COST-BENEFIT ANALYSIS OF THE WHITE PEA BEANS VALUE CHAIN IN ETHIOPIA

GRADUATION WITH RESILIENCE TO ACHIEVE SUSTAINABLE DEVELOPMENT - GRAD PROJECT

FINAL REPORT

This report was produced for review by the United States Agency for International Development (USAID). It was prepared by Optimal Solutions Group, LLC for USAID's "Learning, Analysis, and Evaluation Project (LEAP). Contract Number: AID-OAA-C-11-00169

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
LEARNING, EVALUATION, AND ANALYSIS PROJECT
(AID-OAA-C-11-00169)

COST-BENEFIT ANALYSIS OF THE GRAD WHITE PEA BEANS VALUE CHAIN

FINAL REPORT

Prepared for:

U.S. Agency for International Development/Ethiopia
Contract number: AID-OAA-C-11-00169

Prepared by:

Optimal Solutions Group, LLC
University of Maryland
Research Park, M Square
5825 University Research Court, Suite 2800
College Park, MD 20740, USA
www.OptimalSolutionsGroup.com

Cambridge Resources International Inc.
60 Montgomery Street
Cambridge, MA 02141
USA
www.cri-world.com

Project Analysts:
Glenn P. Jenkins, Cost-Benefit Manager
Richard Barichello, Senior Cost-Benefit Analyst
Mikhail Miklyaev, Cost-Benefit Analyst
Kate Pankowska, Cost-Benefit Analyst

October, 2012

Disclaimer
The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States government.

Table of Contents

ACKNOWLEDGMENTS **4**

ACRONYMS **5**

EXECUTIVE SUMMARY **6**

THE WHITE PEA BEANS GRAD VALUE CHAIN: COST-BENEFIT ANALYSIS **8**

METHODOLOGY **8**

Project Background **8**

Commodity Background **9**

Pulses Production in Ethiopia 9

Current Market Situation in the Ethiopian White Haricot Bean Sector 10

Current Problems Observed in the White pea beans Sector in Ethiopia 10

Project Description and Activities **12**

The GRAD Intervention in the White pea beans Value Chains 12

Assumptions for the Selected GRAD Interventions in the White pea beans Value Chain **12**

PROJECT MODELING **15**

INTERVENTION **15**

"Without" Intervention Scenario 16

"With" Intervention Scenario 17

PREPARATORY TABLES **17**

FINANCIAL ANALYSIS **18**

ECONOMIC ANALYSIS **20**

STAKEHOLDER AND BENEFICIARY ANALYSIS **19**

SENSITIVITY ANALYSIS **21**

RECOMMENDATIONS **24**

REFERENCES **25**

APPENDIX **27**

ACKNOWLEDGMENTS

The LEAP team appreciates the assistance it received from many people during its field visits to SNNPR and Oromia in July 2012, including the representatives of USAID, CARE, REST, SNV, CRS, and the SNNPR Regional Bureau of Agriculture. Special thanks are also directed to many small-scale farmers and local traders unknown by name whose interviews helped provide a clear picture of the current situation for the targeted commodities. The assistance and willingness to cooperate of all aforementioned people are greatly appreciated.

ACRONYMS

ADSCR	Annual Debt Service Coverage Ratio
AGP	Agriculture Growth Program
CARE	Nongovernmental Organization, Implementing Organization
CF	Conversion Factor
CRS	Catholic Relief Services
CSA	Central Statistical Agency of Ethiopia
ETB	Ethiopian Birr (Currency)
FAO	United Nations Food and Agriculture Organization
FEP	Foreign Exchange Premium
GRAD	Graduation with Resilience to Achieve Sustainable Development
FtF	Feed the Future (Program)
IFPRI	International Food Policy Research Institute
Ha	Hectare
MFI	Microfinance Institution
MT	Metric Ton
NCF	Net Cash Flows
NGO	Nongovernmental Organization
NPV	Net Present Value
ORDA	Organization for Rehabilitation and Development in Amhara
REST	Relief Society of Tigray
RUSACCO	Rural Saving and Credit Cooperative
SNV	Netherlands Development Agency
SNNPR	Southern Nations, Nationalities and Peoples Region
US$	United States Dollar
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

Project Description: The *Graduation with Resilience to Achieve Sustainable Development* (GRAD) project proposed by the United States Agency for International Development (USAID) started in 2012 and implemented in 16 woredas around Ethiopia. The project has 5 year lifetime. The selected woredas are located in Amhara, Oromia, Southern Nations, Nationalities, and Peoples Region (SNPPR), and Tigray. The GRAD project aims to graduate 50,000 chronically food insecure households out of 65,000 that are targeted. Each of the selected households will need to achieve an increase in its yearly income of US$365.00 to successfully graduate from the program. Four commodity value chains have been chosen for this project's interventions: honey, pulses, meat, and vegetables.

The implementers of the project include CARE, the Relief Society of Tigray (REST), the Organization for Rehabilitation and Development in Amhara (ORDA), Catholic Relief Services (CRS), the Netherlands Development Agency (SNV), and Tufts University. These well-known organizations are engaged in food-security and value chain–development projects in Ethiopia and other developing countries throughout the world.

To facilitate the proper implementation of the project and flow of necessary financial resources for the targeted households, USAID Ethiopia established a US$2-million loan – guarantee fund that will be available to the microfinance institutions (MFI) and rural saving and credit cooperatives (RUSACCO) that will be in charge of providing loans to the participating chronically food-insecure households. Such financial assurance will diminish the risks facing the financial institutions associated with micro lending and will help facilitate the flow of funds.

Strategic Context and Rationale: The USAID Ethiopia GRAD project is part of the wider strategy of Feed the Future (FtF) programs that support investments in viable and potentially easy to engage agricultural value chains. The GRAD project also hopes to promote gender equality and the inclusion of women to the selection of interventions.

The intervention in white pea beans value chain is designed to provide loan to the GRAD households sufficient for the purchase of improved seeds and fertilizers. The intervention is suggested for introduction in the woredas of Amhara (Lay Gayint) and Oromia (Arsi Negele, Ziway Dugda, Shala, and Adami Tulu).

Financial and Economic Analysis Results: The intervention in the white pea beans value chain is constructed around the provision of loans that are adequate for the purchase of improved seeds and fertilizer. The loans will be offered at a preferential (subsidized) interest rate of 15 percent. The loan structure will allow households to make repayments after the harvest period. In case of unforeseen circumstances households might be given some flexibility to faze loan repayments over a longer period of time. The main group of GRAD households have small landholdings of approximately one quarter of a hectare. The amount of investment required to purchase inputs for white pea beans cultivation is estimated to be ETB700.00. The corresponding loan amount is equal to ETB799.00.[1]

White pea beans usually are not consumed by the households due to test preferences. Production is mainly intended for sell and income generation. White pea beans usually not intercropped and used as break crop in the traditional crop rotation cycles. Ethiopia is well known as white pea beans exporter in the international market. Farmers face no difficulties to sell their production. White pea beans, as a result, produced mainly for the export markets.

[1] Loan amount includes a service charge, an insurance, a pass book fee and an up-front saving of 10 percent.

The analysis is carried out over a period of eleven years. Intervention in white pea beans yields a positive financial net present value of US$ 1,127.90 using 12 percent real financial discount rate. The economic net present value is also positive and equal to US$1,228.81 using real economic opportunity cost of capital of 12 percent. The difference between financial and economic outcomes of the project is due to the fact that the financial values don't include all externalities presented in the project.

Beneficiary Analysis Results: Based on the results of the performed analysis, the GRAD project is expected to increase the net annual income of the GRAD households by US$172.11/year/household. The net increase in income over the period of eleven years is estimated to be US$ 1,127.90. The other beneficiary of the project is the government:

- Government will benefit directly from the taxes collected on the inputs and outputs of the intervention. The indirect benefits to the government will arise because white pea beans are exported from Ethiopia. Increased exports allow the country to earn foreign exchange and in Ethiopia there is an economic premium on foreign exchange that arises from the pattern of indirect taxes in the country. . The present value of the amount that government benefits from the intervention over the eleven years period is estimated to be US$97.51 per household.

Conclusions and Recommendations: The obtained FNPV and ENPV suggest that the proposed intervention in the white pea beans value chain will benefit the targeted GRAD households. The Ethiopian economy as a whole will also benefit from this intervention. Nevertheless, after the implementation of this intervention, targeted households will not be able to achieve the desired increase in income of US$365/household/year. Therefore, it is recommended that the intervention in the white pea beans value chain be implemented "in a package" with another intervention proposed in the GRAD project.

THE WHITE PEA BEANS GRAD VALUE CHAIN: COST-BENEFIT ANALYSIS

METHODOLOGY

Project Background

The United States Agency for International Development (USAID)/Ethiopia started implementation of the Graduation with Resilience to Achieve Sustainable Development (GRAD) project in Ethiopia in 2012. The project is a part of USAID's Feed the Future (FtF) agenda and aims to support improvements in the value chains of several commodities (honey, pulses, meat, and vegetables) to increase the food security[2] of the targeted Ethiopian households. The GRAD project will include a special emphasis on strengthening the livelihoods of chronically food-insecure households in Highlands Areas, improving household and community resilience, and strengthening an enabling environment to promote scale-up and sustainability.

The project has a 5 years lifespan. During this period the GRAD project will target 65,000 food-insecure Ethiopian households that can be categorized as either chronically food insecure (58,500 households) or "Ultra Poor"3 (6,500 households). Of the participating 65,000 households, the GRAD project intends to graduate 50,000 households from chronic food insecurity by increasing their yearly income by US$365/year/household. The GRAD project also plans to include another group of 10,000 Ethiopian households that are either food-sufficient households (6,000) or food-secure households (4,000). These households will act as role models for the chronically food-insecure and "Ultra Poor" groups that are the project's main target.

Sixteen woredas located in four regions of Ethiopia—SNNPR, Tigray, Amhara, and Oromia[4]—will be included in the GRAD project. The project's woredas were selected on the basis of their proximity to the AGP (Agriculture Growth Program) and the presence of active local markets that bring opportunities for engagement in commodity trading. This geographical selection criterion is supposed to guarantee that the households have the potential to market the commodities that they produce, if the intervention goes as planned. The GRAD project also intends to facilitate market linkages in order to connect these households with commodity traders at the local level. This in turn will facilitate the sale of commodities and foster income inflows to the households. The GRAD project is also expected to correct shortcomings experienced in the PSNP Plus project in order to allow each targeted household to increase its yearly income by US$ 365 (or 1 USD per day).

The implementer of this project, CARE will cooperate with technical partners in order to assure the project's proper implementation. These cooperating partners are REST (Relief Society of Tigray), ORDA (Organization for Rehabilitation and Development in Amhara), CRS (Catholic Relief Services) and SNV (Netherlands Development Agency) and Tufts University. All these organizations are well known NGOs that are engaged in various projects in Ethiopia related to food security improvement and commodity value chains development.

---

[2] "Food security" is defined as access to sufficient food by all members of the household for an active and healthy lifestyle in a normal or moderately bad year (per GRAD Technical Proposal).

[3] Ultra Poor households include female-headed households and landless youth.

[4] A full list of the GRAD-selected *woredas* can be found in table A in the appendix. Please note that according to the table, in Tigray an intervention is planned for fava beans. CARE has decided to postpone this intervention due to the problems the organization encountered during its baseline survey. During the conversation that the LEAP team had with the vice chief of party on August 18, 2012, it was confirmed that the fava beans intervention at this point has been terminated, so the LEAP team has not performed a CBA of this commodity.

USAID will establish a loan guaranteed fund of US$2 million to ensure that the microfinance institutions (MFIs) and rural saving and credit cooperatives (RUSACCOs) will have sufficient access to lending capital to develop a flexible lending scheme for the GRAD households. This fund will also help to reduce the risks of these institutions associated with loan defaults of the targeted households.

The GRAD project plans to emphasize non-gender-biased participation and inclusion of women in the proposed interventions for the commodities value chains. Ethiopian women are typically disadvantaged in terms of access to agricultural inputs, so the GRAD project plans to correct these issues whenever possible.

The four commodity value chains selected for the GRAD project have been chosen because of their simplicity in terms of the knowledge required for their implementation and the rather low initial start-up costs necessary to engage in their production. These commodities also offer the potential for future, post – GRAD production increases and marketing. Demand for these commodities is growing in both, domestic and export markets; creating, the possibility for increases in commodities sales and income generation for the households participating in the GRAD project.

Commodity Background

Pulses Production in Ethiopia

The production of pulses in Ethiopia is highly rain dependent[5] and reliant on the small-scale farmers who produce relatively small quantities of pulses and sell them to local traders.[6] Twelve varieties of pulses are currently being cultivated in Ethiopia, which can be divided into "highland pulses" (chickpea, fava bean, field pea, grass pea, lentil, lupine, fenugreek) and "low land pulses" (haricot bean, soya bean, cowpea, pigeon pea, and mung pea). Of these varieties, the biggest share of Ethiopia's pulses production includes fava (36 percent) and haricot beans (17 percent) (IFPRI 2010).

The total planted area of pulses in Ethiopia in 2011–12 (in the long rainy season, Meher[7]) was 1,616,809.37 hectares (Ha), or 13.38 percent of the total cropped area in Ethiopia, with total production of 2,316,201.24 metric tons (MT). Of this total, 331,709.15 ha were planted with haricot beans. The total production of haricot beans was 387,802.311 MT, with an average yield of 1.17 MT/Ha (CSA 2012).

The white pea bean is a type of beans under the category of "Haricot beans". The altitude suitable for the white pea beans cultivation ranges between 600 and 2,200 m. The well-known varieties if white pea beans in Ethiopia are: Awash 1, Awash Melka and Mexican 142. The Mexican 142 variety is the oldest one introduced by the government more than 30 years ago. Awash 1 and Awash Melka perform better in regards to yields and disease resistance. The supply of seeds for these two varieties, however, is limited. The planting period of white pea beans should be set such that harvesting period falls during the dry season. The production period ranges from 85 to 120 days. White pea beans usually are not intercropped. The yield of the white pea beans is decreasing through time. The yield in Ziway Dudega woreda (one of the woredas selected by GRAD for white pea beans interventions), as reported by SNV, is only 1.2 MT/ha. The quality of the beans in the area also has become very poor. The main reason is that farmers usually use their own seeds for planting. The seeds, in most cases, are mixed with other haricot beans varieties.

[5] Even if irrigation is available in the areas where pulses are cultivated, farmers usually do not use it for production purposes.

[6] These local traders are usually uncertified. Small-scale farmers usually need cash quickly after the harvest. Because of the lack of other marketing options they tend to sell to these traders.

[7] Ethiopia has two rainy seasons: Belg, short rainy season (March–April/May) and Meher, long rainy season (June–August). Farmers generally concentrate their planting and cropping efforts during the long rainy season, because rains are more reliable during that time.

Current Market Situation in the Ethiopian White Haricot Bean Sector

The pulses sector in Ethiopia has a big potential for growth. The demand for pulses in the world market is constantly growing. The production of haricot beans in Ethiopia has increased ten times when comparing figures from 1995 and 2009. Pulses are Ethiopia's third-largest exportable commodities after coffee and oilseeds (IFPRI 2010).

White pea beans are mainly grown as a cash crop, because they are less popular for consumption in the domestic market.[8] It is strategic crop to deal with transitory food insufficiency during the months of September and October. The income from white pea beans is used to purchase other commodities for in – house consumption. Farmers usually face no difficulties with sale of the haricot beans. The average monthly domestic producer prices for white pea beans as of May 2012 are presented in table 1, below.

Table 1. Average monthly producer prices for white pea beans as of May 2012 (in ETB/Kg)

	Tigray	Amhara	Oromia	Gambela	SNNPR
White pea beans	12.99	11.7	12.39	11.84	11.31

*Source: CSA, Agricultural Survey, 2012.

Current Problems Observed in the White pea beans Sector in Ethiopia

Among many problems associated with the erratic weather patterns (droughts and floods) that directly influence the status quo in the Ethiopian white pea beans sector, a few non-climate-related barriers also prevent this sector from achieving its potential. The most important ones are discussed below.

1. **Relatively low productivity per hectare that does not reach Ethiopia's potential for the production of white pea beans**

   The average productivity of white pea beans is 1.17 MT/Ha (CSA 2012). At the same time, the observed productivity of experimental plots can be as high as 2.9–3.5 MT/Ha (IFPRI 2010).[9] The relatively low productivity rates for white pea beans are closely related to

   - farmers' low use of chemical fertilizers (phosphates);[10]
   - small plots for cultivation due to population growth and land fragmentation;
   - limited access to improved varieties of seeds; and
   - Poor land-management techniques (inadequate land preparation and suboptimal crop rotation) and nutrient-depleted poor soil prone to waterlogging.

2. **Low availability of improved seeds[11]**

   As of 2010 in Ethiopia, 36 varieties of improved white pea bean seeds were available. The highest-yielding variety for white pea beans is Awash Melka, but the most popular in the export market are Awash 1 and Mexicana 142 (due to their roundness and pure white color). These varieties are better suited to Ethiopia's climatic and soil condition, are higher yielding, and are more disease resistant. Nevertheless, good quality seeds of these three varieties are nearly always

[8] Within Ethiopia, white pea beans are considered to be an inferior food (food for the poor). They are not a part of a traditional Ethiopian diet, so their consumption in Ethiopia is relatively low.

[9] These maximum yields are for monocropping (without intercropping with cereals).

[10] There is a widespread belief among farmers and even some of the local consultants that beans do not require any fertilizers, so their application is unnecessary. This mistaken belief might be the result of lack of training and misconceptions about available types of fertilizer. It is possible that farmers are not aware of the existence of other fertilizer types (phosphates) besides DAP and UREA, that are widely used as fertilizers for cereals.

[11] It has to be emphasized that such improved seeds require a "package approach." Improved seeds alone are usually not better than conventional varieties if the land is not managed properly and if the levels of fertilizer are not applied at the right time and in the appropriate quantity.

in short supply. The majority of farmers are not able to obtain these improved seeds, so they plant conventional ones that are lower-yielding and less disease-resistant.

3. **Problems with quality of improved seeds**
   Even when improved seeds are available in some areas of Ethiopia, they tend to be inferior in terms of quality due to frequent mixing of different types of seeds (improved with unimproved ones, different varieties of improved seeds mixed together, healthy seeds mixed with disease-infected seeds, etc.), and lack of proper labeling of seeds (e.g., the labels do not make clear what variety is being sold).

4. **Low access to fertilizers and pesticides**
   Small-scale farmers have limited access to fertilizers and pesticides due to their unavailability at the local level, the lack of knowledge regarding the type and quantity of fertilizer (pesticide) needed for the production of white pea beans, and scarce financial resources to fund improved farming practices.

5. **Lack of training on proper cultivation of white pea beans**
   Small-scale farmers use traditional methods of land preparation and are largely unaware of improved methods that offer the potential to positively influence bean yields (e.g., optimal quantity of ploughing and weeding, improved seed-bed preparation techniques, recommended planting density, etc.).

6. **Problems obtaining microloans for the purchase of seeds**[12]
   Microcredit institutions are reluctant to provide microloans for seed purchases, because they see farming as a risky business. Small-scale farmers have almost no access to such financial resources and consequently are limited in their access to necessary inputs.

7. **Lack of good statistics about the pulses sector**
   Statistical surveys are conducted infrequently, only every 3 to 5 years. This data are usually collected by the United Nations Food and Agriculture Organization (FAO). Some statistics could potentially be important for commercial purposes, but usually they are not collected.

8. **Inefficient marketing system, lack of market information regarding export-market preferences for different varieties of pulses, and poor storage systems**
   Farmers are often unaware of the preferences for certain varieties of white pea beans in the export markets. Without such information, they end up with crops that cannot be exported. In the case of white pea beans, which are rarely consumed domestically, this lack of market information causes additional problems related to sales. Prices that white pea beans fetch in the domestic market are much lower than they would be in the export market. In addition, small-scale farmers usually do not have storage facilities that will safely store beans when needed, so they experience significant post – harvest losses.[13]

9. **Cyclical changes in price patterns in the world market and changing export opportunities**

[12] The availability of loans for the purchase of improved seeds will not benefit small-scale farmers if loan repayments are not properly scheduled (according to harvesting seasons) to ensure the farmers' ability to make payments and to decrease their risk of defaulting.
[13] As reported by farmers, the way they store beans is very traditional. They put them in ash in locally made clay containers and cover the tops with manure to deter pests.

Like all other commodities traded internationally, pulses are influenced by commodity cycles. Ethiopian white pea beans are no exception. Their prices are influenced by worldwide conditions that affect the production of the commodity in any given year. Domestic prices fall if there is a bumper crop in the world and the FOB and domestic prices rise if there is shortage elsewhere in the world. During "starving years" in Ethiopia when there are food shortages, bean exports usually decrease.

Project Description and Activities

In recognition of the pulses potential for improving the livelihoods of chronically food-insecure Ethiopian households, the GRAD project has included a planned intervention in the white pea bean value chain. The targeted *woredas* that will be engaged in the GRAD project are presented in table 2, below.

Table 2. *Woredas* engaged in the GRAD pulses interventions[14]

Region	***Woreda***
Amhara	Lay Gayint
Oromia	Arsi Negele, Ziway Dugeda, Shala, and Adami Tulu

The GRAD Intervention in the White pea beans Value Chains

The GRAD intervention for the white pea beans value chain is to provide access to the financing needed to purchase inputs for white pea bean cultivation, such as improved seeds and fertilizers. The financing will be provided in the form of loan at an interest rate below the market rate.

Details of the investment expenditures necessary for the intervention in the white pea beans value chain are presented in table 3, below.

Table 3. Total investment expenditures for the GRAD mono cropping intervention (in ETB)[15]

MONOCROPPING	
Input	**Intervention in white pea beans**
Improved seeds	325
Fertilizer	375
Total	**700**

Each GRAD-targeted household engaged in the intervention will receive a loan necessary for the purchase of improved seeds and fertilizer. Details related to the total amount of the loan are outlined in table 4, below.

[14] Per CARE's plan.

[15] The investment expenditures presented in tables 3 do not include expenditures associated with obtaining the loan (down payment, loan insurance, etc.). These additional loan-related expenditures are discussed in the assumptions for the selected GRAD intervention section of this report.

Table 4. Total loan value for the GRAD white pea beans intervention (in ETB)

Mono cropping (ETB/0.25ha)	
Input	**Intervention in white pea beans**
Total investment	700.00
MFI Service Charge	7.00
Insurance	7.00
Pass book fee	15.00
Up – front saving	70.00
Total amount of the loan	**799.00**

Assumptions for the Selected GRAD Interventions in the White pea beans Value Chain

1. Each GRAD-targeted household engaged in the white pea beans value chain will receive a loan necessary for the purchase of improved seeds and fertilizer. The total amount of loan includes a service charge of 1 percent of the total investment, an insurance fee of 1 percent, a pass book fee of ETB15.00 and an up-front saving of 10 percent. The up – front saving will be returned to the household upon repayment of the loan, with no interest accrued.

2. The households are assumed to have access to the improved varieties of white pea beans due to the intervention. This will allow farmers to double the current yield of white pea beans. It will also result on the higher price received for the production due to better quality.

3. For the base line scenario it is assumed that there will be no drought for the entire evaluation period. The effect of the drought occurrence, however, is tested in the sensitivity analysis as a reduction in the average yield. The assumption of no drought for the base case was done because its impact on the intervention will depend on the year in the project's live that it may occur. Currently Ethiopia faces on average two drought seasons in five years period. The drought, however, will affect farmers with or without USAID Intervention (unless intervention is designed to provide irrigation). Due to this reason, although drought reduces returns on the investment, the intervention still may bring positive impact at the household level.

4. It is assumed that white pea beans seeds preserved by the farmers from the total production, have a greater than average value because of the manual selection of the better quality grains.

5. For the purpose of this analysis, the following macro level assumptions have been established: Domestic inflation is 20 percent, the U.S. inflation rate is 2.5 percent, the financial discount rate is a real rate of 12 percent, the economic real discount rate is 12 percent, the foreign exchange premium (FEP) is 6.5 percent, the exchange rate in 2012 is US$1 = 17.50 ETB, the land-tax rate is 85.00 ETB/year, and the MFI interest rate (nominal) is 18 percent.

Table 5. Parameters used in the analysis of the white pea beans intervention[16]

Parameters	Without intervention	With intervention
Household size	5 people	5 people
Area under haricot beans	0.25 Ha	0.25 Ha
Rental value of land	800.00 ETB/Ha/year	800.00 ETB/Ha/year
Land tax	85.00 ETB/year	85.00 ETB/year
White pea beans yield	1,200 kg/Ha	2,400 kg/Ha
Haricot beans price	5.50 ETB/kg	9.00 ETB/kg
White pea beans production disposition		
Seed	20%	10%
Marketed	80%	90%
Losses		
White pea beans	5.00%	5.00%
Input costs		
White pea beans seeds	7.00 ETB/kg	13.00 ETB/kg
DAP	15.00 ETB/kg	15.00 ETB/kg
Input requirements per 0.25 Ha		
White pea beans seeds	25 kg	25 kg
DAP	0	25 kg
Opportunity cost of family labor		
Non-harvesting period	25.00 ETB	25.00 ETB
Harvesting period	35.00 ETB	35.00 ETB
Activities time allocation (days/0.25 Ha)		
Land clearing	2	2
Primary cultivation (first plowing)	1	1
Secondary cultivation (three plowings)	3	3
Preparing lines and planting	2	2
Weeding	4	4
Bird watching	7	7
Harvesting	2	3
Threshing	2	2
Cost of additional activities (ETB/kg)		
Transporting from field	0.05	0.05
Storing	0.05	0.05
Packaging	0.01	0.01
Delivery to market	0.45	0.45

[16] Numerical values for average family size were obtained from CSA. Values for the planted area for haricot beans, the rental value for land, land-tax rates, and the opportunity cost of family labor were obtained from farmers during field interviews in July 2012. Numerical values for haricot beans prices were obtained from the 2012 SNV and CARE Draft Report. Minimum rain requirements, levels of fertilizer necessary, losses, bean production disposition, decreases in yields due to intercropping, and activities time allocation were obtained from the available literature and compared with available data from the field interviews in July 2012.

PROJECT MODELING

The financial and economic feasibility of the GRAD white pea beans intervention has been estimated using a practical framework as outlined by Jenkins, Kuo, and Harberger in "Cost Benefit Analysis for Investment Decisions". Following this methodology, all revenues or potential revenues have been treated as cash inflows and all expenditures or potential expenditures as cash outflows. The analysis is carried out for a period of eleven years.

To estimate the financial sustainability of the intervention in the white pea bean value chain, the annual debt service coverage ratio (ADSCR) of the project over the life of the loan used to finance it has been calculated together with the financial net present value (FNPV) of the project.

The economy resource-flow statements have been constructed by adjusting each of the line items in the cash-flow statements of the total investment point of view by their proper economic conversion factors (CFs). These conversion factors were derived by dividing the separately calculated economic value of a unit of an item by its financial price.

INTERVENTION

The purpose of the project model is to estimate the net benefit of the USAID intervention and to estimate the net impact of this intervention on the income of the family. There is a need to first understand the revenues and expenditures of the existent cultivation practices adopted by the households. Next, one needs to compare these values with revenues and expenditures under the GRAD suggested practice. This comparison will allow one to evaluate whether the incremental benefit of GRAD intervention is worth the cost. This is carried out by building both a "with" and "without" scenario with respect to revenues and expenditures profiles. An incremental cash flows statement is then constructed for the entire evaluation period of eleven years.

(a) "Without" Intervention Scenario

Ethiopian households usually do not intercrop white pea beans. The production period is only in range of 85 to 120 days, which makes white pea beans a crop suitable for rotation. Although, the crop is primarily produced for sale, as a cash crop, it is strategically important in combating transitory food insecurity during the months of September and October. It is usually used as early season income generation crop to finance the children's school fees and other expenditures. Under the existent mono cropping practice, because of the limited availability of improved seeds, the white pea beans yield is only 1,200 kg/ha. This translates into 300 kg/timad. The details of the expenditures and revenues for the "without" intervention scenario are presented below:

Revenue: The revenue for the family is the value of the white pea beans output. The base case market price of the traditional beans is 5.50 ETB/kg. Such price exists on the domestic market during the harvesting period. The majority of the households sell their bean production during the harvesting period, perhaps because of the post – harvest losses associated with long storage of the beans. The post – harvest loss of the haricot beans set equal to 5 percent of gross production. The total quantity harvested amounts to 285.00 kg/timad. From the total annual production 80 percent is sold in the market and 20 percent is kept as seed stock. This 20 percent for seeds stock translates into 57 kg of a manually selected best quality grains. The traditional seed stock are valued at ETB 7.00/kg, because they represent clean and selected beans. The total value of the production, including value of the seed stock, is set at 1,887.25 ETB.

Expenditures: The complete list of expenditures is presented in table 5 above. The expenditures are divided into three groups: input costs, activity costs and costs of additional activities. Inputs costs are

white pea beans seeds and DAP. Activity costs are the opportunity cost of labour and land. The last group, additional activities cost, includes transportation storage and packaging. All these cost items in some cases may be performed by other actors in the value chain, for instance transportation can be performed by renting donkeys from other farmers. In other cases it also can be done by the households themselves. There is also a land tax of 85 ETB/ha/year.[17]

(b) "With" Intervention Scenario

The proposed USAID intervention will give farmers access to improved seeds and capital required for the purchase of the seeds and other inputs. This is expected to allow the farmers to double the yield of the haricot beans. The resulted yield is reported to be 2,4 MT/ha, which translates into 600 kg/timad. The post – harvest loss rate, assumed not to change, will remain at the level of 5 percent, allowing farmers to harvest 570 kg/timad.

Revenue: The better quality of seeds will allow farmers not only to increase haricot beans yield, but also to fetch a better price in the market. The price will increase up to the 9.00 ETB/kg, because of the better quality of the beans. The value of seeds will also increase to 13 ETB/kg. The quantity of seeds produced, however, is assumed to remain at the same level of 57 kg. The total value of production is estimated to be 5,358 ETB.

Expenditures: The complete list of expenditures is presented in table 5 above. The expenditures are divided into three groups: the inputs cost, activity costs and costs of additional activities. Inputs costs are white pea beans seeds and DAP. Activity costs are opportunity cost of labour and land. The last group, additional activities cost, includes transportation storage and packaging. All these cost items in some cases may be performed by other actors in the value chain, for instance transportation can be performed by renting donkeys from other farmers. In other cases it also can be done by the households themselves.

PREPARATORY TABLES

In the CBA model, tables 2 to 10 are preparatory information about white pea beans cultivation, projected expenditures and value of production both for the "with" and "without" intervention scenarios.

Table 2 contains the total investment cost required for the white pea bean cultivation. The total investment cost is estimated to be 700.00 ETB. Table 2 is the basis for the Table 3, of the model, where total amount of the loan is derived. The total amount of loan, in addition to the investment cost, includes a charge of 1 percent, an insurance of 1 percent, a pass book fee of 15 ETB and up – front saving of 10 percent of the total investment required. Up – front saving is returned to the household upon repayment of the loan with no interest accrued on the saving. Resulted amount of the loan is equal to 799.00 ETB.

Table 4 presents the rate of domestic inflation per production period (6 months) that is estimated to be 9.54 percent and related domestic price index. A domestic price index is used to adjust the prices in the initial year to reflect the impact of inflation over the evaluation period. The expected exchange rate of the Ethiopian Birr to the US dollar is derived by multiplying the initial year exchange rate with relative price index over time. Relative price index, in turn, is the ratio of the price index of Ethiopia to that of the US.

Table 5 depicts the projected loan schedule. The monthly interest rate is estimated to be 1.17 percent[18]. The households is assumed to take loan just before the beginning of the production cycle in May, and to

[17] The land tax in Ethiopia is calculated based on number of factors, such as soil fertility and etc. The rate used in the analysis is the most frequent one mentioned by the households during interviews.
[18] Annual interest rate is equal to 15 percent

repay the principal and interest accrued after they harvest and sell haricot beans in the month of November. The households will have 5 month of grace period.

Table 6 presents production per round based on nominal input and operating costs for both, “with” and “without” scenarios. The nominal values are derived by adjusting the initial year values by the corresponding price index. It is assumed that the households will bear all the production related costs at the beginning of each period (6 month). The production, however, will be sold at the beginning of the next period.

Table 7 presents annual production in kilograms for both “with” and “without” case. The table is the basis for the Table 8 where the total value of production in nominal terms is derived.

FINANCIAL ANALYSIS

The modeling exercise was constructed for the 11 years evaluation period. Tables 11 and 12 of the model present the cash flow statement from the total investment or project point of view in nominal and real values for both, “with” and “without” scenarios.

The mono cropping case without scenario yields in real terms a financial net present value (FNPV) of ETB 3,284 or US$ 188 with real discount rate of 12 percent. The “with” case yields a financial net present value of ETB 23,081 or US$ 1,319 using 12 percent real discount rate. To estimate the addition to the family welfare, because of the intervention, one has to examine the difference between “with” and “without” scenarios. The tables 11 and 12 of the CBA model are used for consequent construction of the incremental cash flow statements from the total investment or project point of view presented in Table 13 of the model. The incremental analysis of the mono cropping scenario yields a positive Financial Net Present Value (FNPV) of ETB 19,798 or US$1,131 using real discount rate of 12 percent. Tables 6, below, presents the incremental cash flows for the white pea bean intervention:

Table 6. Incremental cash flow statement – Total investment or project point of view for the white pea beans intervention (Real ETB)

Line Items Year<<<<	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	PV
Receipts												
Seeds	342.00	342.00	342.00	342.00	342.00	342.00	342.00	342.00	342.00	342.00	342.00	**2,274.38**
Marketed Beans	3,363.00	3,363.00	3,363.00	3,363.00	3,363.00	3,363.00	3,363.00	3,363.00	3,363.00	3,363.00	3,363.00	**22,364.70**
Total Inflows	3,705.00	3,705.00	3,705.00	3,705.00	3,705.00	3,705.00	3,705.00	3,705.00	3,705.00	3,705.00	3,705.00	**24,639.08**
Expenditures												
Inputs Cost:												
Seeds	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	**997.53**
DAP	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00	**2,493.83**
Land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Activity Costs:												
Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Primary Cultivation (first plowing)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Secondary Cultivation (three plowing)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Preparing Lines and Planting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Weeding	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Bird Watching	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Harvesting	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	**232.76**
Threshing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Land Tax	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Transporting from Field	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	**99.75**
Storing	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	**99.75**
Packaging	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	**19.95**
Delivery to market	135.00	135.00	135.00	135.00	135.00	135.00	135.00	135.00	135.00	135.00	135.00	**897.78**
Total Outflows	728.00	728.00	728.00	728.00	728.00	728.00	728.00	728.00	728.00	728.00	728.00	**4,841.36**
Net Cash Flows	2977.00	2977.00	2977.00	2977.00	2977.00	2977.00	2977.00	2977.00	2977.00	2977.00	2977.00	**19,797.71**
Net Cash Flows, REAL USD	***170.11***	***170.11***	***170.11***	***170.11***	***170.11***	***170.11***	***170.11***	***170.11***	***170.11***	***170.11***	***170.11***	**1,131.30**

NPV @12% discount rate ETB	**19,798**
NPV @12% discount rate $US	**1,131**

Table 14, in the CBA, depicts the cash flow statement from the total investment point of view excluding the value of seeds produced. Farmers usually use seeds as input for production for the consequent cultivation period. Part of the seeds may be sold. The households, however, very often do not sell seeds to the neighbourhood but give them in return to some activities, such as help during the harvesting period, rent of donkeys used for the beans transportation and etc. Hence seeds value may not represent a monetary cash outflow and those should be excluded from the analysis to properly assess ability of the households to serve their debt obligations. The same rationale holds for opportunity cost of family labour. In this case labour expense should be added back to the net cash flow over the period since money actually stays within the family and can be used to cover debt obligations. The Table 14 is again constructed on an incremental basis. This allows one to determine the ability of the households to repay the loan without requiring a contribution of financial resources from other activities.

The Annual Debt Service Coverage Ratio (ADSCR) for each round is estimated to be 3.80. The ADSCR above one usually indicates ability of the households to cover their debt obligations. Hence, the value of 3.80 indicates a strong ability for the households to repay their loan obligations.

Table 15 of the CBA model presents the cash flow statement in real terms from the equity point of view. The only difference between total investment and equity point of view is the effect of financing. The cash flow statement from the total investment project of view is constructed to assess the overall attractiveness of the project. The cash flow statement from the equity point of view, in turn, determines the returns to the households taking into consideration the source of project financing. The resulted FNPV from the equity point of view is US$1,127.90.

ECONOMIC ANALYSIS

Differences arise between the financial and economic outcomes due to the fact that the financial values do not include in all the externalities that are present in the economy (e.g., government). To show the true economic impact on the Ethiopian economy of the proposed intervention, the economic values are derived by adjusting the financial values by appropriate economic conversion factors. If no distortion is present in a market then the financial value of an item is used to measure the economic value of an item. The resulted economic net present value of the project is US$ 1,228.81 using a 12 percent real economic opportunity cost of capital.

The proposed intervention will increase Ethiopian white pea beans production. Ethiopia currently exports white pea beans. Increased exports will benefit Ethiopian economy by bringing foreign exchange to the country. The foreign exchange premium for Ethiopia was estimated to be equal to 6.5% (Kuo, 2011). The foreign exchange premium of 6.5 percent means that every incremental dollar earned on exports has economic value of 1.065 dollar. If there are no other distortions this connotes that every incremental kg of haricot beans produced should be attributed with the positive externality of 6.5 percent. Table 7 presents resource flow statement from the economy point of view:

Table 7. Incremental Resource flow statement Economy point of view white pea beans intervention (Real ETB)

Line Items	CF	Year<<<<	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	PV
Receipts														
Seeds	**1.08**		368.69	368.69	368.69	368.69	368.69	368.69	368.69	368.69	368.69	368.69	368.69	**2,451.85**
Marketed Beans	**1.08**		3,625.42	3,625.42	3,625.42	3,625.42	3,625.42	3,625.42	3,625.42	3,625.42	3,625.42	3,625.42	3,625.42	**24,109.82**
Total Inflows			3,994.10	3,994.10	3,994.10	3,994.10	3,994.10	3,994.10	3,994.10	3,994.10	3,994.10	3,994.10	3,994.10	**26,561.67**
Expenditures														
Inputs Cost:														
Seeds	**1.08**		161.70	161.70	161.70	161.70	161.70	161.70	161.70	161.70	161.70	161.70	161.70	**1,075.37**
DAP	**1.06**		395.80	395.80	395.80	395.80	395.80	395.80	395.80	395.80	395.80	395.80	395.80	**2,632.19**
Land	**1.00**		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Activity Costs:														
Land Clearing	**1.00**		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Primary Cultivation (first plowing)	**1.00**		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Secondary Cultivation (three plowing)	**1.00**		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Preparing Lines and Planting	**1.00**		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Weeding	**1.00**		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Bird Watching	**1.00**		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Harvesting	**1.00**		35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	**232.76**
Threshing	**1.00**		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Land Tax	**0.00**		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Transporting from Field	**1.00**		15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	**99.75**
Storing	**1.00**		15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	**99.75**
Packaging	**1.00**		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	**19.95**
Delivery to market	**1.00**		135.00	135.00	135.00	135.00	135.00	135.00	135.00	135.00	135.00	135.00	135.00	**897.78**
Total Outflows			760.51	760.51	760.51	760.51	760.51	760.51	760.51	760.51	760.51	760.51	760.51	**5,057.55**
Net Cash Flows			3233.59	3233.59	3233.59	3233.59	3233.59	3233.59	3233.59	3233.59	3233.59	3233.59	3233.59	**21,504.11**
Net Cash Flows, REAL USD			***184.78***	***184.78***	***184.78***	***184.78***	***184.78***	***184.78***	***184.78***	***184.78***	***184.78***	***184.78***	***184.78***	**1,228.81**

NPV @12% discount rate ETB	**21,504**
NPV @12% discount rate $US	**1,228.81**

STAKEHOLDER AND BENEFICIARY ANALYSIS

A surplus is also created in the economy by employing capital, land, and labour and paying financial prices for these inputs that are greater than the value of their opportunity costs. The GRAD interventions yield two groups of beneficiaries: the households engaged in red haricot beans cultivation and the Government of Ethiopia.

The FNPV represents the benefits accruing to the households. In this case it has a positive value of US$ 1,131. The greater economic values are due to additional benefits arising from additional tax revenue accruing to the government. The financing contribution of USAID is a transfer of resources from USAID to the farmer. This financial subsidy created through the submarket interest rates does not affect the ENPV of the project. It is accounted for as a direct subsidy provided to households by the lower than market interest rates, and is included as a benefit in the calculation of the FNPV of the households.

The Ethiopian government benefits from the additional inflow of taxes that accrues directly through the taxation of inputs purchased by the farmers and also indirectly because of the presence of a foreign exchange premium (FEP) on the net foreign exchange earnings created by the project. This foreign exchange premium is simply a measure of the increase in indirect tax revenue in the economy that occurs when the project generates additional foreign exchange. The values of stakeholder gains for the intervention are presented in the Table 8 below:

Table 8. Stakeholder and Beneficiary Impacts of Project (in US$)

Economic NPV (FNPV + Externalities)	1,228.81
• **Financial NPV (Households)**	1,127.90
• **Externalities**	100.91
o **Government**	97.51
o **Financing Contribution**	3.40

SENSITIVITY ANALYSIS

The variables for which a sensitivity analysis for the white pea beans intervention has been conducted include the cost of seeds, the yield of the beans, the cost of fertilizer, the price of beans, and effect of the drought. These variables are the most important factors that will influence a participating household's income. It is important to consider their possible effects on the sensitivity analysis. The joint impact of beans prices and beans yield are presented in table 9, below. Similarly, the impact of costs DAP fertilizer and seed costs (jointly) is presented in table 10. Table 11 outlines the impact of different incidence of drought on ADSCR and net cash flows (NCF) for year 2 and after. Table 12 shows the joint impact of the selling price of beans and the cost of fertilizer on NCF.

Table 9. Joint impact of beans yield and price of beans on the FNPV for the white pea beans intervention (in US$)

		Price in ETB			
Yield (in kg)	**5.00**	**6.00**	**7.00**	**9.00**	**10.00**
1,800	**65.95**	212.16	358.37	650.79	797.00
2,000	160.01	322.46	484.92	809.83	972.28
2,200	254.06	432.76	611.46	968.86	1,147.57
2,400	348.11	543.06	738.01	**1,127.90**	1,322.85
2,600	442.17	653.36	864.55	1,286.93	1,498.13
2,800	536.22	763.66	991.09	1,445.97	**1,673.41**

Table 9, above, presents the joint impact of the white pea beans yield and the beans price. Under the assumed scenario when selling price of beans is 9.00 ETB/kg and the yield is 2,400 kg/ha, the FNPV is US$1,127.90. If the selling price of beans stays the same and the yield increases, the FNPV will increase as well. In the best case scenario if the yield reaches 2,800 kg and the selling price reaches 10.00 ETB/kg, the FNPV will increase to US$1,673.41. In the worst case scenario if the price of beans decreases to 5.00 ETB/kg and the yield drops to 1,800 kg/ha the FNPV will decrease to US$ 65.95.

Table 10. Joint impact of cost of beans and cost of DAP on the FNPV for the white pea beans intervention (in US$)

		Cost of Seeds (in ETB)			
Cost of DAP	**10.00**	**12.00**	**13.00**	**15.00**	**18.00**
12.00	**1,120.46**	1,144.60	1,156.67	1,180.81	1,217.02
13.00	1,110.87	1,135.01	1,147.08	1,171.22	1,207.43
15.00	1,091.69	1,115.83	**1,127.90**	1,152.04	1,188.25
17.00	1,072.51	1,096.65	1,108.72	1,132.86	1,169.07
20.00	1,043.74	1,067.88	1,079.95	1,104.09	**1,140.30**

Table 10, above, outlines the joint impact of the cost of seed beans and the cost of fertilizer (DAP) on the FNPV. The expected scenario assumes the cost of seeds is 13.00 ETB/kg and the price of DAP is 15.00 ETB/kg, resulting in a FNPV of US$1,127.90. If the price of seeds increases and the price of DAP stays the same, the FNPV will increase because farmers engaged in this intervention are assumed to produce

more high quality seeds that is required for their own planting, The difference between seeds production and seeds requirements will give incremental income for the households. In case if the price of seeds stays the same but the price of DAP increases the FNPV will decrease. Regardless of the increases or decreases in the prices of seeds and DAP, for the tested ranges of both prices, the FNPV always yields positive results.

Table 11. Number of droughts within 5 years and their influence on FNPV (in US$)

FNPV = US$1,130.14	
Number of droughts in 5-year period	**FNPV**
0	1,127.90
1	717.27
2	**389.92**
3	108.98

Table 11 outlines the sensitivity analysis conducted to determine the effect of the frequency of droughts in Ethiopia within a 5-year period and their influence on the FNPV of the mono cropping intervention. Under the assumed scenario, no droughts occur within that period of time, so the FNPV reaches US$1,127.90.

Nevertheless, taking under consideration the climatic conditions of Ethiopia, it is possible that at least one drought will occur during each 5 years over the evaluation period. If one drought occurs the FNPV becomes US$ 717.27. If two droughts occur within 5 years (which is possible, taking under consideration the historical data of drought occurrence in Ethiopia), the FNPV of the intervention drops to US$389.92.

Another important assumption made in order to assess effect of drought is the yield of white pea beans during the drought season. It was assumed that in "without" intervention case yield will drop from 1,200 kg/ha to 50 kg/ha. In the "with" case scenario, the yield will drop from 2,400 kg/ha to 100 kg/ha. It is possible, however, to attain higher yields if farmers will have access to improved varieties of white pea beans that are drought resistant. One can insert a corresponding yield into the model and see the change on the FNPV in the sensitivity part of the analysis.

Table 12. Joint impact of yield and price of beans on NCF in year 2 and after

		Price (in ETB)			
Yield (in kg)	**5.00**	**6.00**	**7.00**	**9.00**	**10.00**
1,800	10.43	32.41	54.40	98.37	120.36
2,000	24.57	49.00	73.43	122.29	146.71
2,200	38.71	65.59	92.46	146.20	173.07
2,400	52.86	82.17	111.49	170.11	199.43
2,600	67.00	98.76	130.51	194.03	225.79
2,800	81.14	115.34	149.54	217.94	252.14

Table 12, above, shows the joint impact of yield and the price of white pea beans on net cash flows (NCF) for year 2 and after. Under the expected scenario, with a yield of 2,400 kg and beans selling price of 9.00

ETB/kg, the NCF is US$170.11. The NCF is sensitive to changes in yield and bean prices. When the yield is 2,800 kg and the selling price of beans is 10.00 ETB/kg, the best case scenario, the NCF will increase to US$252.14. On the other hand, if the selling price of the beans or yield decreases, the NCF will decrease.

RECOMMENDATIONS

This cost-benefit analysis shows that the planned GRAD intervention in the white pea beans value chain yields positive financial and economic NPVs. This intervention will benefit targeted households and will increase the overall welfare in the Ethiopian economy. Implementing this intervention will also yield an increase in yearly income of US$183.26/household. Nevertheless, this intervention on its own will not guarantee the desired income increase of US$365.00/household/year. Therefore, it is recommended that this intervention be implemented jointly as part of a "package solution" with another intervention proposed by the GRAD project.

REFERENCES

Abebe, G. (2009). Effect of Np Fertilizer and Moisture Conservation on the Yield and Yield Components of Haricot Bean (Phaseolus Vulgaris L.) in the Semi-Arid Zones of the Central Rift Valley in Ethiopia. *Advances in Environmental Biology, 3*(3): 302–307.

Ayalew, A. (2011). *Factors Affecting Adoption of Improved Haricot Bean Varieties and Associated Agronomic Practices in Dale Woreda, SNNPRS.* Master's thesis, Hawassa University.

Central Statistical Agency of Ethiopia. (2012). *Agricultural Sample Survey.* Retrieved July 20–28, 2012, from http://www.csa.gov.et/index.php?option=com_rubberdoc&view=category&id=75&Itemid=561

Ferris, S., and Kaganzi, E. (2008). *Evaluating Market Opportunities for Haricot Beans in Ethiopia.* Improving Productivity and Market Success (IPMS) of Ethiopian Farmers Project, International Livestock Research Institute (ILRI).

Ferris, S., Paschall, M., and Seville, D. (2011). *Dried Beans in Ethiopia: Increasing Food Security Through Trade.*(http://seasofchange.net/wp-content/uploads/downloads/2012/03/Case-SFL-Ethiopia-dried-beans.pdf)

Graduation With Resilience to Achieve Sustainable Development (GRAD). Technical proposal, July 20, 2012.

International Food Policy Research Institute. (2010). *Pulses Value Chain in Ethiopia: Constraints and Opportunities for Enhancing Exports.* Working paper, July.

Jenkins, G., Kuo, C., and Harberger, A.. (2011). Cost-Benefit Analysis for Investment Decision, August 2011 Edition.

Kuo, C.Y. (2011). *Estimates of the Foreign Exchange Premium and the Premium for Non-Tradable Outlays for Countries in Africa.* John Deutsch International, Department of Economics, Queen's University, Canada.

The Sphere Project. (2011). *Humanitarian Charter and Minimum Standards in Humanitarian Response (* http://www.spherehandbook.org/).

Negash, R. (2007). *Determinants of Adoption of Improved Haricot Beans Production Package in Alaba Special Woreda, Southern Ethiopia.* Master's thesis, Haramaya University.

Shirefaw, A., Berhe, K., Jaleta, M., Gebremedhin, B., and Hoekstra, D. (2010). *Improving Elements of Haricot Bean Value Chain in Alaba Special District, Southern Ethiopia: Experiences From IPMS.* ILRI.

SNV. (2010). *Red Beans Value Chain Analysis in PSNP Plus—Dale and Loka Abaya Woredas.* Era Agrilink PLC.

SNV and CARE. (2010). *Rapid Market Assessment for Red Beans—Dale and Loka Abaya Woredas.*

SNV and CARE. (2012). *Red Beans Value Chain Analysis, Draft Report.*

USAID. (2008). Success Story: Improved Haricot Bean Basic Seed Multiplication Increased Yield/Income and Quality. *Success Story #12*, December.

Yilma, K., Berhe, K., Hoekstra, D., Jaleta, M., Alemayehu, F., Gebrehawariat, K., and Ayele, D. (2010). *Innovative Haricot Beans (Phaseolus vulgaris) Seed System for Smallholder Farmers in Dale District Southern Ethiopia: Experiences From IPMS*. IPMS Ethiopia.

APPENDIX

Table A. GRAD-selected *woredas* and their choice of commodities (per CARE plan)

Region	*Woreda*	Type of value chains selected for GRAD *woredas*
SNNPR	Shebedino	Fattening (shoats and cattle), vegetables (potato and onion), honey
	Awassa Zuria	Shoats fattening, red pepper, vegetables (potato and onion)
	Loka Abaya	Shoats fattening, **Pulse (beans),** honey
	Hawale Tula	Vegetables (potato and onion), fattening (shoats and cattle), honey
	Mareko	Red pepper, fattening (shoats and cattle), onion
	Meskan	Red pepper, fattening (shoats and cattle), vegetables (onion and tomato)
Tigray	Alamata	Vegetables (onion and tomato), cattle fattening, honey
	Ofla	Shoats rearing, honey, vegetables (garlic and pepper), fattening (shoats and cattle), **pulse (fava beans)**
	Enda Mehoni	Vegetables (potato and garlic), shoats rearing, cattle fattening, honey, **pulse (fava beans)**
	Raya Azebo	Shoats rearing, fattening (shoats and cattle)
Amhara	Lay Gayint	Cereals (malt barley), **pulse (white pea beans),** potato, shoats fattening
	Libo Kemkem	Cattle fattening, honey, vegetables (onion)
Oromia	Arsi Negele	Shoats fattening, **pulse (white pea beans),** red pepper
	Ziway Dugda	**Pulse (white pea beans),** vegetables (tomato and onion), shoats fattening
	Shala	Shoats fattening, **pulse (white pea beans),** potato
	Adami Tulu	Red pepper, **pulse (white pea beans),** shoats fattening

Table B. The FtF indicators proposed for monitoring and evaluating the GRAD project

Results	Indicator	Target
Overall Objective: **To graduate chronically food-insecure households from food support**	Graduation of chronically food-insecure households from food aid by increasing their yearly household income	Increase in yearly income of US$365 by year 5 for 50,000 households
Result 1: **Enhanced livelihood options for chronically food-insecure households**	4.5-2 Number of jobs attributed to FtF implementation (RiA)	Higher is better
	3.1.9.1-3 and 4.7-4 Prevalence of households with moderate or severe hunger (RiA)	Lower is better
Result 2**: Improved community and household resilience**	3.1.9-16 Prevalence of underweight children under 5 years of age (R)	Lower is better
	3.1.9-13 Prevalence of underweight women (R)	Lower is better
	3.1.9-4 and 3.1.9.1-4 Prevalence of exclusive breastfeeding of children under 6 months of age (RiA)	Lower is better
	3.1.9-11 Prevalence of stunted children under 5 years of age (R)	Lower is better
	4.5.2-14 Number of vulnerable households benefiting directly from USG assistance (S)	Lower is better
Result 3: **Strengthened enabling environment to promote scale-up and sustainability**	4.5 Women's Empowerment in Agriculture Index Score (R)	Higher is better
	4.5.1-27 and CBLD-5 Score, in percent, of combined key areas of organization capacity among USG direct and indirect local implementing partner levels	Higher is better
	4.5.2-38 Value of new private-sector investment in the agriculture sector or food chain leveraged by FtF implementation (RiA)	Higher is better

Table C. CFs used in the economic analysis of GRAD-planned white pea beans intervention

Summary of CFs	
White pea beans	**1.08**
White pea beans seeds	**1.08**
Maize	**1.02**
Maize seeds	**1.02**
Transportation	**0.84**
Labor	**1.00**
Storage	**1.00**
Packaging	**1.00**
Land	**1.00**
UREA	**1.05**
DAP	**1.05**