

**INTERAGENCY AGREEMENT
BETWEEN THE UNITED STATES AGENCY FOR INTERNATIONAL
DEVELOPMENT
AND
THE UNITED STATES DEPARTMENT OF AGRICULTURE**

**PERFORMANCE REPORT
FOR THE PROJECT**

**“TRAINING AND ANALYSIS IN BUILDING CAPACITY FOR
AGRICULTURAL MARKETING AND EXPORTING IN GHANA AND
PROPOSAL FOR TRAINING IN SPS AND STANDARDS TECHNOLOGY”**

Submitted to USAID by:

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Attachment 1

- Financial Report

Preface

This report covers activities undertaken by the USDA Technical Assistance Team and is provided in IAW the provisions of the USDA/USAID Interagency Agreement (AFR-P-00-01-00008-00).

1.0 BACKGROUND

The Government of the Republic of Ghana recognizes that in order for it to achieve middle income status within the next twenty years, it must dedicate a significant proportion of its national resources to sustainable development in six categories: (1) human development; (2) economic development; (3) economic growth; (4) rural development; (5) urban development; and (6) an enabling environment.

The nations agricultural goals have been significantly strengthened by the substantive deliberations of the U.S. - Ghana Consultative Committee on Agriculture and Rural Development (CCARD). On June 29, 2000, the U.S. Department of Agriculture (USDA) and the Republic of Ghana's Ministry of Food and Agriculture (MOFA) entered into a bilateral agreement, through a Memorandum of Understanding (MOU), to promote joint collaboration on the restructuring of Ghana's agricultural infrastructure. The CCARD has "facilitated discussion and cooperation on agricultural programs, projects, and exchanges between the two countries in, but not limited to, the areas of natural resource conservation, and management; agricultural technology development for income generation; institutional development and capacity building; agricultural trade and market access, investment, and development; regulation and safety of food products; food and nutrition; trade information, extension, and research."

This MOU established the working agenda for the U.S.-Ghana CCARD and has resulted in a number of joint U.S. and Ghanaian mechanisms to address key agriculture market access and infrastructure issues that are intended to be mutually beneficial to both countries. To operationalize this comprehensive approach, three Working Groups were constituted: (1) Market Access (MA); (2) Institutional, Human Resources and Rural Development (IHRRD); and (3) Natural Resources Management (NRM).

In April 2002, the second meeting of the U.S.-Ghana CCARD was held in Accra, Ghana to review progress achieved by the Working Groups and to exchange ideas to arrive at workable programs and initiatives. The meetings also served as a forum to discuss issues identified as technical barriers to trade (TBT) and recommend steps to resolve these trade issues in accordance with World Trade Organization (WTO) obligations. The April 2002 CCARD Working Group Executive Summary outlined the joint USDA/MOFA recommendations for bilateral implementation of an ambitious agenda that requires a U.S. government investment within the near term of three years.

This overall strategy is designed to enhance the production, processing, and marketing of agricultural products, including livestock, by improving, market access; infrastructure; agricultural processing; sustainable power and water supplies for worker health, irrigation and food processing; and surface transportation improvements and options for maximum rural farm-to-distribution center connectivity.

2.0 MARKETING AND TRANSPORTATION TRAINING PROJECT

2.1 Activity Objective

USDA's Cooperative State Research, Education and Extension Service (CSREES) is collaborating with the Ghanaian Ministry of Food and Agriculture (MOFA) to support

agribusiness entrepreneurial development and extension development in Ghana. The goal of this project is to build capacity within the Ghanaian Extension System to enable agricultural agents to guide farmers in developing the ability to produce for the domestic market and to participate in world trade. The project will develop and implement a series of train-the-trainer workshops for agricultural extension personnel in Ghana in a variety of areas from production through post-harvest handling, value-added processing, export marketing, agribusiness development, farm entrepreneurship and the development of off-and-on farm human and institutional resources.

The first train-the-trainer program focusing on marketing and export business development of chili peppers and okra was presented in February 2003. A second chili/okra workshop focusing on production and post harvest handling practices as they relate to marketing strategies was held in June 2003. An additional two workshops are scheduled for July 2003 for pineapple and sweet potato.

2.2 Progress Report

2.2.1 Marketing and Transportation Training Seminar I

A train-the-trainer program focusing on Marketing and Export Business Development of okra and chili peppers was presented by Kwame Garcia, Director, Cooperative Extension Service (CES), University of the Virgin Islands (UVI), and Kofi Boateng, Assistant Director, CES, UVI. Several resource persons from Ghana also served as trainers. The purpose of the seminar was to establish a market-oriented training for extension agents and to provide them with training strategies and skills to better advise farmers on marketing, development of business plans and accessing international markets.

The seminar had the following goals:

- Present a guide that can provide the extension agents with a better understanding of marketing
- Present a guide that can provide the extension agents with a basic understanding of business plan development
- Discuss how the extension agents, as trainers, can apply the lessons learned in this seminar to programs for farmers

The intensive 3-day seminar was held in Accra, Ghana, February 19-21, 2003. Thirty-one (31) participants attended the training, which included representatives from MOFA and non-government organizations (NGOs).

Various methods were used in the training including lectures, demonstrations, discussions, group work and group presentations. See **Appendix 1** for the full agenda. Each participant received copies of the trainer presentations and USDA/CSREES will develop a training CD.

The teaching style used involved significant interaction between the instructors and the participants, encouraging an ongoing dialogue of questions, comments, and personal experiences to reinforce lesson material. The atmosphere promoted instructor recognition for a given expertise and also recognized the knowledge and experiences of the participants.

At the end of the seminars, the participants were requested to respond to an evaluation. Effective evaluations allow the presenter and sponsoring organization to systematically determine areas of success in the training environment, identify areas requiring modification, and address additional areas of interest. The evaluations results indicate the participants were pleased with the training materials and the trainers.

Appendix 1. WORKSHOP PROGRAM

US-GHANA TECHNICAL ASSISTANCE PROGRAMME

Marketing and Export Business Development

DAY ONE

8:00 a.m.	Registration
8:30 a.m.- 10:00 a.m.	Opening Prayer Introduction of Chairperson Dr. Bertha Gana Chairperson's Opening Remarks Welcome Address by the Chief Director, MOFA Remarks by USDA Ag Attaché, Jamie Rothchild Chairperson's Closing Remarks Vote of thanks - Mrs. Milly Kyofa-Boamah Closing prayer - Mr. Simon Addom
10:00-10:30 a.m.	Snack and photo session
10:30-11:30 a.m.	Principles and Practices of Marketing of Horticultural Crops <i>Kwame Garcia</i>
11:30 - 12:30 p.m.	Overview of Export Marketing of Chilies and Okra in Ghana <i>Roland Akkor</i>
12:30 - 1:30 p.m.	Lunch
1:30 - 2:30 p.m.	Strategic Marketing of Chilies and Okra <i>Kwame Garcia</i>
2:30 - 3:00 p.m.	International Rules and Opportunities-WTO <i>Chris Amedoh</i>
3:00 - 3:30 p.m.	International Standards and Regulations - EUREPGAP, Sanitary and Phytosanitary (SPS) Requirements <i>Mrs. Milly Kyofa-Boamah</i>
3:30 - 3:45 p.m.	Snack Break
3:45 - 4:45 p.m.	Developing a Marketing Plan for Export <i>Kofi Boateng</i>
4:45 - 5:30 p.m.	Open Discussion/Q&A
5:30 p.m.	Dismissal

DAY TWO

8:30 - 10:15 a.m.	Farm Record Keeping <i>Kofi Boateng</i>
10:15 - 10:30 a.m.	Tea and Coffee Break
10:30 - 12:30 p.m.	Developing a Business Plan <i>Kofi Boateng</i>
12:30 - 1:30 p.m.	Lunch

1:30 - 2:30 p.m.	Developing a Business Plan (continued) <i>Kofi Boateng</i>
2:30 - 3:30 p.m.	Farmer Based Organization as a Tool in Agricultural Development <i>F. Nyantaky-Dapaah</i>
3:30 - 3:45 p.m.	Snack break
3:45 - 4:45 p.m.	Overview of Export Business Management <i>Kofi Boateng</i>
4:45 - 5:15 p.m.	General Discussions
DAY THREE	
8:30 - 9:00 a.m.	Development of an Export Oriented Business Plan <i>Kofi Boateng</i>
9:00 - 11:00 a.m.	Group Work on Development of a Business Plan
11:00 - 11:15 a.m.	Snack Break
11:15 - 12:30 p.m.	Presentation of Group Work
12:30 - 1:30 p.m.	Lunch
1:30 - 3:30 p.m.	Communication Skills for Effective Extension Delivery <i>Dr. J. Kwarteng</i>
3:30 - 3:45 p.m.	Snack Break
3:45 - 4:00 p.m.	Evaluation
4:00 - 5:00 p.m.	Closing Ceremony Presentation of certificates by Patty Fulton, USDA Closing Remarks by a participant Closing Remarks by MOFA representative
5:00 p.m.	Dinner

2.2.2 Marketing and Transportation Training Seminar II

The second train-the-trainer workshop focusing on production, post-harvest handling and value addition of chili peppers and okra was conducted by Mawuli Agboka, Horticulturist, DAES/MOFA; Stafford Crossman, Extension Supervisor, Cooperative Extension Service (CES), University of the Virgin Islands (UVI); and Manuel Palada, Research Associate Professor, Agricultural Experiment Station (AES), UVI in Accra, Ghana, June 4-6, 2003. Two resource persons from Ghana were also invited to present and share their experiences in production, processing and marketing of chili peppers and okra. The purpose of the workshop was to establish market-oriented training for the extension officers and to provide them with training strategies and skills to give advice to farmers.

The workshop had the following goals:

- Present and discuss the importance of appropriate management practices for growing and producing chili peppers and okra to ensure quality of the product.

- Discuss the basic principles of post-harvest handling and provide the extension officers with a better understanding of post-handling and processing of chili peppers and okra for domestic and export markets.
- Demonstrate and discuss various methods and forms used in handling, storing, and value-adding processing for chili peppers and okra.

Thirty participants attended the training seminar with representation from local farmer cooperatives, food processors, and MOFA extension officers.

The 3-day workshop consisted of training lectures, discussion, demonstrations, farm visits, visit to a post-harvest handling facility, group work, group presentations and evaluation. See **Appendix 1** for the full agenda of the workshop. Each participant received handouts that the trainers used during the presentations and USDA/CSREES will develop a training CD for all of the participants.

At the end of the workshop, the participants were requested to respond to an evaluation to determine the impact of the training session and materials. Evaluation results are being compiled and will be provided during the next quarter reporting cycle.

2.2.2.1 Post Workshop Discussions

After the workshop, the Train-the-Trainer Team met with Mawuli Agboka , DAES/MOFA to discuss future plans for training on other crop commodities under the Agricultural Extension Capacity Building Project. Mr. Agboka suggested that the next workshop should focus on pineapples and sweet potatoes and be conducted in late July or early August 2003. He emphasized the need for more information on **post-harvest handling and processing**. Therefore, the next workshop must address this need and focus on post-harvest handling and processing of pineapples and sweet potatoes.

ACKNOWLEDGMENTS

The workshop would not have been successful without the dedication and support of the following individuals:

- Mawuli Agboka, MOFA
- Stafford Crossman and Manuel Palada, University of the Virgin Islands
- Local processors of chili peppers and okra

Appendix 1. Workshop Program

**US – GHANA CCARD TRAINING OF TRAINERS WORKSHOP ON PRODUCTION,
POSTHARVEST HANDLING AND VALUE ADDITION OF CHILLI PEPPER AND OKRA,
ERATA HOTEL JUNE 4–6, 2003**

Day/Time	Topic	Presenter
Day 1 June 4th	Agronomy and Plant protection	
8.30-9.30	Overview of Chili peppers and Okra production in Ghana	Mawuli Agboka
10.45-11.45	Climate and soil requirements	Stafford Crossman
11.45-12.30	Land preparation, planting methods	Stafford Crossman
12.30-1.30	Lunch	
1.30-2.30	Mulching, irrigation, plant nutrition	Stafford Crossman
2.30-3.30	Integrated pest management	Stafford Crossman
3.30-3.45	Snack	
3.45-4.45	Harvest and post-harvest, tools, tech.	Manuel Palada
4.45	Close	
Day 2 June 5th	Field Visit	
7.00 am	Departure from hotel	
8.45am-3.00pm	Practical Activities on field (Nursery preparation, land preparation, identification of pests and diseases, harvest and post-harvesting techniques, PH facilities, etc)	MOFA + USDA resource persons
3.00 pm	Departure from field to hotel	
Day 3 June 6th	Post harvest and Value Addition	
8.30-9.30	Post-harvest biology & technology	Manuel Palada
9.30-10.30	Cooling, grading and sorting	Manuel Palada
10.30-10.45	Snack break	
10.45-11.45	Packing materials & methods	Manuel Palada
11.45-12.30	Post-harvest handling and value addition-processing	Manuel Palada
12.30-1.30	Lunch	
1.30-3.30	Interaction with some processors of chilli pepper and okra for local consumption and export	Local processors
3.30-3.45	Snack	
3.45-4.15	Developing individual Action plans	Mawuli Agboka
4.15-5.00	Presentation of Action plans	
5.00-5.15	Evaluation	
5.15-5.30	Closing Remarks	Trainers & Participants
6.00 pm	Closing dinner	

3.0 IMPROVING GHANA'S FARM-TO-MARKET TRANSPORTATION COSTS

3.1 Activity Objective

The primary objective of this activity was to design a series of activities to improve the Ghanaian System of transporting agricultural products and to strengthen the understanding of the Ghanaian extension and education system of effective marketing practices. USDA, in collaboration with Ghanaian transportation officials and extension agents, would train selected staff on improved transportation, post-harvest handling and marketing practices, and institute a train-the-trainer program covering agricultural and marketing practices for Ghanaian extension agents.

3.2 Progress Report

3.2.1 Postharvest Handling and Transportation Training of Trainers Workshop Report Summary

The postharvest handling “train the trainers” workshop, funded through the Market Access Working Group of the U.S.-Ghana CCARD, was successfully held from September 2-4, 2002 in Accra, Ghana. Through effective collaboration between employees of the U.S. Department of Agriculture (USDA), Ghana’s Ministry of Food and Agriculture (MOFA), 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 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.

3.2.2 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; Papaya; Mangoes; Yams; Chilies; Sweet Potato; Eggplant, Okra, Ginger, Avocado, Green Beans and Watermelon.

The training was designed to “train the trainers” so that the information could be extended throughout the greater Accra farming region. 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.)

3.2.3 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 the 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 (GSB).

The training began with a formal opening ceremony, attended by the Market Access Working Group and MOFA officials. During Module 1, 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 demonstrations for the following day.

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 into, 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, United States Embassy/Ghana, distributed 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. 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.

3.2.4 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 infrastructure 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.

3.2.5 Evaluation Results

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.

3.2.5.1 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 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.

3.2.6 Recommendations for Follow-Up

Depending on funds availability, 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.

Action Taken: Procured

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 (GEPC)
- MOFA/Plant Protection and Regulatory Services Directorate (PPRSD)
- MOFA/Agricultural Engineering Services/ Postharvest Management Division
- University of Ghana, College of Agriculture Library
- Vegetable Producers and Exporters Association of Ghana (VEPEAG)
- Sea Freight Pineapple Exporters of Ghana/Horticultural Association of Ghana
- Ghana Standards Board (GSB)

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)

Action Taken: Procured

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*

Action Taken: Mentoring Services funded by USDA/FAS

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.

Action Taken: Survey Questionnaires being reviewed by USDA/AMS

5. Project Implementation

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.

Action Taken: MOFA to monitor progress

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

Action Taken: Post-Harvest Working Group will formulate recommendations

7. *Post Harvest Working Group Activity*

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).

Action Taken: Sub-Working Group will be constituted under Market Access

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

Action Taken: Post-Harvest Working Group will formulate recommendations

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

Action Taken: Post-Harvest Working Group will formulate recommendations

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.

Action Taken: Post-Harvest Working Group will formulate recommendations

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/estafrica.

Action Taken: Post-Harvest Working Group will formulate recommendations

12. Work in collaboration with the above-mentioned resource centers, including MOFA and the GSB, 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.

Action Taken: Post-Harvest Working Group will formulate recommendations

Appendices: See Post Harvest Report on CCARD Website

<http://www.ams.usda.gov/tmd2/ccard/>

4.0 FOOD SAFETY AND SPS TRAINING

4.1 BIOLOGICS TRAINING

4.1.1 Activity Objective

The training program was organized by the Institute for International Cooperation in Animal Biologics (IICAB), an OIE collaboration center for the diagnosis of animal disease and vaccine evaluation, Ames Iowa, May 6-24, 2003. Sponsorship for the program was provided by USAID and USDA in collaboration with the Veterinary Services Directorate of Ghana.

It is important to note that veterinary vaccines and other biologics have been beneficial in the control of animal diseases, enabling the intensification of livestock production thus ensuring the availability of animal protein for human consumption. They have also greatly influenced the improvement of human health through the control of zoonotic diseases as well as severe and fatal diseases of companion animals. In short, veterinary biologics have had a profound impact on modern society.

For vaccines and other biologics to continue to be effective in the control of animal diseases requires a thorough regulation of the processes of development so as to guarantee that the products reaching the end users are “pure, safe, potent and efficacious” and not worthless, contaminated, dangerous and harmful. The U.S. federal regulations regarding veterinary biologics as stipulated in the Virus Serum Toxin Act (VSTA) of the Code of Federal Regulations, Article 9 (9CFR), empowers USDA through the Center for Veterinary Biologics (CVB) to regulate veterinary biologics in the U.S.

4.1.2 Training Program

The training program was structured to give participants, who were from varied backgrounds, the understanding of the processes of ensuring compliance of manufacturing companies to the regulations of VSTA, Article 9CFR, and the licensing of veterinary Biologics in the U.S. The training program addressed the following areas:

- Basic Veterinary Immunology and the Principles of Vaccination
- Principles of ensuring vaccine safety and efficacy
- Potency and Safety testing of vaccines and diagnostic test kit evaluation.

A. Basic Veterinary Immunology and the Principles of Vaccination

The effective performance of a vaccine depends greatly on the immune status of the organism (animal) receiving it. The immune system consists of the following:

- 1) Native Defense Mechanisms, which is the nonspecific defenses of the organisms to

invading pathogens. The native defenses are made up of the phagocytic cells, complementary systems that aid in phagocytosis, native defense cytokines and the natural killer cells. All these are the first line of defenses when the organism encounters an invading pathogen.

- 2) Acquired Defense Mechanisms. These are specific defense systems, which develop when the animal is attacked by a specific pathogen (e.g., *Brucella abortus* bacterium). They would therefore act on only the pathogen that has induced their production. Acquired defense mechanisms include specific antibody production, stimulation of cell-mediated immunity (i.e. T-cell cytokines and cytotoxic T-cell proliferation).

These two defense mechanisms function together to ensure the elimination of the infectious agent from the infected animal. For example, when an organism first encounters a pathogen, antibodies from the humoral immune system aid the phagocytic cells to recognize it as foreign through opsonisation. Phagocytes are further activated by T-cell defense cytokines to ensure total killing of the agent. The processed antigen is then presented on the surface of phagocytes so that T-lymphocytes can recognize it. T-lymphocytes are then stimulated into active proliferation thus forming antibody producing plasma cells and memory T-cells for a much quicker defense response in subsequent encounter with the same pathogen. These body defense mechanisms could sometime lead to various degrees of adverse immunological reactions such as hypersensitive reactions of types I – IV.

The proper functioning of the native and acquired defense mechanisms depends on the physiological status (age, sex), nutrition and environmental conditions (cold conditions, housing etc) of the macroorganism-animal. These must be considered in the planning of vaccinations for a full immune response.

Vaccinations aim at activating the acquired defense mechanisms with pathogens that cannot cause disease during the vaccination process and well before an anticipated attack by circulating disease-causing agent of the same type. When used properly, such as administered to apparently healthy animals, a good vaccine that is pure, safe, potent and efficacious would confer protective immunity on the vaccinated animals. However, there have been instances when vaccinated animals still come down with acute disease situations attributable to the agent against which a vaccine had previously been given. The vaccination has failed to protect the animals. Vaccines also sometimes induce adverse clinical reactions either at the site of injection or systemically. However, it must be noted that animals would commonly experience adverse clinical signs from a variety of courses including vaccination. It is therefore to be expected that adverse clinical signs will occur after animals have been vaccinated for reasons unrelated to the vaccine administered. These are false adverse vaccinal reactions.

True adverse vaccine reactions are those undue local or systemic reactions of the animals resulting from the action of the vaccine administered. Factors that account for true adverse vaccine reactions include the following:

1. Contamination of vaccines with extraneous agents
2. Failure to completely inactivate the vaccine organism in the case of killed vaccines, resulting in the vaccine inducing acute disease
3. Residual virulence of the vaccine organism, especially with modified live vaccines

4. Adverse vaccine reactions due to vaccine induced immune suppression, with a consequent susceptibility to infections
5. Adverse vaccine reactions due to excessive induction of cytokine release
6. Hypersensitivity response to vaccine antigens resulting in systemic anaphylaxis
7. Injection site lesions.

Vaccine failures are frequent occurrences in the livestock and poultry industries, with consequent great economic losses as a result of high mortalities due to acute diseases. Some of the causes of vaccine failures are:

1. Vaccine failures may occur because the vaccinates are not able to respond appropriately to the vaccine. In young animals, maternal antibodies may neutralize or complex with the vaccine before it can induce an immune response, thus making the animal vulnerable to infection.
2. Vaccine failure due to overwhelming challenge with field virulent agents.
3. Vaccine failure due to antigen differences between vaccine and field strains of agent.
4. Vaccine failure due to interference when multiple vaccines are administered concurrently.

In summary, vaccines fail to protect animals from diseases due to problems with **client education or compliance with good animal management practices**. It is important to adhere to proper timing and method of vaccine administration and to minimize immunosuppressive factors and exposure of vaccinated animals to high challenges of infectious agents.

B. Procedures for Ensuring Vaccine Safety and Efficacy

To ensure the purity, safety, potency and efficacy of biological products, companies intending to engage in their production must apply for license to operate from the Center for Veterinary Biologics (CVB), stating clearly the products that would be produced and the procedures of production (Outline of Production). With the guidance of the Outline of Production, the premises are inspected and then licensed for production after which the outline of production can never be altered. Should there arise the need for a change in the outline of production, a new license would have to be applied for and issued by the CVB before production can continue.

The first serials of products would have to be tested by the manufacturing company for purity, safety, potency and efficacy in the target animals and the results submitted with samples of serial to the CVB for the product license. The CVB would either test the serials independently to confirm results of company, or review the company's test results and if they are convincing enough, then the product license is issued, and the product released for marketing. All subsequent serials would have to be released by the CVB before they can be distributed. The CVB also periodically visits biologics manufacturing companies, unannounced to inspect for compliance to good manufacturing practices and the outline of production. In case of foreign companies intending to export biological products to U.S., they will be inspected by the CVB and the products first licensed before they can be marketed in the U.S.

C. Potency and Safety Testing of Vaccines and Diagnostic Test Kit Evaluation

This was mainly a practical session, with participants given the chance to see and try carrying out some of the potency and safety testing done at the CVB before biologics are licensed.

The potency of a biologic is the amount (quantity) of the antigen of the agent that can induce the required immunological response in the target animals if used as recommended by the manufacturer. There are a number of in-vitro tests that can be used for potency testing of products. They include the Enzyme Linked ImmunoSorbent Assay (ELISA), SDS-PAGE/Western Blot assay for protein analysis. There were also demonstrations of the various techniques of titration of viruses in cell cultures and embryonated chicken eggs and the Polymerase Chain Reaction (PCR) assay.

The CVB also licenses veterinary diagnostic test kits for use in the U.S. and for sale to other countries. There was an overview of the processes of evaluation of these kits before licensing.

4.1.3 Conclusion

Ghana imports almost all the needed veterinary biological products either from the U.S., European Union or other biologics manufacturing companies all over the world. All these products might have been licensed for use in the exporting countries. It was very interesting to know that the CVB issues permits for the export of products not licensed for use in the U.S. These products might even be from unlicensed facilities for their production.

The Food and Drugs Board of Ghana as well as the Ghana Standards Board are the two institutions responsible for ensuring that drugs and other products being marketed for public consumption are of required standard quality. These products do not include veterinary biologics. Veterinary biological products arriving in the country or produced in the country and released for marketing, more often than not, are not retested to ensure their purity, safety, potency and efficacy by an independent body, before being marketed to the end users. The independent body empowered by government policy to regulate veterinary biologics does not exist. The result is the yearly outbreaks of diseases even among vaccinated animals with consequent high rates of mortalities thus hindering attempts to improve the livestock and poultry industries.

There are a number of Veterinary Laboratories in Ghana, which if well resourced and equipped, could carry out safety and potency testing of veterinary biologics entering the country for certification for release by the Veterinary Directorate. These laboratories have nucleus staff, which if given a minimal training as in OIE Veterinary Biologics Training Program, can efficiently carry out the task of ensuring that veterinary biologics being marketed in the country are not worthless, contaminated, dangerous and harmful. The skills and knowledge obtained from the OIE Veterinary Biologics Training Program could be the starting point of the establishment of a body for the regulation of veterinary biologics in Ghana. It is therefore recommended that additional Ghanaian veterinarians be given the opportunity to participate in future Veterinary Biologics Training Programs.

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ATTACHMENT 1

FINANCIAL PLAN AND BUDGET

ITEM	Budget Amount	Current Quarter Disbursements	Cumulative Disbursements	Remaining Budget Balance
MARKETING AND TRANSPORTATION TRAINING				
TOT Activities	\$120,000	\$27,700	\$85,159	\$34,841
Farm to Market Transportation	\$60,000	\$0	\$42,083	\$17,917
FOOD SAFETY/SPS TRAINING				
Plant Health Systems Analysis (1)	\$45,000	\$0	\$0	\$45,000
Regional SPS Conference (2)	\$22,500	\$0	\$0	\$22,500
FSIS Meat and Poultry Seminar	\$52,500	\$12,952	\$20,311	\$32,189
TOTAL	\$300,000	\$40,652	\$147,553	\$152,447

EXPLANATION FOR UNUSED FUNDING:

(1) Plant Health Systems Analysis Course postponed the last 2 years by proponent (USDA/APHIS).

(2) Regional SPS Conference held in Accra, Ghana in September 2002 and funded by USDA/FAS/Trade Policy ATRIP account.