during the program—those interested in fruits would have preferred all fruits, those interested in vegetables wanted more time spent on vegetables, and those interested in root and tuber crops were keen on more topics related to yams. These responses may explain the slightly lower rating on the evaluation question “did the workshop meet your expectations?” since most of the trainees would have preferred to have the topics focus only upon their specific commodity of interest.

In response to the evaluation question “with whom and how do you plan on sharing the information you gained during this training program?”, trainees listed seminars, workshops and demonstrations for the following groups.

Target group	Number of trainees indicating they will provide training for this group
Extension Officers	4
Farmer organizations or associations	4
Farm managers	4
Farm workers, field laborers	20
Exporters	5
Market women	1
Transporters	1

The responses to the evaluation question “what other topics would you have liked to be covered?” included quality assurance, TQM, food processing, postharvest handling of cereals, postharvest treatments to control pests, and some related topics (soil management, project management, farmer/exporter group formation).

Ideas for future U.S./Ghana CCARD activities that may help foster agricultural trade opportunities between the U.S. and Ghana are included in [Appendix D](#).

Recommendations for Follow-Up

Depending on the amount of money available for this CCARD project, the training team recommends the following as follow-up to this training: (where possible, estimated costs are provided):

1. *Purchase digital thermometers for each participant of the training.* It is impossible for the participants to use the cold chain information given to them without a thermometer with the proper temperature range. The ability to train others will not be possible without this simple device. The training team spent many hours searching for such a thermometer in Accra, but with no success. The single thermometer brought for training and demonstrations was left with the box of training supplies. However, more are needed. We have priced a basic, probing digital pocket thermometer at only \$17.95 a piece. (<http://store.yahoo.com/ircstore/ecdigther.html>). Since putting what was learned into practice is the number one priority of the training program, this minimal expense should be made first priority.

Estimated cost: 35 x \$17.95 = \$628 (plus shipping)

2. *Provide handbooks to chosen libraries/resource centers:*
During the training, the participants were asked to list locations where they have immediate access for borrowing books and other training materials. The participants listed the following locations:

- Ghana Export Promotion Council
- MOFA/Plant Protection and Regulatory Services
- MOFA/Agricultural Engineering Services/ Postharvest Management Division
- University of Ghana, College of Agriculture library
- Vegetable Producers and Exporters Association of Ghana
- Sea Freight Pineapple Exporters of Ghana/Horticultural Association of Ghana
- Ghana Standards Board

These locations should quickly be sent copies of each publication used or referred to during this training for the participants to access as needed.

Estimated cost: \$1,000 (plus shipping)

3. *Provide mentoring services.* The training program was designed as “train the trainers.” Although the participants are well qualified to share the information they learned in terms of technical knowledge, due to limited time we could provide only minimal guidance on conducting future postharvest training. The participants will undoubtedly have specific questions on how to repeat the demonstrations and how to conduct the training in the field (versus a hotel venue) without a “power point projector” or electricity. Participants may also have detailed questions about applying the information learned to their own specific situations and putting on simple demonstrations. Having a small-scale postharvest expert available to answer questions for the next 12 months would be a valuable resource. Contact with the consultant on a regular basis at very low

cost would be achieved simply via email and the Internet. It is recommended that Dr. Lisa Kitinoja be chosen as the mentor since she has a long history of working directly as a trainer with produce handlers in developing countries. She would be paid only for the time spent answering questions/providing assistance as requested by the training participants.

Estimated cost: 10 days @ \$360/day = \$3600

4. *Series of follow-up surveys/interviews.* Most training programs that start with a pre-assessment usually end with a post-assessment. It is important to keep the momentum going by following up with the participants periodically to ensure they are using the information given to them, offering encouragement, suggestions, and resources where necessary. However, instead of sending U.S. trainers back to Ghana at approximately \$5000 a trip, it would be more cost-effective to use the experts in Ghana to conduct interviews and surveys of the training participants. USDA employees can draft the interview questions and surveys, asking a group of selected participants (one from each sector represented at the training workshop) to conduct two or three sets of interviews and surveys over the next 12 months. They will be reimbursed for their time (within reason) at an overall cost much lower than the travel expenses incurred by an American traveler. The results from the interviews would be sent to USDA employees for tabulation and review. More training, resources, and assistance may be recommended for future CCARD work as a result of the interviews. However, the ultimate goal is to realize any successes, in terms of the number of training sessions conducted, the number of persons trained, and actual costs savings as a result of the using the information provided in the training workshop.
5. Many of the participants have ideas about how they would like to implement the training for their own export operations or producer associations. For example, VEGPEAG has a packing shed on MOFA property that would require massive upgrading to meet international food safety/quality standards.



It is recommended that rather than spending enormous sums on physical plant (buildings, coolers, cold storages, etc), participants be encouraged to consider field packing and utilization of existing cooling services as a solution to their packing problems. Training on proper handling methods and quality grading must be provided to growers and to the workers who harvest, sort and pack product. It would be better to utilize existing cooling and cold storage facilities to their capacity before building new facilities that may not be used efficiently. For example, the forced-air cooling service illustrated below is currently under-utilized, and provides cooling at low cost (\$0.04 per kg).



6. Provide incentives for effective training and follow-up:
Organize a competition among the participants to reward the top three performers over the next 6 or 12 months. Top performers would be those who do the most effective job in training others on proper harvesting and handling of fresh produce. The rewards could be tools that they can use in further training, such as a digital camera, refractometer, penetrometer, and so on. Selection could be done by the training team based on documented reports of activities to be submitted by the trainers by a deadline to be included in the announcement of the competition.

Estimated cost: \$1,000

7. Sponsor the formation and activities of the Postharvest Working Group in Ghana to facilitate continued collaboration and cooperation among the participants from the private and public sector. The MOFA Postharvest Management Division should be equipped to handle simple adaptive research and demonstrations, such as testing for what temperatures are best for handling Ghana's local varieties. The basic tools and equipment that would be needed include the supplies used as training materials for the program, plus three or four cold chambers (high quality refrigerators that can be set at a range of temperatures).

8. If resources permit, send a USDA Caliper II (\$20 each) to each of the trainers. This is useful for measuring dimensions of various commodities. If less funds are available, then send them a caliper I (\$3 each) plus a diameter gauge (\$1.50 each). None of these quality evaluation tools are available in Ghana.

Estimated cost: \$200 to \$700 plus shipping

9. If and when resources permit, provide resource centers that do not currently have computers with a computer that can be dedicated for accessing the Internet to find information about production, postharvest handling, and marketing of horticultural crops.

Estimated cost: \$1,500 at each location

10. Encourage joint-ventures between U.S. and Ghanaian companies to make available in Ghana the various inputs needed for proper postharvest handling of horticultural perishables, such as quality and safety assurance tools, packinghouse equipment, cooling equipment, and returnable, reusable plastic containers. These should become lucrative business ventures as more and more people in Ghana begin to utilize improved handling and cooling practices.
11. For follow-up training conducted by training participants, the Ghanaian trainers should ask the Ministry of Transport, local packaging suppliers, and airport and seaport service companies (cargo handlers, stevedores, freight forwarders, insurers, carriers, etc.) to participate, discuss issues, and ask/answer questions. Future CCARD work may involve projects focused purely on transportation and infrastructure as it relates to farm accessibility to markets. Examples of transportation management projects conducted in Africa are available at these websites: www.ams.usda.gov/tmd/southafrica and www.ams.usda.gov/tmd/eastafrica.
12. Work in collaboration with the above mentioned resource centers, including MOFA and the Ghana Standards Board, to provide participants with: 1) additional produce standards, such as Economic Commission for Europe and Codex Alimentarius Commission, 2) international packaging standards such as Fibre Box Association and corrugated.org, 3) transportation guidelines and regulations, such as ECE, DOT, and AMS, and 4) more detail on U.S. food safety and labeling standards on the FDA website.

Appendices

[Appendix A](#): List of Training Participants and Contact Information

[Appendix B](#): Training Agenda

[Appendix C](#): Contents of Training CD

[Appendix D](#): Evaluation Results

Appendix A—List of Participants and Contact Information

S/n	NAME and Rank	Organization/ Institution	Address	Telephone/Facsimile	Email/Website
1	Acquaah, Emily Afaribea Junior Consultant	Amex International, Accra	House No. 9714 Labadi Light Industrial Area P.O. Box 5196 Accra-North, Ghana	764607, 024 620708	amextirp@ighmail.com
2	Aggor, Rowland Exports Development Officer	Ghana Export Promotion Council	Tudu Road, Republic House GEPC, PO Box M146 Accra	Tel: 021-228813/30 Fax: 021-233725	selormagger@hotmail.com
3	Agboka, Mawuli Horticulturist	Directorate of Agricultural Extension Services	DAES/MOFA P.O. Box M37 Accra	Tel: 665282	icpacc@ghana.com
4	Al-Hassan, Mohammed Sam Agricultural Officer	Plant Protection and Regulatory Services	PPRSD/MOFA P O Box M37, Accra	Tel: 302638	icpacc@ghana.com
5	Amarh, Ernestina (Mrs) Senior Agricultural Officer	Agric. Engineering Services Directorate/MOFA	PO Box M82 Accra	Tel: 7010263 or 77789	rtiu@gh.com
6	Ametefe, Cephas T. Vice President	Vegetable Producers and Exporters Association of Ghana	VEPEAG, P O Box SD 239, Accra	Tel: 675580	Email: Vepeag@hotmail.com Vepeag@ghana.com www.plus.com.gh

7	Crentsil, David Acting Head	Postharvest Management Division, AESD/MOFA	Post Harvest Management Unit, AESD, MOFA, P O Box M82, Accra	Tel: 77787/9; 7010263	dbcrentsil@hotmail.com
8	Annan, Emmanuel Technical Support Officer	Vegetable Producers and Exporters Association of Ghana	VEPEAG, P O Box SD 239, Accra	Tel: 00233-21- 675580/00233-24-679153	
9	Peter, K. Arthur Manager	Bomarts Farms	Bomarts Farms, P O Box 124, Nsawam	Mobile: 020-8180449 Office: 021-410027	Email: pkarthur@yahoo.com
10	Ayeh, Frederick Quaisie President	Ghana Assorted Foodstuffs Exporters Association (GAFEA)	P O Box MS 853, Achimota, Accra North	Tel: 00233-21- 400968/00233-21-307398	Gafea2002@yahoo.com
11	Banahene, Osei Executive Secretary	Ghana Yam Producers & Exporters Association	P O Box TF 248, Trade Fair, Centre Accra		Email: benbob45@yahoo.com
12	Biney, Juliet Marketing Officer	Vegetable Producers and Exporters Association of Ghana	VEPEAG, P O Box SD 239, Accra	Tel: 675580	Email: jbiney@hotmail.com
13	Bleppony, Harry Assistant Agricultural Officer	MOFA/Directorate of Crop Services (DCS)	DCS/MOFA P O Box 37, Accra	Tel: 021-662471/024- 464228	Email: hbleppony@yahoo.com

14	Boateng, Godfrey A. Export Officer	Unifruit, Ltd.	P O Box 7443 Accra-North	Tel: 779161/760010 020-2011-841	
15	Boateng, Kwaku Executive Member	Vegetable Producers and Exporters Association of Ghana	P O Box ST 239, Accra	Tel: 675580 Mobile: 0208111814	
16	Bright, Victoria A. Treasurer	Vegetable Producers and Exporters Association of Ghana	P O Box SD 239, Accra	Tel: 675580	VEPEAG@ghana.com
17	Darkey, Yayra Assistant Technical Support Officer	Vegetable Producers and Exporters Association of Ghana	P O Box SD 239, Accra	Tel: 021-675580; 020- 8158104	Email: ydarkey@yahoo.com
18	Darko, Samuel Mintah Export Manager	Prudent Exports Ltd.	P O Box 7273, Accra- North	Tel: 501371 Fax: 501463	
19	Groen, Merjim Farm Manager	Milani Ltd.	P O Box KA 18168, Accra	Tel: 021-778336	milani@africaonline.com.gh
20	Gyampoh, E. Ayete Assistant Farm Manager	Horizon Farms Ltd.	P O Box 12669, Accra- North	Tel: 245879	

21	Hassan, Nour Managing Director	Gannat Farm Limited	P O Box KT 330, Kotobabi, Accra	Tel: 761470 Fax: 764850 Mob: 0208125557	gannet@ghana.com
22	Hayford, Eugene Kwaku Farm Manager	Green Span Farms Ltd.	P O Box KIA 18121, Accra	Tel: 778339 Mobile: 024-271367	
23	Hayford, Theophilus K. Executive Member	Ghana Yam Producers and Exporters Association	PO Box DC 171, Dansoman, Accra	Tel: 020-8117910	Email: kenvivl@yahoo.com
24	Koko, Eric Quality Control Manager	Farmapine Ghana Limited	Box NW 772, Nsawam	Tel: 024-613372 Fax: 027-515130	Email: eriquekoko@hotmail.com farmpine@ghana.com
25	Koomson, Gerogina Coordinator	Ideal Providence Farms	P O Box CS 9060, Tema	Tel: 024-664572/022 300991	ginakoomsons@yahoo.co.uk
26	Kyofa-Boamah, Milly Assistant Director	PPRSD/MOFA	P O Box M37, Accra	Tel: 02081207211 022413051 021302638	Email: mkyofabo@hotmail.com
27	Mawuenyega, Gabriel Export Manager	Georgefields Farms Ltd.	P O Box 12762, Accra- North	Tel: 229135/0208173773	
28	Muange, Emmanuel N. Export Manager	Packhouse, Ghana Fresh Produce Ltd,	P O Box CT 4703, Cantonments, Ga District, Accra	Tel: 020- 8140444/769148	Email: enmuange@hotmail.com

29	Obu, Emmanuel Y.B. Export Officer	Jei River	P O Box CT 3972, Awutu-Efutu, Central Region	Tel: 020-8169729	
30	Okoampah, Eric Export Manager	Paradise Farms LTd.	PMB, KIA, Accra	Tel/Fax: 779931 Mobile: 0208133127	Email: okoam@yahoo.com
31	Tetevi, Winfred Holly Senior Scientific Officer	Ghana Standards Board,	PO Box MB 245 Accra	Tel: 500056/5	Email: whyholly@yahoo.com
32	Woode, Ruth Senior Agricultural Officer	GAR, MOFA	P O Box MB 199, Accra		Email: wooderuth@yahoo.com
33	Attah-Tetteh, George	Deku Farms PRO	Box 15796 Accra North	Tel: 028-209114 Fax: 021-232483	
34	Owusu, O.E.	Amex Int'l Inc.	Box S196 Accra North	Tel: 764607	Email: eo_owusu@hotmail.com

Appendix B—Training Agenda

**CCARD - POSTHARVEST HANDLING AND TRANSPORTATION
TRAINING OF TRAINERS WORKSHOP
SEPTEMBER 2-4, 2002
ACCRA, GHANA**

TRAINING AGENDA

MONDAY, SEPTEMBER 2

MODULE 1: Harvesting and Preparation of Fruits and Vegetables for Market
OBJECTIVE: To provide hands-on learning activities, demonstrations, audio-visual and written materials and discussions on postharvest handling practices related to improved quality, food safety, reduced physical losses, higher exportable yield and market value.

TIME	TOPIC	PRESENTER
8:30 am	Registration	Damba Rooms 1&2
9:00 am	Welcome	
	Opening Prayer	Mrs. Milly Kyofa-Boamah
	Introduction of Chairman	Dr. (Mrs.) Bertha Gana
	Chairman's Remarks	Professor Asenso Ochere
	Welcome Address	Chief Director, MOFA, Mr. Kwaku Owusu Baah
	Statement by U.S. Department of Agriculture Representative	Mrs. Heidi Reichert
	Opening Address	Hon. Deputy Minister, MOFA, Dr. A. Majeed-Haroun
	Participant Introductions	
10:00 am	Coffee/Tea Break and Photo Session Damba Room	
10:15	Introduction to the Training of Trainers Program, training materials and instructors	Dr. (Mrs.) Lisa Kitinoja
10:30 am	Introduction to Module 1	Dr. Lisa Kitinoja

11:00 am	Domestic vs. International Marketing for Key Commodities	Mrs. Heidi Reichert
11:30 am	Grades & Standards	Mrs. Heidi Reichert
12:00 pm	Phytosanitary Requirements	Mr. Brian McGregor
12:30 pm	Causes & Sources of Postharvest Problems	Dr. Lisa Kitinoja
1:00 pm	LUNCH	
2:00 pm	Postharvest Handling of Fruits (Harvest Indices, Washing, Cleaning, Trimming, Waxing, Sorting, Pest Management)	
	papaya	Dr. Adel Kader
	pineapple	Dr. Adel Kader
3:00pm	Introduction to Food Safety (EUREP-GAP: Good Agricultural Practices)	Mr. Emmanuel Owusu
3:30 pm	BREAK	
3:45 pm	Postharvest Handling of Immature Fruit-Vegetables (Harvest Indices, Washing, Cleaning, Trimming, Waxing, Sorting, Pest Management)	
	Green Beans	Dr. Adel Kader
	Chilies and Sweet peppers	Dr. Adel Kader
4:45 pm	Food Safety Practices for Fruits and Vegetables (Good Agricultural Practices)	Mr. Emmanuel Owusu
5:15 pm	Day One Wrap-Up	Dr. Lisa Kitinoja

TRAINING AGENDA
TUESDAY, SEPTEMBER 3

TIME	TOPIC	PRESENTER
8:30 am	Continuation of Module 1	Dr. Lisa Kitinoja
8:45 am	Postharvest Handling of Tropical Root and Tuber Crops (Harvest Indices, Washing, Cleaning, Curing, Waxing, Sorting, Pest Management)	
	sweet potatoes	Dr. Adel Kader
	ginger	Dr. Adel Kader
9:30 am	Costs and benefits of Using Improved	Dr. Lisa Kitinoja

	Handling Practices	
9:50 am	Wrap-up of Module 2	Dr. Lisa Kitinoja
10:00 am	BREAK	

MODULE 2: Cooling Practices and Relative Humidity Management for Fresh Produce

OBJECTIVE: To provide hands-on instruction, audio-visual and written materials and discussions and demonstrations on the importance of cooling and relative humidity management for protecting produce quality, shelf life, and market value. Instruction will include illustrations and demonstrations of the effects of temperature on shelf life, water loss, and decay rates, and an introduction to the use of simple, low cost cooling practices that can be used to cool produce to 15 C before packing and to protect produce from heat gain during shipping.

TIME	TOPIC	PRESENTER
10:15	Introduction to Module 2	Dr. Lisa Kitinoja
10:30 am	Effect of temperature and relative humidity on rate of water/weight loss. Demonstrations.	Dr. Adel Kader
10:50 am	Effect of temperature on rate of ripening, senescence. Demonstrations.	Dr. Adel Kader
11:30 am	Recommended handling temperatures and RH for key commodities	Dr. Adel Kader
12:00 pm	LUNCH	
1:00 pm	The basics of pre-cooling fresh produce When to pre-cool Providing shade Evaporative cooling Small-scale hydro-cooling Portable forced-air coolers Cooling during transport Avoid chilling injury Avoiding water condensation	Mr. Brian McGregor
3:00 pm	BREAK	
3:15 pm	Problems with “just-in-time” handling without cooling	Dr. Lisa Kitinoja
3:45 pm	Calculating the costs and benefits of cooling	Dr. Lisa Kitinoja

in Ghana
 4:15 pm Wrap-up of Cost/Benefit calculations and Demonstration results. Dr. Lisa Kitinoja

TRAINING AGENDA

WEDNESDAY, SEPTEMBER 4

MODULE 3: Improving the Transportation of Fruits & Vegetables in Ghana
OBJECTIVE: To provide hands-on instruction, audio-visual and written materials and discussions and demonstrations on the importance of proper handling during loading/unloading and shipping. To provide an introduction to management practices that will protect produce quality, prevent damage, extend shelf life, and reduce shipping costs.

TIME	TOPIC	PRESENTER
8:30 am	Introduction to Module 3	Dr. Lisa Kitinoja
8:45 am	The importance of packages and packaging materials; Palletization of cartons	Mr. Brian McGregor
9:15 am	Reducing transport damage	Mr. Brian McGregor
10:00 am	BREAK	
10:30 am	Loading vehicles, worker safety, protection of produce Road (open loads) Refrigerated trailers Marine containers Marine cargo holds Air containers	Mr. Brian McGregor
11:00 am	Demonstrations	Mr. Brian McGregor
12:00 pm	Minimizing delays and re-warming during handling and transport	Mr. Brian McGregor
12:30 pm	LUNCH	
1:30 pm	Management of transportation of produce for export Planning/scheduling Consolidation of loads	McGregor/ Reichert

	Buying or leasing vehicles Freight forwarding Sanitation and inspection Maintenance of transport vehicles	
2:30 pm	Reducing shipping costs	Mrs. Heidi Reichert
3:00 pm	BREAK	
3:15 pm	The future of produce transport Refrigerated road transport vehicles Inter-modal transportation Modified atmosphere transport	Dr. Adel Kader
4:00 pm	Wrap-up/Discussion – Where does the CCARD/USDA project go from here?	Reichert/Kitinoja
4:30 pm	Participant evaluations; CD Rom Demonstration	Mrs. Heidi Reichert
4:45 pm	Certificate Ceremony	Mr. Gary Pergl, Deputy Chief of U.S. Embassy
5:00 pm	Reception/Light refreshments	



Appendix C—Contents of Training CD

- Small-Scale Postharvest Handling Practices-A Manual for Horticultural Crops
- Transportation and Post-Harvest Handling Assessment
- Agenda with Links to Presentations from Training Sessions
- Tropical Products Transport Handbook
- U.S. Grades & Standards for Key Commodities
- Produce Facts for Key Commodities
- Transporting Perishable Products by Truck
- EUREPGAP Protocol for Fresh Fruit and Vegetables
- Other Resources (website links)
- Directions for Building USDA's Portacooler
- Cold Chain Overview
- Food & Agricultural Import Regulations & Standards Report for the United States
- The Harmonized Tariff Schedule of the United States
- Sanitary & Phytosanitary Measures and International Agricultural Trade
- "The Produce Pipeline"
- Article on Quality Assurance
- Checking Out Your Freight Forwarder
- U.S. Agricultural Exports to Ghana/Imports from Ghana
- Demonstration Protocols
- Instructor CV's
- Training Evaluation Results
- List of Participants
- Training Materials Inventory

Appendix D—Evaluation

Each participant completed a training evaluation at the conclusion of the training workshop. The overall response was very positive. Participants rated the workshop high (an average higher than 4 on a scale of 1-5) and the comments/answers to the questions were just as positive. The training topics ranked highest by participants were: causes and sources of postharvest loss, calculating the benefits of better postharvest handling, transportation management, and effect of temperature and relative humidity on water loss. Other positive comments included appreciation for trainer frankness, for the in depth information provided, and for the training materials.

The only disappointment reported by most of the participants was that the training duration was too short. Three days, they explained, was not long enough to learn in enough detail all the information they were provided. Other participants would have liked to see more hands-on demonstrations (perhaps in the field) and more information on their particular fruit or vegetable of interest. One participant commented that a time for prayer should have been offered every day and not just the first. This is a cultural matter that probably should have been shared with the training team prior to the training.

Regarding follow-up work and projects, the trainees would like to participate in exchange programs with U.S. farmers, shippers, and exporters. They would also like to see continued and nurtured the partnership between the U.S. and Ghana in the area of postharvest. In addition, participants requested more sharing of information domestically and internationally, as well as better collaboration between existing key organizations, such as the commodity and export trade associations in Ghana. Other areas and topics that the participants would like to see addressed by CCARD are accessing U.S. markets, export/import laws and regulations, new technologies available for postharvest handling, infrastructure development, and farming inputs.

Detailed evaluation results are available on the training CD.

Evaluation Questions

- Rating of training goals
- "Most important" technical presentations
- What did you like most about this workshop?
- What did you like least about this workshop?
- What other topics would you have liked to have been covered in this workshop?
- This training has been designed to "train trainers." With whom and how do you plan on sharing this information?
- Other than training sessions of this nature, how can the U.S.-Ghana CCARD help to foster agricultural trade between the U.S. and Ghana?

Example of actual responses:

How else can the U.S.-GH CCARD help to foster agricultural trade opportunities between the U.S. and Ghana?

Always get in-touch with it's Ghanaian counter-parts. Through the various groupings like SPEG, HAG, VEPEAG, Ghana Export Promotion Council, etc., and impart new technologies to us.

The opportunities Ghana and U.S. would have should be relationship in marketing and transportation of agriculture products between the two countries.

Assist the gov't of GH to implement some of the laws and regulations that came up during Discussions.

have an exchange programme, but identify the right people who are willing to share their ideas with other.

CCARD should keep exploring opportunities how best to create mutually beneficial programmes for the generality of our peoples; U.S., having known the disadvantaged position of Ghana, should endeavour to assist her to realize the objectives of protocols that have been signed between the two nations.

organizing exchange programmes, sending technical materials to be used

organize trips to the U.S. for example of participants of this program and some of them to have a "feel" of what has been taught

More training and visits to the U.S. and Secretariat established in Accra to facilitate info transfer Constant interaction, i.e. workshops and exchange of visits.

Exchange program, conference

Sharing of current information, trade fairs

Participants to training program should form a network of trainers and should be able to meet periodically to brainstorm, get updated, receive further training

There should be more information on products that can be exported to the U.S., for example market requirements

Exporting organizations must come together to form a potent force in the industry, so that we can together strategize to enhance agricultural trade between the U.S. and Ghana and then some aid to put up physical structures and work with government to come out with policies.

Assist in developing projects to produce and access the American market. Assistance should involved selecting a few products and exporters. This should be from research through marketing Inviting representatives from some farms that are doing well to visit U.S. for exchange programs. E.g. Companies that manufacture cooling system equipment.

We need many of such training sessions from U.S.-Ghana CCARD in the near future to help boost trade between U.S. and Ghana

By helping in marketing efforts to expose the Ghanaian products to USA market; organizing some sort of business forums between Ghana & USA

Exchange programs between our various agricultural related institutes, groups, or individuals in agricultural related businesses. This could begin with correspondence.

Organizing more of this workshops, exchange program and forming a common associations, to regulate activities of the exporters especially in Ghana

Information on trade and marketing opportunities should regularly be shared between the two countries especially between importer and exporters of the 2 nations

There should be the invitation of exchange programs between Ghana and U.S., this would actually help build better opportunities

Provide subsidy in the production, cooling system and exportation of fruit & vegetable in Ghana. Help search market for fruits and vegetables (good market). Government subsidizing agricultural inputs such as chemicals and fertilizers for farmers

I would be glad if 1 year program is drawn between the University of CA, USDA, the University of GH to train agricultural technical officers and farmers for a diploma course which would be purely postharvest. 9 months intensive classroom work and 3 months farm work in large farms in any part of the world. So that we can practicalize what we've learned.

Expose train trainers to what is existing in the U.S. farms in the shortest possible time (Exchange of visits between Ghanaian farmers/associations to U.S. farmers)