

Peanut CRSP 2012 Final Report for Project UCN 139

1. Final Summary

a. Brief statement of overall goal

Loss of soil fertility along with unreliable water supplies has adversely impacted agricultural productivity in many African countries. Peanut cultivation offers significant economic value for smallholder farmers in many African environments because of the potential high returns per unit area of this crop and the role it could play in the farming system as a contributor to soil fertility improvement. Peanut production offers women a way to earn cash income, thereby increasing their agency and empowerment.

Due to poor understanding of the socio-economic potential of peanut cultivation in arid and semi-arid lands (ASAL), national research and extension activities typically have not addressed adequately the farm level economics of peanut in many countries. The limited empirical evidence available for African peanut farmers shows considerable gaps between what farmers could achieve and actual average performance. These data reveal a major potential to improve farm performance and income even with existing levels of technology.

There are several actions that can be taken to deal with the challenges facing the peanut industry throughout Africa including: 1) application of better farming practices to conserve soil fertility and raise farm productivity; 2) adoption of appropriate seed varieties; 3) a thorough understanding of peanut production within the overall farming system; 4) increasing earning opportunities for women; 5) improving awareness of aflatoxin contamination and implementing practices that reduce this problem; and 6) developing and promoting value added options that are suitable for farm level implementation and that can deliver good quality products and thus lead to market expansion.

The potential significance of peanuts in the well being of poor rural households underscores the importance of research geared to developing and promoting sustainable technologies focused on this crop specifically and also on the broader farming systems in which it is produced. In this project, the US and African partners worked closely to generate and disseminate knowledge dealing with the economics of peanut production with the overarching objective of improving the well being of poor farm households and strengthening the research capabilities of participating organizations.

The overall purpose of the UConn-PCRSP was to improve understanding of the farm level economics of peanut production in Uganda and Kenya. We focused on the analysis of the socio-economic benefits of peanut farming, on strengthening human capital resources and on disseminating relevant information to key stakeholders in selected peanut producing regions in each of the two countries.

The UConn PCRSP pursued the following five specific objectives:

- 1: Improve farm level data collection protocols and introduce standardized procedures for data collection and documentation.
- 2: Analyze the potential to increase household income through productivity growth in peanut farming systems.
- 3: Examine the impact of alternative peanut farming systems, including value-added activities, on resource use and income generation.
- 4: Work with Host Country collaborators to develop training materials and workshops on production economics and farm management, with special attention to women farmers.
- 5: Provide partial support to train several professionals in agricultural economics and other relevant fields, both at the Ph. D. and M.S. levels.

b. Significant Technical Achievements-Host Country, US

Several published materials were completed and are available for use by the research community and extensionists. These works focus on a host of issues including the analysis of the adoption of improved seeds, fertilizer and information among Senegalese, Kenyan and Ugandan peanut farmers. Work was also completed on the connection between social network structures and the acquisition of information about new seed varieties and productivity among groundnut farmers in Uganda and Kenya. Efforts were made to assess the impact of climatic variability on groundnut production in Uganda accounting for the various farming systems found throughout the country based on pooled cross-sectional time-series data at the district level. A promising area of inquiry concerns the measurement of productivity gaps, from technological and managerial sources, among groundnut farmers in both Uganda and Kenya. A key issue in this last focus area is the effect of improved groundnut seeds on farm productivity.

In addition, several workshops related to the design and implementation of farm level surveys, impact evaluation of development projects, cost of production, farm profitability and the use of GIS techniques in farm planning were held. All these sessions were very well received by stakeholders in both Uganda and Kenya. Moreover, several students, all women, have completed advanced degrees (M.Sc. and Ph.D.) in Agricultural and Resource Economics, and Adult Education and their research contributed directly to the project.

All of the activities undertaken have led to the generation of new knowledge and the strengthening of human capital. A salient accomplishment was the consolidation of strong professional ties between East Africa and US scientists. This was the first time that UConn had worked in East Africa under the P-CRSP and thus the first two years were largely spent in building working relationships. It would be unfortunate if this work does not continue. The teams that been consolidated are poised to use the knowledge that we have gained and the

networks that we have constructed to continue our scientific work and make significant progress over the next several years.

c. Significant Issues/Challenges

In the early days of the project a significant challenge was to establish the teams in Uganda and Kenya. This issue took considerable effort since the scientists did not know each other and the institutions involved had no previous experience in working together. As indicated above, we have completed this phase with strong teams and thus we were able to overcome successfully these early challenges. We also learned important lessons that would be helpful if we were to continue this type of work with our current partners and/or with different scientists and institutions in new countries.

We are very appreciative of the many efforts made by the ME to support our work over the past several years. By its nature, the P-CRSP can be difficult to implement given the limited budgets, the distance that separates the US from the HC researchers and by the fact that working in agricultural development is not an easy undertaking. A fundamental issue that we faced was the financial management of the Project *vis a vis* the HC institutions. It would have been much easier to revert to managing the subcontracts with the HC institutions directly by each participating US University. A related item is the importance to have frequent visits to the Host Country institutions by US PIs in order to insure continuity in the work. Having several PIs working collaboratively in a given country can help spread the visits so that we can have in-country presence on a regular basis and in a cost effective fashion. These are among the lessons learned that can be invoked in future work.

Another significant lesson and challenge relates to the importance of developing well-articulated collaborations among various researchers from different US Universities and Host Country Institutions early on the project preparation stage. It was fortunate that the projects NMS172, UGA136 and UCN139 were able to develop a very congenial and productive working strategy but this happened after implementation started. Although there is a challenge in coordinating scopes of work and budgets, such collaborations could be even more productive and cost effective if this is done when the projects are in the development phase.

d. Capacity development, i.e. laboratory, field, equipment-Host Country, US

UCN139 did not have much funding allocated to equipment. The one exception was funding available for the purchase of computer equipment for the Serere Station in Uganda and the Kisii Station in Kenya. This equipment was used intensively during the project. The PI for UCN139 also assisted in the protracted procurement of the truck for Serere, which required a major effort.

e. Human Capacity/training to be listed in a table that includes:

Table 1: Human Capacity/Training

Name	Gender	Country	Degree	Completion Date	Host Country	Host University	Employment
Aizhen Li	F	China	Master	November 2010	USA	UConn	N.A.
Angelista Kihaga	F	Tanzania	Master	April 2011	USA	UConn	Ministry of Ag. in Tanzania
Grace Lemunge	F	Tanzania	Master	May 2011	USA	UConn	Ministry of Ag. Tanzania
Mary Thuo	F	Kenya	Ph.D.	December 2011	USA	UConn	UConn-Ethiopia
Cresensia Asekenye	F	Uganda	Master	July 2012	USA	UConn	NARO in Uganda

f. Key workshops/short-term trainings listed in a table that includes:

Table 2: Key workshops/short-term training

Location	Training type	Participants		Date
		Male	Female	
Uganda, Soroti	Training enumerators for data collection	4	1	January 2009
Kenya, KARI Kisii	Training enumerators for data collection	10	3	September 2009
Uganda, Soroti	Training new enumerators for data collection	3	1	January 2010
Uganda, Soroti	Workshop: GIS Applications in Agriculture	12	2	May 2010
Kenya, KARI Kisii	Workshop: Enterprise Budgeting... and farm Profitability Analysis	12	2	October-November 2010
Kenya, Kari Nairobi	Scientific Conference on Groundnuts	120	30	November 2010
Kenya, KARI Nairobi	Workshop: Impact Evaluation of development Projects	12	3	April-May 2011
Uganda, Soroti	Workshop: Enterprise Budgeting... and farm Profitability Analysis	14	3	October 2012

g. Publications

Refereed Papers and Other Articles

Asekenye, C., B. E. Bravo-Ureta and D. K. Okello. “The Average Economic Performance of Alternative Groundnut Varieties in Uganda”. Chapter in D, K., Okello, C. Asekenye, P. Okori, W.M. Munthali, J. Ininda, B. E. Bravo-Ureta. 2013. Groundnut Seed Production Manual for Uganda, In Press.

Thuo, M., Bell, A, Bravo-Ureta, B. E., Okello, D. K., Okoko, N., Kidula, N., Deom, C. and Puppala, N. “Effects of Social Network Factors on Information Acquisition and Adoption of Improved Groundnut Varieties: The Case of Uganda and Kenya.” *Agriculture and Human Values* (2013a): Revise and resubmit.

Thuo, M., Bell, A, Bravo-Ureta, B. E., Okello, D. K., Okoko, N., Kidula, N., Deom, C. and Puppala, N. “Social Network Structures among Groundnut Farmers.” *Journal of Agricultural Education and Extension* (2013b): <http://dx.doi.org/10.1080/1389224X.2012.757244>

Thuo, M., B. E. Bravo-Ureta, K. Obeng-Asiedu and I. Hathie. “Adoption of Agricultural Input Packages by Smallholder Farmers: The Case of Groundnut Hybrid Seed and Chemical Fertilizer in the Senegalese Groundnut Basin.” *The Journal of Developing Areas* (2013c): Forthcoming.

Okello, D.K., Deom, C.M., Monyo, E., Puppala, N., Bravo-Ureta, B. and Oloka, H.K. “Reaction of Elite Germplasm Lines to Groundnut Rosette and Late Leaf Spot Diseases in Uganda.” *Health Plant Progress* (2013): Under Review.

Li, A., B. E. Bravo-Ureta, D. K. Okello, C. M. Deom and N. Puppala. “Groundnut Production and Climatic Variability: Evidence from Uganda.” *Zwick Center, Working Paper*, February 2013.

Asekenye, C., B. E. Bravo-Ureta, Mukherjee, A. Kihaga, D. Kalule Okello, N. Okoko, N. Kidula, M. Deom and N. Puppala. Productivity Gaps among Smallholder Groundnut Farmers in Uganda and Kenya: A Stochastic Production Frontier Approach. UConn, Manuscript in Progress, 2013.

Thuo, M., B. E. Bravo-Ureta, I. Hathie and P. Obeng-Asiedu. Adoption of Chemical Fertilizer by Smallholder Farmers in the Peanut Basin of Senegal.” *Journal of African Agricultural and Resource Economics* 6(2011): 1-17.

Ph. D. Dissertation

Thuo, Mary. How Social Networks relate to Groundnut Farmers’ Knowledge and Decisions to Adopt New Varieties: A Case of Kenya and Uganda. Ph. D. Dissertation, Neag School of Education, University of Connecticut, December 2011.

Master Theses

Asekenye, Cresensia. An Analysis of Productivity Gaps among Smallholder Groundnut Farmers in Uganda and Kenya. M.Sc. Thesis, ARE UConn, July 2012.

Kiaga, Angel. An Analysis of Technology and Management Gaps for Groundnut Producers in Kenya. M.Sc. Thesis, ARE UConn, May 2011.

Master Papers

Lemunge, Grace. A Value Chain Analysis for Groundnut/Peanut in Kenya. M.Sc. Plan B Paper, ARE UConn, May 2011.

Li, Aizhen. Groundnut Production Function Estimates Accounting for Climatic Conditions: Evidence from Uganda. M.Sc. Plan B Paper, ARE UConn, November 2010.

Invited Presentations

Bravo-Ureta, B. “Impact Evaluation of Agricultural Development Projects.” Kenya Agricultural Research Institute (KARI), Nairobi, Kenya, April 30-May 2, 2012.

Bravo-Ureta. “Future Vision: Program Priorities in Production Economics.” Panel Presentation, Peanut CRSP Strategic Research Conference, Valletta, Malta, December 14, 2011.

Papers Presented

Bravo-Ureta, B. E., E. Njuki and A. Kihaga. “Technological Change, Managerial Performance and Productivity Differentials: A Conceptual Framework for Groundnut Farming.” Paper Presented at the 12th KARI Biennial Scientific Conference, November 9, 2010, Nairobi, Kenya, p. 46, Conference Program and Book of Abstracts. November 2010.

Kidula, N., N. Okoko, B. E. Bravo-Ureta and M. Thuo. “A Preliminary Analysis of Yield Gaps in Groundnuts between Research and Non-Research Farmers in Kenya.” Paper Presented at the 12th KARI Biennial Scientific Conference, November 9, 2010, Nairobi, Kenya. p. 47, Conference Program and Book of Abstracts. November 2010.

Thuo, M., S. Bell and B. Bravo-Ureta. “Transforming Rural Agricultural Systems in Sub-Saharan Africa: What Role do Social Networks Play? Proceedings of the 2011 American Education Research Conference and Canadian Association for the Study of Adult Education Joint Meeting, Toronto, Ontario, Canada.

Posters

Okoko, N., with N. Kidula, L. Wasilwa, B. E. Bravo-Ureta, M. Thuo, W. Selle. “Groundnut Product Value Chain (APVC) Research in KARI.” Peanut CRSP Strategic Research Conference, Valletta, Malta, December, 2011.

Bravo-Ureta, B. E. and Team. “Improving Livelihoods of Farm Households in Peanut-based Farming Systems in East Africa: 2007-2012.” Peanut CRSP Strategic Research Conference, Valletta, Malta, December, 2011.

Thuo, M., with A. Bell, B. E. Bravo-Ureta, N. Okoko, N. Kidula, D. Okello. “Effect of Social Networks on Groundnut Farming: The case of Kenya and Uganda.” Peanut CRSP Strategic Research Conference, Valletta, Malta, December, 2011.

Kihaga, A., with B. E. Bravo-Ureta, N. Okoko, N. Kidula, C. Asekenye and M. Thuo. “Increasing Household Income through Higher Productivity in Groundnut Farming Systems.” Peanut CRSP Strategic Research Conference, Valletta, Malta, December, 2011.

2. Final Interpretation

a. Importance of Technical Achievements-

i. Host Country

Based on the results obtained, we strongly believe that this project has strengthened the capacity of Host Country institutions in terms of designing programs focusing on the promotion of productivity and income growth in the agricultural sector. Host Country personnel have acquired methodological skills that should prove very helpful in future research and collaborations. Partnerships with different stakeholders and local institutions have enhanced the ability of our collaborators to work with farmer groups to develop promising research and outreach activities. The findings of this project, disseminated through publications, workshops and various meetings, also give policy makers a better understanding of agricultural processes, how to encourage productivity, output and income growth in agricultural development and changes in resource use over time within the study area.

The advanced degree training received by several females makes an important contribution to advancing their careers as well as their contributions to women and development in their respective organizations.

ii. US

The partnership with the African collaborators has expanded UConn’s global connections especially with developing countries in East Africa, thus enhancing the opportunities for future work and contributions by/from faculty and students. This project also has expanded the exposure, capabilities and experience at UConn concerning the important role of women in development in Africa. These contributions have been of particular value to staff, graduate students, undergraduate students and faculty members at the Department of Agriculture and Resource Economics.

b. Importance of physical and human capacity development-

i. Host Country

Benefits also stemmed from the training of extensionists and researchers and from research and training materials that can be used to promote sustainable growth in the peanut industry. We can expect that in the near future those that have been trained directly in the program, including graduate students and non-degree trainees, would have a multiplier effect in terms of training others. An important point is that all the trained graduate students are women and thus there is a major potential for increasing gender considerations and the role of women in future agricultural projects undertaken by these professionals.

ii. US

Collaboration with the various African institutions has deepened the knowledge and skills of UConn researchers, enabling them to work more effectively with colleagues and others in East Africa to strengthen the peanut industry. In addition, experience acquired in the field by UConn researchers provides a unique opportunity to include new material into courses, thus enhancing the quality of instruction in agricultural and resource economics, and development studies. A larger benefit accrued to agricultural researchers in general. For example, datasets developed through this project are available to conduct further scientific studies by students and faculty and thus provide additional understanding of the agricultural development process thus affording a wider opportunity to develop new research efforts with host country colleagues.

c. Heritage left from workshops and short-term training-

i. Host Country

The heritage left can be evaluated in terms of acquired knowledge and human capital development. For example, there are more trained people in Uganda and Kenya and these people have greater knowledge in the socio-economic development process in general and the economics of peanut farming in particular. These people have access to technical and published documents and reports, and they have access to relevant materials and information to design survey instruments and collect data.

ii. US

In general, US researchers have enhanced their understanding of agricultural productivity in developing countries by interacting with peanut farmers, researchers and government officials in the region. They acquired field knowledge that is fundamental in the modeling process in terms of filling the gaps between theoretical and empirical framework. This knowledge concerns in particular assumptions that need to be relaxed in order to better capture reality in developing country settings.

d. Heritage left in publications

Several papers are at various stages in the publication pipeline. Here we provide a very brief summary of the papers listed as Referred Articles and Other Papers above.

- The chapter by Asekenye et al. (2013a) presents a brief analysis of the cost and returns from a number of improved peanut varieties developed by the breeding program in NaSARRI-Serere and compares them with two traditional varieties. The data shows that the improved varieties offer a clear advantage when compared with the conventional material.
- The manuscript in progress by Asekenye et al. (2013b) uses farm level data to examine technological and managerial gaps among groundnut producers based on surveys applied in Uganda and Kenya. The results, based on the estimation of stochastic production frontiers, show a marked productivity advantage in favor of the improved varieties.
- The Thuo et al. (2013a) article explored the effects of social network factors on information acquisition and adoption of new seed varieties among groundnut farmers in Uganda and Kenya. The results show that Ugandan farmers primarily used weak ties with researchers and extension agents as sources of information. In contrast, Kenyan farmers used strong ties with close associates. Strong ties, natural factors and farmers' own experience with new varieties were most associated with productivity. The majority of farmers had ties to local groups to strategically pool risks and access available resources. Visualizing farmers' social networks enables policy-makers and change agents to identify relevant social relationships that could be utilized strategically to increase the capacities of poor farming communities.
- The Thuo et al. (2013b) paper examined how social network structures relate to the acquisition of information about new seed varieties and productivity among groundnut farmers in Uganda and Kenya. The results show that information acquisition and adoption were correlated. Social network factors, particularly close associates like researchers and extension agents, partially influenced information acquisition, but did not influence adoption. This study provides insights on the importance of farmer participation in applied technology research and the impact of social interactions among farmers and external agents in agriculture.
- The Thuo et al (2013c) article provides empirical evidence of factors that influence the adoption of an improved groundnut variety (La Fleur 11), and chemical fertilizer in the Senegalese Groundnut Basin. Results show that the decision to plant La Fleur 11 and to use chemical fertilizer on groundnuts is independent from each other. Adoption of La Fleur 11 was positively associated with ownership of draft power, but negatively related to farmer's experience and location. Fertilizer use was positively affected by farm size, the number of plots and location, and negatively affected by access to off-farm income and ownership of draft power. Results suggest a need to tailor the diffusion of productivity enhancing inputs to area specific conditions and to design technology adoption strategies within a broader policy environment.
- The objective of the Okello et al. (2013) study was to report breeding efforts that introduce resistance to Groundnut rosette disease (GRD) and late leaf spot disease (LLD) under natural agricultural conditions in Uganda, while examining the potential for management of GRD and LLD within Uganda. Sixty-four accessions from the International Crops Research Institute for Semi-Arid Tropics (ICRISAT) were screened for resistance to GRD and LLD in eastern Uganda. The use of these accessions in controlling the two diseases would boost groundnut production thereby contributing to income and food stability in Uganda and the region.
- The paper by Li et al. (2013) assesses the impact of climatic variability on groundnut production in Uganda, accounting for the various farming systems found throughout the

country based on cross-sectional time series data at the district level. The data includes 333 observations corresponding to 37 districts for 9 consecutive years, from 1992 to 2000. The results suggest that climatic conditions, based on the ENSO phenomenon, have a significant negative effect on output particularly for the warm phase. An important and alarming finding is a marked negative rate of technological change revealing productivity losses over the time period studied.

- The Thuo et al (2011) article focuses on the adoption of chemical fertilizer among smallholder farmers in the Peanut Basin of Senegal. The results show that the probability of using fertilizer increases where household heads have higher literacy, larger families and larger farms, but decreases where they have off-farm income. Fertilizer use is also positively associated with the amount of rainfall and varies by geographical location. The analysis indicates that both the adoption and the intensity of fertilizer use by peanut and millet farmers have been declining over the study period (1998–2005).

3. Final Summary of Accomplishments by Objective

Objective 1: Improve farm level data collection protocols and introduce standardized procedures for data collection and documentation.

To improve farm level data collection and introduce standardized procedures, we purchased and installed computer hardware, software and related equipment (e.g. printers, LCD projector) in the Soroti (Uganda) and Kisii (Kenya) Experiment Stations. This equipment facilitated and should facilitate in the future farm level data collection and organization at the stations. In addition, farm level survey instruments were designed and completed. Moreover, training workshops for data collection and sample selection procedures were organized for participants from Uganda and Kenya. Then, primary farm level data were collected and used to study various aspects regarding peanut farming.

Objective 2: Analyze the potential to increase household income through productivity growth in peanut farming systems.

Work was done to enhance our understanding of how household income could be increased through improved farm performance based on higher farm productivity within the peanut sector. Students from host countries financed by the program and other sources have conducted studies based on primary and secondary data to better understand the relationship between household income and productivity growth in peanut farming systems. Various publications, working papers and presentations, as documented elsewhere in this report, resulted from these efforts.

Objective 3: Examine the impact of alternative peanut farming systems, including value-added activities, on resource use and income generation.

The goal was to have a better understanding on how farmers' knowledge and practices could enhance development of an environmentally sustainable farming system that incorporates an economically viable value chain system in the peanut sector. We have completed a report on the peanut value chain as part of Plan B M.Sc. Paper.

Objective 4: Work with Host Country collaborators to develop training materials and workshops on production economics and farm management, with special attention to women farmers.

A number of workshops were conducted in both Kenya and Uganda covering various topics including data collection protocols, designing and applying survey instruments, use of GIS methods to monitor and manage experimental and farm level data, farm costs of production and profitability, and benefit-cost analysis and impact evaluation of development projects. Training materials including several power point presentations were developed to conduct the training sessions and were made available to all participants.

Objective 5: Provide partial support to train several professionals in agricultural economics and other relevant fields, both at the Ph. D. and M.Sc. levels.

Five female students completed their advanced degrees (M.Sc. and Ph.D.), in Agricultural and Resource Economics, and Adult Education, and specialized in fields relevant to the project. Aizhen Li defended her M.Sc. Plan B Paper in the Department of Agricultural and Resource Economics and returned to China; Angelista Kihaga defended her M.Sc. Thesis in the Department of Agricultural and Resource Economics and returned to her job at the Prime Minister's Office for Regional Administration and Local Government in Tanzania; Grace Lemunge defended her M.S. Plan B Paper in the Department of Agricultural and Resource Economics and returned to her job at the Export Processing Zone Authority in Tanzania; Mary Thuo successfully defended her dissertation in the Department of Educational Leadership and is now working in Ethiopia in a project led by the University of Connecticut; and Cresensia Asekenye successfully completed her M.Sc. program in Agricultural and Resource Economics at UConn and returned to Uganda where she currently works for the National Agricultural Research Organization (NARO) at the Ministry of Agriculture Animal Industry and Fisheries.