

Impact Assessment for the Peanut Collaborative Research Support Program

Final Report

Peanut Collaborative Research Support Program

UGA128

(October 2010 – December 2012)

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I. FINAL SUMMARY

A. The Overall Goal of the Project

The overall objective of the project is to provide a comprehensive estimate of the magnitude of socioeconomic benefits generated by the Peanut Collaborative Research Support Program (PCRSP) activities in Uganda and Ghana. In addition, we provide an in-depth portrait of the impacts on vulnerable groups like poor households and female household members.

The impact assessment analysis addresses all three PCRSP general themes, but at varying levels of intensity across the study countries. Increases in production values and market values from PCRSP generated technologies are documented either ex-post or ex-ante for the projects in Ghana and Uganda using economic surplus methods. The associated distribution of benefits to peanut producer and consumer households from yield gains are measured using quantitative simulation methods.

A more in-depth analysis of the distribution of project benefits is conducted in two study countries (Ghana and Uganda), which have hosted nine PCRSP projects. Specifically, the impact assessment examines how the benefits of PCRSP research have been distributed across producers and consumers and different types of households (i.e. poor, medium, rich), with a particular focus on the technology impacts on household income, poverty alleviation and food insecurity. Intra-household distribution of PCRSP technology benefits by gender is also documented in the impact assessments for Uganda using a mixture of qualitative and quantitative methods. The household analysis examines two particular activities of the PCRSP: the impact of post-harvest PCRSP activities in Uganda, and the adoption and impacts of PCRSP supported Integrated Pest Management (IPM) peanut practices in rural Ghana.

B. Significant Issues/Challenges

During the two years of our project we encountered two main challenges. First, as part of the analysis, we conducted an expert opinion survey to collect information on PCRSP projects in Africa from the late 90's to the present. The survey asked questions about the new technology(s) that the projects introduced, the countries and regions where the technology(s) was introduced, gains in peanut yields with the new technology(s), variance reduction in yields with the adoption of the new technology(s), changes in peanut production costs in \$/acre (e.g. cost of seed, labor, and other inputs) associated with the new technology(s), adoption rates of the new technology(s) from the time the project started until 2010 and expected adoption rate for the technology(s) introduced by 2020. This information is crucial for ex-post impact assessment analysis. The survey had a very low response rate as well as incomplete information from the responders. The results of the survey presented a challenge for parts of our analysis, especially with respect to estimating potential risk benefits.

Second, one of the goals of the impact analysis was to document benefits to producers and consumers from the adoption of new technologies provided by PCRSP in Bolivia and conduct ex-ante simulations of potential benefits from on-going research. We attempted to collect data on annual peanut yields for the last several years for Bolivia through a survey, through e-mails to research contacts as well as a visit to Bolivia. We were unsuccessful in getting the necessary statistics for the impact analysis. Due to the lack of data, we were unable to conduct an economic surplus analysis for Bolivia.

C. Human Capacity/Training

Several graduate students were involved with the project. Eric Carlberg, an MS student from the University of Georgia worked on the ex-post impact of technology adoption in Ghana and Uganda. In the first part of his thesis he conducted country level surplus analysis. The second part examined the effects of Farmer Field Schools in Ghana using data from a survey that was conducted from the project in Ghana during August 2011. His thesis titled "Two Essays on the Impacts of Improved Peanut Technologies: Evidence from Ghana

and Uganda.” Two papers from this work will be submitted to peer reviewed journals, with the first to be submitted by April 2013.

Table 1 - Human Capacity and Training Funded by PCRSP/USAID

Name	Gender	Institution	Nationality	Degree	Completion Date	Country Where Trained
Eric Carlberg	Male	University of Georgia	USA	M.S.	August, 2012	USA
Anthony Murray	Male	Virginia Tech	USA	Ph.D.	August, 2012	USA
Darren Enterline	Male	Virginia Tech	USA	M.S.	July, 2013 (Expected)	USA
Eftila Tanellari	Female	University of Georgia	Albanian	Post-Doc	December, 2012	USA

Anthony Murray and Dr. Bradford Mills examined the impacts of the Peanut CRSP on food insecurity in Ghana and Uganda. Their research entitled “Do improved peanut seeds make African farmers more secure? Evidence from Uganda and Ghana” is expected to yield a publishable paper in a peer reviewed journal. He completed his work in August 2012 and the paper will be submitted to a peer reviewed journal by April 2013.

Darren Enterline worked with data entry, data cleaning and analysis. Even though the PCRSP funding is over, he is continuing his thesis work on “Household Crop Diversification, Improved Technologies and Food Insecurity” and he is expected to finish his MS from Virginia Tech in August 2013.

Dr. Eftila Tanellari and Dr. Genti Kostandini investigated the impact of the PCRSP with respect to technology adoption and practices of peanut production on intra-household relations in Uganda. The analysis used household survey data collected by the project. The research focused on the differences in implementation of new technologies among male and female farmers and male and female household heads and the determinants of adoption rates. They also used the Uganda National Household Survey (2005/06) data to document the PCRSP contributions to poverty alleviation based on revenue and expenditure impacts of technologies on poor households. In addition, Dr. Tanellari and Dr.

Kostandini examined the different determinants that affect the use of improved peanut varieties among men and women in Eastern Uganda in an effort to explain some of the reasons regarding gender differences in adoption rates. The paper will be submitted to a peer reviewed journal by April 2013.

D. Presentations and Publications

“Impact Assessment Evaluation for the Peanut Collaborative Research Support Program”, by the UGA 128 project team. Poster presented in the PCRSP annual meeting in Malta, December 2011.

“The Effects of Integrated Pest Management Techniques (IPM) Farmer Field Schools on Peanut Productivity: Evidence from Ghana” by Eric Carlberg, Genti Kostandini and Awere Dankyi. Paper presented at the Agricultural and Applied Economics Association, Seattle, Washington, August 2012.

“Evaluating Ex-Post Impacts of the Peanut Research Program: Evidence from Uganda” by Genti Kostandini, Eftila Tanellari, Anthony Murray, Bradford Mills. Paper presented at the 28th International Conference of Agricultural Economists, Foz do Iguacu, Brazil, August 2012.

“Gender Impacts on Adoption of New Technologies: Evidence from Uganda” by Eftila Tanellari, Genti Kostandini. Paper presented at the Southern Agricultural Economics Association, Orlando, Florida, February 2013.

II. SUMMARY OF ACCOMPLISHMENTS BY OBJECTIVE

Surveys and Data Collection

UGANDA

In-person interviews were conducted to collect data from farmers on peanut cultivation methods and practices. Villages were selected from the Eastern Region (the largest peanut growing region) using a two mile buffer (one mile each way) access from a main road. A

total of 40 villages were randomly identified; 20 villages from within the buffer and 20 villages outside the buffer. The village leader was then contacted to provide a list of all the peanut growing farmers and 10 households were chosen from each village to be interviewed. The participating households were chosen using systematic sampling determined by the total number of households in the village. We interviewed all family members in the household that manage and cultivate their own peanut fields. The surveying process resulted in 463 completed surveys.

GHANA

In-person interviews were conducted to collect data from farmers on peanut cultivation practices and methods. We targeted FFS (Farmer Field School) as well as Non-FFS Villages in order to evaluate the effects of FFS participation on production. The six FFS villages selected were Hiawoanwu, Bonyon, Kasei, Atebubu, Derma, and Somanya. The seven Non-FFS villages were randomly selected from all the villages within a 10 mile radius of each FFS village. The enumerators with the help of the Agricultural Extension Officer in each village worked closely to randomly select thirty peanut growing households from each village. All members of the household that cultivate and manage their own peanut fields were interviewed. A total of 360 surveys were completed.

Objective 1

Document ex-post benefits to producers and consumers from the adoption of new technologies provided by PCRSP in Ghana and Uganda and provide ex-ante simulations of potential benefits from on-going research.

Most of the data for the analysis of social gains were collected through the household surveys in Ghana and Uganda in 2011 as well as two nationally representative surveys for Uganda, the Uganda National Household Surveys of 2005/2006 and 2001/2002. The data collected includes information on demographics, income, peanut production practices, food security as well as information on peanut varieties and production outcomes. Additional information on market, agronomic and economic data was collected through

macroeconomic databases, published literature and other research and evaluation reports. We used an economic surplus model to assess the economic impact of PCRSP in Uganda. The model estimates the changes in consumer surplus and producer surplus related to the adoption of improved technologies. The model also accounts for increases in input costs incurred by the farmer when estimating the increase in production due to the adoption of new varieties. In Uganda, between 2001 and 2011, through efforts of PCRSP, National Agricultural Research Centers (NAARS), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), and National Semi-Arid Resources Research Institute (NARI) in Uganda, the adoption rate of improved peanut varieties increased from 4.1 percent to almost 50 percent. Findings suggest that the cumulative gains since PCRSP began in 2001 are US\$41 million. Over 70 percent of the social gains appear during the later years as the adoption rate continued to rise. The research investments also rose in the later period along with the social gain to Uganda's peanut sector leading to a significant cost-benefit ratio over time. Overall the costs benefits ratio is in the range of 50 times the costs provided by the agricultural research institutions. However, this does not include the costs incurred by other research institutions (e.g. ICRISAT) and national agricultural research centers, which, given the relatively short time of the project, were hard to collect or estimate.

In Ghana, agronomic practices were introduced through Integrated Pest Management Farmer Field Schools (IPM FFS) since 2002. An economic surplus model as well other quantitative methods are used to assess the economic impact of the peanut IPM FFS and estimate the change in benefits to farmers from participation. Benefits from peanut IPM FFS during the 2002-2010 period amount to US\$3.5 million. This figure includes direct impacts on FFS participants as well as indirect effects on the diffusion of FFS lessons from participants to neighboring farmers. The ex-ante analysis for the 2011-2017 period suggests that consumers would likely benefit more from the decrease in peanut prices due to increased production than producers gain from having a higher yield. The total surplus for the 2011-2017 period is estimated to be US\$8.8 million with producers gaining 33 percent of the benefits and consumers the remaining 67 percent.

Objective 2

Investigate Peanut CRSP benefits in Ghana for representative poor, medium and rich farms using household surveys.

A treatment effect model is used to examine the benefits among FFS participants in Ghana. There are two main effects associated with participation in IPM FFS: an increase in production by farmers who choose to adopt improved agronomic practices and farming techniques and an increase in input cost such as labor, time and pesticide cost by adopting farmers. Results from the treatment effect model provide evidence that farmers who participated in FFS benefited from a yield increase of 145kg per acre in 2010 which led to an average gain of US\$102 per FFS farmer. This leads to a direct impact of US\$306 thousand in 2010 by peanut IPM FFS in the regions where the survey was conducted. In addition, there is an indirect effect to participation in FFS that results from participants sharing information with other farmers. On average, participants shared information with 5 other farmers. The indirect FFS impact in 2010 is US\$382 thousand bringing the total impact of FFS in 2010 to US\$668 thousand. Beginning in 2002, a consistent flow of farmers participated in FFS training with a total of 3,000 farmers directly impacted and around 15,000 indirectly impacted.

Objective 3

Document impacts of post-harvest Peanut CRSP activities in Uganda and determine the major factors affecting adoption and quality of life of farmers and family using household surveys.

Data from the 2005/06 Uganda National Household Survey (from the Uganda Bureau of Statistics) were used to determine factors affecting the adoption and distribution of benefits among different households in Uganda. The sample consisted of 1248 peanut growers nationwide. A probit model was used to estimate the probability of adoption and the adoption decision was modeled using a random probability framework. It is assumed

that farmers' decision to adopt is based on expected profits as well as household constraints and socioeconomic characteristics. Our findings indicate that adoption of improved varieties is positively related to the education of the farmer, the number of people residing in the household (labor availability), whether the household head was married, the type of land tenure, the use of other improved crops, whether a household member participated in the National Agricultural Advisory Services (NAADS) training and whether the household was visited by an extension worker in the last 12 months. Results also show that adopters of improved peanut varieties are on average less poor than the non-adopters. In addition, we find that there are significant income gains due to an increase in the adoption rate. Simulating an adoption rate of 30 percent nationally results in a 5 percent increase in the mean household income of peanut producing households that adopt improved peanut varieties.

Objective 4

Document PCRSP contributions to poverty alleviation based on revenue and expenditure impacts of technologies on poor households.

The Uganda National Household Survey of 2005/2006 was also used to estimate the impact of new technology adoption on poverty alleviation. As mentioned, the sample size consists of 1248 peanut growers nationwide. Using the estimates of adoption benefits and the initial household income levels, we estimate the change in poverty status. The poverty measures are estimated using the Foster-Greer-Thorbecke index and three measures of poverty, the headcount index, the depth index and the severity index. Our results show that the adopters of improved varieties are less poor than the non-adopters. The headcount index or the proportion of the population that is poor is about 5 percentage points lower for adopters compared to non-adopters. In addition, the depth index (shortfall of income of the poor relative to the poverty line) and severity index (the degree of inequality among the poor) is lower for adopters than non-adopters indicating that adopters are more homogeneous than non-adopters. The analysis of income gains due to an increase in adoption result in a mean increase of about 5 percent in household income (assuming that

the adoption rate increases to 30 percent). The mean percent change in income will benefit mostly poor farmers (based on income per capita) and medium farmers (based on acres of land owned).

Objective 5

Explore the intra-household distribution of PCRSP benefits, with a specific focus on the gender distribution of impacts

The analysis also examines the different determinants that affect the use of improved peanut varieties among men and women using the household survey data collected from the project team in Eastern Uganda in 2011. We interviewed all family members that manage or cultivate their own peanut fields. This enabled us to distinguish between the gender of the farmer/respondent and the gender of the household head by examining the adoption behavior through two models. The first model focuses on the household as the unit of observation while the second model uses the individual farmer as the unit of observation enabling us to distinguish between female managed fields and male managed fields. The decision to adopt and use improved varieties of peanuts is modeled using a probit model. The estimators use to predict the probability of adoption include the agro-ecological zone, distance to market (to account for market access), distance to extension office, the size of the household, total peanut production, whether farmers change the peanut seed, number of visits to extension office for help and farmers' socioeconomic characteristics. The analysis shows that location plays a major role in the adoption behavior for both male and female farmers. Households that reside in the Teso sub-region, which includes the Serere research station, have an adoption rate of 81 percent while only 33 percent of households that reside outside of that sub-region use improved seed varieties. This difference in adoption behavior implies that the research station effectively distributes and influences farmers in its direct vicinity. The analysis shows that the determinants of adoption include whether the farmers reside in the Teso region, the

number of visits to the extension offices for help and whether the farmer changed the peanut seeds in the past 5-10 years. All these factors affect the adoption decision positively. Male farmers are more likely to adopt than female farmers. Results also indicate that males have adopted at a rate of 62 percent while females at a rate of 52 percent.

The analysis with respect to the gender of the household head suggests that the adoption decision for female-headed households is positively related to the size of the household (which is a proxy for the availability of labor), on whether the farmer is a large producer of peanuts and on whether the farmer was located in the Teso region. For male-headed households, whether farmers change their seed and whether they are located in the Teso region increase the probability of adoption. These results infer that, given women's gendered tasks in the production of peanuts, policies should target female farmers and female-headed households to increase the adoption rates and improve overall welfare.

Objective 6

Study the effects of extension activities (IPM Farmer Field Schools) on production in Ghana.

The analysis uses household survey data from Ghana in 2011 to examine whether participation in Farmer Field Schools contributed significantly to changes in production. Various econometric models were tested to ensure robust results. The treatment effect model was determined to be the most appropriate model to evaluate the treatments, participation, and effect on peanut productivity. Several variables were tested to determine what influences farmer participation in FFS using a probit model. Two separate techniques, full information maximum likelihood and two step-estimators were used to get consistent estimates. The results indicate that farmers' education and whether they visit the extension office increase the likelihood of participation. The distance of the farmers' residence to the main road has a negative impact on participation in FFS. In both techniques, the treatment effect is found to be a positive, statistically significant variable. Each technique attributes an increase of approximately 4.7 bags of peanuts per acre to the treatment effect with the bottom half of the 95 percent confidence interval at 2.9 bags per acre. The results also

indicate that the agro-ecological zone, head of household status, experience, and distance to field are statistically significant. The maximum likelihood approach found that the farmer's education, age, and trips to extension were also significant. Results suggest that FFSs have a significant positive impact on peanut production in Ghana.

Objective 7

Document the impacts of adoption of improved peanut varieties on food security in Ghana and Uganda.

Data for this part of the analysis were also collected through the household surveys from the project team in in Ghana and Uganda. In the last part of the surveys we prepared questions that asked households about their food intake over the past seven days. More specifically they were asked about goods typically consumed (as identified by the World Food Program), how often over the past week household members have consumed that good and the source of the good. The Food Consumption Score (FCS) developed by the World Food Program (WFP) was used to measure food security among the households surveyed in Ghana and Uganda. The FCS aggregates several different foods into larger categories, such as starches, meats, dairy products, etc. Each category is assigned a weight based on its nutritional value. The responses to how many days households eat each good is summed together in order to calculate the FCS.

In Ghana, the analysis showed that the villages we surveyed were on average food secure. The minimum value reported exceeds the food insecurity threshold and only 5.7 percent of the sample were "borderline" food secure (household is vulnerable to food insecurity). No significant difference in food insecurity between FFS villages and non-FFS villages was found.

The analysis focused more on the effect of improved groundnut seed on smallholder food security in Eastern Uganda, with emphasis on the Teso sub-region. Model results indicate that adopters significantly increase household food security as measured by the World Food Programme food consumption score index. Scores of adopters increase by nearly 18

points (6.5 percent), the equivalent of consuming pulses six days a week. Some demographic characteristics significantly affect smallholder food security and improved adoption decisions. Heads of household with more years of schooling exhibit significantly higher food security while larger households have significantly lower food security scores. Households headed by a female are less likely to adopt improved seed, indicating a gender gap in adoption. Visits from agricultural extension agents also increases improved seed adoption propensities. Higher food security through seed adoption provides policy makers with an actionable tool to target food insecure smallholders.

BOLIVIA

In Bolivia there are two organizations that support peanut growing farmers. The first organization, ANAPO (based in Santa Cruz) is collaborating with PCRSP and is working on finding and testing disease resistant and high yielding peanut varieties. The main diseases that affect peanuts in Bolivia are leaf rust and leaf spots. Several years of cross breeding and testing have resulted in two main improved varieties, Mairana and Cordillera. These varieties are far better suited for mechanized harvest of peanuts. However, both varieties are in the seed production phase and are not yet released for use by farmers. Once released, these varieties are expected to be priced at the market price. These varieties may differ in performance due to the different climates and altitude of peanut producing regions in Bolivia. The second organization, Fundacion Valles (based in Cochabamba) is collaborating with ANAPO on improved peanut varieties. Fundacion Valles has successfully developed two new varieties of peanuts, Saramani and Colorado that are appropriate for the Cochabamba climate. The Colorado variety has passed all the requirements and is currently in the seed production phase. Fundacion Valles also tested one of the varieties developed by ANAPO, the Cordillera, but it was unsuccessful, mainly due to the difference in altitude.

In Bolivia peanuts are mostly used for home consumption in salted form, candied form or for a variety of soups. The market price of peanuts in Bolivia is higher compared to other countries at an average of \$70 per 50kg bag of unshelled peanuts. The high price offers a

great profit opportunity for peanut farmers. In Cochabamba, local peanut farmers are more concerned with preserving their cultivating practices that are mostly organic farming. Fundacion Valles together with USAID are working with farmers on maintaining their practices as well as adopting improved varieties. In addition, they are helping farmers with peanut marketing and processing and currently helped open a processing plant for salted and candied peanuts. The value added organic peanuts are exported in Europe making this a successful value added chain from production to marketing.