Annual Activity Update (for 2007) for Larry L. Murdock

GRANTS

Cowpea Hermetic Storage Technology Transfer in West and Central Africa – funded by the Bill and Melinda Gates Foundation. $11.4 million. L.L.M. and colleagues created the original technology that is the foundation of the grant; I also drafted (as first author with Jess Lowenberg-DeBoer and Joan Fulton – see attachment) the concept note that was submitted to the Gates Foundation.

Genomic and Proteomic Responses to Dietary Toxins in a Stored Grain Insect Pest funded for $900,000 over three years by the USDA/CSREES; Keyan Zhu-Salzman P.I., B.R. Pittendrigh and L.L. Murdock Co-PI’s. Currently we are in the third year of the grant.

PUBLICATIONS

Refereed


Encyclopedia Entry

Book Chapter

Book Edited
Book Authored

SCIENTIFIC CITATIONS

H-Index = 25 (see L.L. Murdock at ISI to verify)
Citations of my papers in 2007: 94, average last four years = 95 per year.
3 of my papers have >100 citations; 13 of them >50 citations

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TEACHING

ENT 595G Course entitled “Fishing in the Entomological Stream” 13 students, mostly graduate students; course designed to deal with issues important to careers in science (sources of ideas, importance of writing, bandwagons, scholarly management, dealing with distorted personalities, etc. – important things rarely or never taught in classes).

SPECIFIC GOALS FOR 2008

GOAL 1: Be a better, more inspiring teacher. Develop, with the participation of my ENT 551 students, the beginnings of a web-based encyclopedia of insect physiology and biochemistry

GOAL 2: Be a better more original and productive researcher. Complete ongoing original work with the Gates project. I intend to publish at least 4 papers in the coming year.

GOAL 3: Be a better, more responsible member of the community. I will publish at least one more book that will include entomological themes. I will serve as co-organizer of an international meeting on cowpea in Abuja, Nigeria, and as co-organizer of field trials of Bt cowpea in Puerto Rico.

CONSTRAINTS

1. Low morale due to the departure from the Department of gifted young people.

2. Continuing lack of appreciation of my work, my influence in the world-wide cowpea community, and my accomplishments as a scholar, creator of long-term programs, and mobilizer of talent. This is a constraint because if I were encouraged I would be far more productive.
Appendix

Cowpea Hermetic Storage Technology Transfer in West and Central Africa: A Concept Note

Submitted to the Gates Foundation in response to RFP# GD-AG-01 by Larry Murdock, Joan Fulton & Jess Lowenberg-DeBoer, Purdue University, West Lafayette, IN, USA

I. Background and Rationale:

Cowpea is the most economically important indigenous African grain legume. It is produced by small-holder farmers on about 8 million hectares in West and Central Africa (Langyintuo et al, 2003). In the 1990s production in that region was about 2.6 million tons annually. It is used for both household subsistence and as a cash crop. It is a major item in regional trade. Cowpea grain is very susceptible to storage insects, especially the cowpea weevil (Murdock et al, 1997). Storage insecticides can control cowpea weevils, but impoverished farmers often do not have access to these insecticides and when they do they often misuse them resulting in poisoning and environmental pollution. The USAID funded Bean/Cowpea Collaborative Research Support Program (CRSP) has developed a portfolio of non-chemical storage methods for cowpea grain. A recent regional impact assessment study showed that the CRSP hermetic storage technologies have been widely adopted in the region (Moussa, 2006), but that growers often lack the materials and information to implement them effectively. The purpose of this concept note is to propose an initiative to disseminate information on proper use of the CRSP techniques and to facilitate entrepreneurs to provide cowpea storage materials.

The most commonly used CRSP technology is double/triple bagging which is a hermetic storage technique which relies on limiting oxygen to control insects. Depending on the country, it is employed for 5% to 25% of cowpea, but sometimes fails for lack of appropriate bags and/or misunderstanding of the methods. Double/triple bagging is a flexible technique which adapts easily to any scale of production from women who grow a few kilograms for home use to emerging commercial farmers who may have several tons. This storage method also fits the West Africa cowpea trade which handles all cowpea in bags. Growers often cannot find good-quality heavy-duty plastic bags and instead use recycled plastic bags with holes or tears in them or vented cement or sugar bags which are not hermetically sealable. Because the recycled bags are often not hermetically sealed growers frequently use storage insecticides (e.g., phostoxin, actellique) in the bags. There are plastics manufacturers in the region who have the capability to produce heavy duty double or triple layer bags for storage, but growers often do not know they could benefit from using such bags and merchants are unaware of the potential market for them.

Informing growers about how hermetic storage works and linking plastics manufacturers to potential clients would benefit millions of cowpea growers and consumers. Our vision for success is that by the 5th year of the project over 50% of cowpea in West and Central Africa will be stored with CRSP hermetic technologies. Using the methodology described by Moussa (2006), this project would benefit about ________ farm families, conserving ________ tons of cowpea that would otherwise have been lost to storage insects, and generating an estimated net present value of about $____ million.
II. Project Objectives:
The general objective of this project is to increase the incomes of small holder farmers in West and Central Africa and the food supply of consumers in the region by disseminating improved cowpea storage technology. The specific objectives are to:

1) determine the best container for hermetic storage of cowpea suited to locally available materials, prices, climate and other factors,
2) disseminate information on non-chemical cowpea storage methods to extension services, NGOs and farmers,
3) demonstrate the most effective cowpea storage methods in each village in the major cowpea production areas of West and Central Africa, and
4) develop businesses that provide hermetic storage supplies (e.g., one-piece triple plastic bags)

III. Project Design and Implementation Plan – Purdue University will serve as the prime contractor, assisted by World Vision International. Subcontracts will be developed with National Agriculture Research Systems (NARS), national extension services and non-governmental organizations to carry out the following activities in the main cowpea growing area of West and Central Africa, including Benin, Burkina Faso, Cameroon, Ghana, Mali, Niger, Nigeria, Senegal, Tchad, and Togo:

1) Adaptive Research:
   a. Testing one piece double or triple bags – These optimized bags would be manufactured specifically for cowpea storage. We will determine if shipping, handling and durability of the bags would be facilitated if the outside layer were of woven polyethylene? We will establish the most cost-effective design.
   b. Determine the best size for cowpea storage bags – Most of the CRSP work has been with 50 kg bags, but the regional cowpea trade uses 100 kg bags almost exclusively.
   c. Identify alternative containers for hermetic storage – 200 liter metal drums have proven effective, but they are in demand for many other uses and are frequently too expensive for cowpea storage use. Also, they are not available in many places. Plastic jugs (e.g., originally used for cooking oil, motor oil, and other consumer products) are used by some growers with small quantities to store. Emerging commercial farmers and cooperatives with larger quantities of cowpea are interested in the potential for using large containers (e.g., 1000 L or 2000 L plastic tanks designed for water storage).
   d. Estimate the effect of improved storage on cowpea prices. Currently, cowpea prices often double or triple from harvest time to the following growing season. This seasonal price increase is a major factor in the profitability of cowpea storage. Small-scale producers – who often must sell at harvest when the price is lowest and purchase grain later in the year when prices are much higher, are doubly hurt by the price swings. Would that season price change be dampened by improved storage? This would
be estimated based on econometric analysis of cowpea price patterns in Nigeria and neighboring countries.

2) Information Dissemination:
   a. Revise and republish earlier paper cowpea storage bulletins in the primary written languages of West and Central Africa (ie. English, French, Hausa, Fulfuldè, Wolof, Bambara, Moré). Bulletins would be available on the CRSP and NGICA websites for free download and in paper form. This is mainly a train-the-trainers activity. Most cowpea farmers are not literate, but extension and NGO staffs must understand the technology to communicate effectively.
   b. Create and show a new video on the need for, mode-of-action of and step-by-step procedures for the CRSP cowpea storage technologies. A video was created and effectively used in Cameroon in the mid 1990s. This video needs to be updated and dubbed into national languages. It needs to be shown as part of public service broadcasting on national TV channels in the target countries.
   c. Create and broadcast short radio spots on cowpea storage. Radio is the most widely used medium of mass communication in West and Central Africa. It does not depend on literacy. Radio is broadcast in many local languages. The nature of the radio spots may differ from country to country, but short radio dramas have been an effective way to communicate important messages (e.g., AIDS awareness).
   d. Village level demonstrations – The impact assessment (Moussa, 2006) shows that village level demonstrations of the CRSP technologies are the single most effective method for facilitating adoption. Experience in Cameroon in the 1990s by the CRSPs and NGO partners suggests that this is not expensive, roughly US$200 per village at the time. These demonstrations could be implemented by Extension and NGO staff, or by “bush technicians” trained for the purpose.
   e. Linking plastics manufacturers with entrepreneurs – We will order hermetic cowpea storage bags from regional plastics manufacturers and place them on consignment with merchants in shops and markets in or close to villages where demonstrations are occurring. Village demonstrations will include information on where to obtain storage materials locally. After the initial consignment is sold we will either find a local entrepreneur who wants to serve as the intermediary with the plastics manufacturers or link the local merchants directly with the manufacturers. Ultimately the bag supply system will be self-sustaining because of its profitability.

V. Monitoring and Evaluation

Monitoring will be the responsibility of the project manager. He or she will be in regular contact with participating subcontract organizations via email and phone. He or she will visit each participating subcontract organization at least once per year. He will review workplans and annual reports, providing written comments to the project director and the administrative counsel. Midcourse corrections will be done when a problem is noted and a solution identified. Adjustments will need not await a year-end review. Major
changes to workplans will be reviewed by the administrative council and approved by the project director.

Evaluation of the project in year five will follow the methodology used by Moussa (2006) in evaluating the Bean/Cowpea CRSP cowpea storage efforts. In 2004 and 2005 Moussa and colleagues interviewed randomly-selected farmers in the main cowpea growing areas of Benin, Burkina Faso, Cameroon, Mali, Niger, Nigeria, and Senegal. These countries include 96% of the cowpea production in West Africa. His information was complemented by a World Vision impact assessment of cowpea storage activities in one district in northern Ghana. He estimated the number of farmers using each type of cowpea storage technology, the quantity stored with each technology and problems with each technology. He used standard economic surplus methods (Alston et al., 1995; Masters et al., 1996) to estimate the net benefit of cowpea storage research and extension efforts by country and for the whole region. The Moussa et al (2006) study will serve as a baseline for the evaluation of work under this project.

VI. Organizational Capacity and Management Plan

The project will be managed from the International Programs in Agriculture office (IPIA – www.agriculture.purdue.edu/IPIA) at Purdue University. IPIA coordinates interdisciplinary international agricultural development efforts for Purdue University. It has a long history of managing international development projects in West and Central Africa. From 1983 to 1992 IPIA managed a $10 million institution building project with the National Agricultural Research Institute of Niger (INRAN). From 1990 to 1994 they managed a similar project with the Institute of Agricultural and Environmental Research (INERA) of Burkina Faso. IPIA coordinates Purdue involvement in six of the nine USAID funded collaborative research support programs (CRSPs) including: the International Millet and Sorghum CRSP, Bean/Cowpea CRSP, Aquaculture CRSP, Sustainable Agriculture and Natural Research Management (SANREM) CRSP, Integrated Pest Management CRSP, and Peanut CRSP. Collectively, the annual CRSP budget at Purdue is about $2.5 million. Through these and other projects Purdue IPIA has close working relationships with most of the NARS (National Agricultural Research Systems) in West and Central Africa, and many of the NGOs.

Overall management of the project will be in the hands of a project director, Dr. Joan Fulton (http://www.agecon.purdue.edu/directory/details.asp?username=fultonj). Dr. Fulton’s is an agricultural economist whose work focuses on marketing and entrepreneurship in the US and Africa. She has international experience in Burkina Faso, Niger, Nigeria, Senegal and India.

Day-to-day management of the project will be handled by a project manager based at IPIA. This individual would need to travel frequently to participating countries and represent the project with national authorities, NGOs, extension services and other stakeholders. The person will be bi-lingual English and French, and have at least a Masters degree in a related field (e.g., Ag Economics, Entomology, Ag Education and Extension).

Technical and administrative oversight will be provided by an administrative council composed of two Purdue faculty members who are closely involved in the project, a World Vision representative and two members chosen from stakeholder groups in Africa. This council would meet face-to-face once at the beginning of the project and a second time in the third year. Other meetings would be held by conference call or video conferencing if stakeholder representatives in Africa have access to the necessary
facilities. The primary responsibility of the council would be to review workplans and annual reports from various project components. While their main output would be in the form of recommendations to the project director, they would be expected to inform the relevant authorities if they felt their recommendations were not being acted on. The relevant authorities might be Purdue administration (IPIA director, Dean of Agriculture) or the Gates Foundation representative for the project.

Purdue will establish subcontracts with NGOs, extension services and other groups in each participating country. An annual plan of work will be established with each group. Because of their long experience in cowpea storage issues, the national agricultural research organizations in Niger, Burkina Faso and Cameroon will carry out the adaptive research. Progress in this adaptive research would be monitored through annual reports, conference presentations and publications, but the final test of the research is in whether effective cowpea storage technology is used by the general public. For the mainly technology transfer subcontracts an annual progress report would be required including the number of farmers trained, the number of hermetic storage containers sold on consignment, number of bulletins distributed, and an estimate of the viewership and listening audience of video or radio materials.

(Larry & Joan – IPIA have some standard institutional capability statements that I will edit to fit the occasion. Lonni will find the capability statements on Monday.)

References:
Masters, W., B. Coulibaly, D. Sanogo, M. Sidibe, and A. Williams. 1996. “The economic impact of agricultural research: a practical guide”. Purdue University, West Lafayette, IN, USA.
Moussa, Bokar, “Economic Impact Assessment of Cowpea Storage Technology” Master of Science Thesis, Department of Agricultural Economics, Purdue University, West Lafayette, IN, USA, 2006.