

COST-BENEFIT ANALYSIS OF SMALL HOLDERS' LAMBS AND GOATS FATTENING ACTIVITY IN ETHIOPIA

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Abstract

The objective of this study is to identify if the subsidized interest rates' loans from micro-finance institutions in Ethiopia used to purchase and fatten small ruminants (lambs and kids) allow the poor households to substantially increase their annual income. A deterministic cost-benefit analysis of the base line scenario indicates that the proposed fattening scheme would result a satisfactory net present value. The high prices of feed in the country, however, suggest that the fattening calendar is an important variable. The study assess financial and economic benefits arising to the stakeholders of the activity and identifies key risky variables. This analysis points out that in the context of pro-poor interventions the loan schedule should be tied to the nature of the activity financed by the loan. The study proposes the suitable loan structure for the examined activity. High prices of commercial feed products along with the low scale of the activity do not allow the feeding scheme based on the highly nutrition commercial feed products. The study therefore is based on the free grazing feeding scheme with a limited quantity of supplementary feed.

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Key words: cost-benefit analysis, investment appraisal, stakeholder analysis, small ruminants fattening, lamb and kids fattening, meat value chain, poverty reduction, sustainable development, access to finance, loan enabling intervention.

JEL: D13, D31, D61, D62

ACRONYMS

AGP	Agriculture Growth Program
CBA	Cost-Benefit Analysis
CF	Conversion Factor
CRS	Catholic Relief Services
CSA	Central Statistical Agency of Ethiopia
ENPV	Economic Net Present Value
EOCK	Economic Opportunity Cost of Capital
ETB	Ethiopian Birr (Currency)
FEP	Foreign Exchange Premium
FNPV	Financial Net Present Value
FtF	Feed the Future (Program)
GDP	Gross Domestic Product
GRAD	Graduation With Resilience to Achieve Sustainable Development
Ha	Hectare
kg	Kilogram
MFI	Microfinance Institution
NCF	Net Cash Flow
NGO	Nongovernmental Organization
NPV	Net Present Value
ORDA	Organization for Rehabilitation and Development in Amhara
PSNP	Productive Safety Net Program
QDSCR	Quarterly Debt Service Coverage Ratio
REST	Relief Society of Tigray
RUSACCO	Rural Saving and Credit Cooperative
SNV	Netherlands Development Agency
US\$	United States Dollar
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

Project Description: In 2012, USAID Ethiopia initiated the Graduation with Resilience to Achieve Sustainable Development (GRAD) project. Implementation of this project will take place over a period of 5 years in 16 woredas around Ethiopia. The main purpose of this project is to graduate 50,000 chronically food insecure households (out of 65,000 that are targeted) from the Productive Safety Net Program (PSNP) and increase their yearly income by US\$365/year/household.

The implementers of the GRAD project include CARE Ethiopia, REST (Relief Society of Tigray), ORDA (Organization for Rehabilitation and Development in Amhara), CRS (Catholic Relief Services), and AgriServices Ethiopia.

To facilitate the proper implementation of the project and the flow of necessary financial resources for the targeted households, USAID established a US\$3-million loan guarantee fund that will be available to lending institutions, microfinance institutions (MFIs), and rural savings and credit cooperatives (RUSACCO) to allow these institutions to supply the targeted households with the loans necessary for undertaking the GRAD interventions.

Strategic Context and Rationale: The USAID Ethiopia GRAD project is part of the wider Feed the Future (FtF) strategy, which supports investments in viable and potentially easy to engage in and profitable agricultural value chains. Four value chains have been selected for this intervention: honey, meat, vegetables, and pulses.

The intervention suggested for the meat value chain proposes the fattening of shoats.¹ This specific intervention was chosen because it requires minimal specific knowledge to be implemented at the household level. In addition, the initial costs related to the intervention and the additional labor requirements at the household level are relatively low, which makes the intervention suitable for GRAD chronically food-insecure households.

Financial and Economic Analysis Results: The baseline of this analysis assumes that the households will have three rounds of shoats fattening. They will receive a loan sufficient to purchase six heads of small ruminants and the required quantity of feed concentrate per year. Approximately 10 percent of the loan will also be set aside as working capital.

The analysis is projected over a duration of 10-year period. It shows that shoa fattening yields a positive financial net present value (FNPV) of US\$942.13 per household. The economic net present value (ENPV) is also positive, with a value of US\$1,198.10 per household.

Since the project's initiation, implementing partners have transferred US\$2.12 million in loan guarantee funds to the participating microfinance institutions (MFIs). The corresponding MFIs' contribution to the total fund available for loan disbursement has already reached US\$5.02 million. Hence, the total loan fund available to the GRAD beneficiaries amounts to US\$7.13 million and keeps expanding.

The assumption was made that 20 percent of this US\$7.13-million fund would be used by the households for shoa fattening. The mean loan size per household is US\$228.57 (ETB4,000), and such approximately 6,241 households would be engaged in this activity.

Although the real number of participating households might be higher, not every household will spend the full loan amount to fatten shoats. In fact, most of the households engage in more than one value chain; such households fatten fewer than six animals per round. The aggregation of such households into one household unit (assuming two households fattening three shoats per round are equal to one household fattening six shoats per round) will not alter the results of the analysis.

¹ "Shoats" is a local term used to define sheep and goats.

The aggregate ENPV of the project discounted at 12 percent economic opportunity cost of capital (EOCK) is US\$9.00 million, while the FNPV of the project is US\$5.88 million.

The difference between financial and economic outcomes of the project is because the financial values do not include all externalities present in the project. In the case of shoat fattening, such a difference results from two factors:

1. Shoats are both input and output items of the project. The financial cost of shoats is almost 10 percent less than their true economic cost. The economic value of the final product (fattened animals) is 10 percent higher than the financial value of the output.
2. The financial values of other inputs used for shoat fattening, such as salt and veterinary expenses, differ from their true economic values.

The analysis shows that upon the implementation of the intervention, these chronically food-insecure households would observe an increase in their yearly income of US\$152.47/household/ year, excluding the opportunity cost of family labor involved in the activity. The increase in the annual income of the households when the opportunity cost of family labor is added to the net income earned by the households reaches US\$210.33/household/year. These figures are presented in real terms (adjusted for the inflation rate) and occur from 2015 until the end of the project. For the first 3 years (2012–2015), net cash flows are lower due to required loan repayments.

Beneficiary Analysis Results: The results of the analysis reveal that targeted households' income will increase. Each household's net income increase including the opportunity cost of family labor is estimated to be US\$1,065.40/household over ten years. The government and MFIs will also benefit for the following reasons:

- The government will benefit directly from the taxes collected on the inputs and outputs of the shoat-fattening intervention. The indirect benefits to the government will also rise because meat is exported from Ethiopia, which allows the country to earn foreign exchange premiums (FEP). The present value of the government's benefits from the intervention over the 10-year period is estimated to be US\$233.22/household. The total government benefits from the GRAD shoat-fattening intervention will amount to US\$1.46 million, assuming that 6,241 household units² benefit from the activity.
- The present value of MFIs' gross revenue over the ten year period is estimated at US\$22.75/household. The smaller gross revenue amount results from the highly subsidized loan interest rate. In fact, each household will pay only US\$8.57 in interest in addition to the real value of loan principle of US\$228.57, or approximately 3.75 percent of the annual real interest rate. The remaining 11.25 percent of the interest rate will be erased by the inflation rate in Ethiopia, assuming that the risk premium on the loans charged by MFIs is zero.³

Conclusions and Recommendations: The cost-benefit analysis (CBA) of the intervention in shoat fattening shows a positive FNPV, which suggests that the benefits of implementing such an intervention will outweigh the costs. The households eventually will be able to repay their loans related to financing the shoat fattening.

It is recommended that the loan repayment schedule be restructured to allow the households to make three principle repayments. The first two repayments should not exceed 20 percent of the loan principle and interest accrued, and the residual 60 percent of the principle plus corresponding interest should be paid at the end of the loan term. The GRAD "Quarterly Narrative Report" reported loan-repayment rates of 70 percent. This repayment rate may improve if the repayment structure is adjusted, as recommended above, to be more consistent with the fattening calendar.

² Household unit is defined as a household that fattens six animals per fattening period.

³ Assumption of the zero rate of the risk premium is only possible due to the loan guarantee fund established by the GRAD project.

The analysis reveals that by the end of 2015, the households will have sufficient financial resources to continue fattening activities without obtaining loans from MFIs. This important finding suggests that the intervention will achieve one of the main GRAD objectives: financial stability at the household level.

The GRAD project's goal of graduating chronically food-insecure households by increasing their yearly income by US\$365.00/per household/per year within 3 years after the households begin receiving support from the project cannot be achieved by implementing this intervention for shoat fattening. However, the shoat-fattening activity nicely complements activities for the households engaged in other GRAD value chains, particularly crop-production activities, because post-harvest crop residues can be used to feed the animals.

This intervention also benefits landless households, which are not able to benefit from other production-based GRAD interventions. The total increase in the income of this household category will be lower, because they will need to purchase more feed for the animals unless they have access to free grazing areas.

THE GRAD MEAT VALUE CHAIN: COST-BENEFIT ANALYSIS

METHODOLOGY

Project Background

The gross rate of Ethiopian real gross domestic product (GDP) in 2011 was 7.5 percent. Ethiopia, however, is still one of the poorest countries in the world. Currently about 8 million Ethiopians, out of a total population of 93 million,⁴ live in chronic food insecurity (The World Factbook, CIA). Each year, between June and October more than 60 percent of Ethiopian rural households experience significant food shortages (GRAD Technical Proposal, 2011). These figures show that for several months of the year, a large portion of Ethiopian families cannot obtain enough food to avoid hunger. This is one of the main reasons why the USAID Ethiopia Mission supports various initiatives to increase food security for Ethiopia's most vulnerable inhabitants.

The GRAD project is part of USAID's broader FtF agenda. It focuses on a group of initiatives that have been specifically developed to support chronically food-insecure Ethiopian households.⁵

The GRAD project specifically targets 65,000 households that previously received support from the PSNP. The 58,500 households that are categorized as chronically food insecure combined with 6,500 households that are classified as "Ultra Poor" (landless youth and female-headed households) to form the GRAD project's primary target. A secondary target group includes about 10,000 households that belong to two groups: food-sufficient households (6,000) and food-secure households (4,000). This second group is intended to serve as role models for the first GRAD group. Of the targeted 65,000 households, the GRAD project aims to progressively graduate 50,000 (77 percent of the total) during the project's planned 5-year lifespan. The majority of the targeted households are situated in rural areas and engaged in cash-crop production with small landholdings. They lack financial services and proper marketing information for the outputs they produce.

The families targeted in this project are located in 16 woredas within Ethiopia.⁶ These woredas were selected on the basis of their proximity to the Agriculture Growth Program (AGP) and the presence of active local markets that bring opportunities for engaging in commodities 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 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 project to allow each targeted household to increase its yearly income by US\$365 (or US\$1 per day).

The GRAD project also puts special emphasis on gender equality and inclusion of women. The GRAD project considers women to be a subtarget group, which translates into developing interventions to address their specific needs and roles in the society.

The leading implementer of this project, CARE, will collaborate with technical partners to ensure the project's proper implementation. These cooperating partners are CARE Ethiopia, REST (Relief Society of Tigray), ORDA (Organization for Rehabilitation and Development in Amhara), CRS (Catholic Relief Services), and AgriService Ethiopia. All these organizations are well-known nongovernmental organizations (NGOs) that are engaged in various projects in Ethiopia related to improving food security and developing commodity value chains.

⁴ As per CIA estimation from July 2012.

⁵ 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 (as per GRAD Technical Proposal, 2011).

⁶ The full list of selected woredas and commodities is presented in Table A in the appendix.

To facilitate the implementation of the GRAD project, USAID will establish a loan guarantee fund of US\$3.00 million. The main rationale for the establishment of this fund is the idea that MFIs and RUSACCOs that will be lending to the GRAD-targeted households will need to have access to funds to develop a viable lending scheme for the GRAD project. This credit guarantee will also spread the level of risk of possible loan defaults associated with microlending as well as contribute to the total amount of funds available for distribution.

The GRAD project specifically focuses on four commodity chains: honey, pulses, vegetables, and meat. These commodity chains were chosen because of their simplicity in terms of the knowledge required for entry and rather low initial start-up costs needed 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.

Project Description and Activities

Grad Intervention in the Meat Value Chain

The specific GRAD intervention that is proposed for implementation in the livestock (meat) value chain consists of fattening shoats (goats and sheep) using locally available feed resources. Households are theoretically able to have four fattening rounds per year, with the average round lasting 3 months. The actual number of fattening periods may differ for every household. A household's decision regarding the number of cycles to pursue and number of animals to fatten is based on several factors, including, but not limited to:

- timing decision (animals are purchased when the market price is low and sold during the holidays, allowing households to increase financial returns of the fattening activity);
- availability of cheap feed resources (post-harvest crop residues, access to free-grazing land, etc.); and
- timing of the loan disbursement.

This intervention is planned for all woredas included in the GRAD project (unlike the interventions in other GRAD value chains that require specific locations, such as proximity to a water resource in the case of vegetables), due to its almost nonexistent requirements related to specific geographic location and the customary livestock ownership observed at the smallholder level in the targeted areas.

Assumptions for the Selected GRAD Interventions in the Meat Value Chain:

1. The base line scenario of the analysis assumes that the households will pursue three fattening cycles per annum.
2. The number of animals fattened per cycle is limited to six. The mean loan size available for the households is US\$228.57 (ETB4,000). The loan size will not allow the beneficiaries to purchase more than six animals per round without equity contribution. Animals purchased using equity funds, if any, would yield benefits that should not be attributed to the GRAD intervention.
3. The majority of the households are engaged in more than one GRAD value chain, so a fraction of the loan will be used to purchase inputs for other production activities. This study aggregated the households involved in more than one value chain into household units. For example, two households fattening three shoats per cycle are assumed to be identical to one household fattening six shoats per round.
4. The purchase of both types of animals will be pursued during the nonholiday periods when livestock prices tend to be lower. In addition, the animals that will be purchased will be healthy, with no visible defects; they will be 7 months to 2 years old; and they will weight 15 to 20kg each.
5. The average fattening period for shoats is 90 days. After that period, the households will sell fattened shoats and buy new animals for the next round of fattening.
6. It is assumed that the main source of feed will come from whatever is available around the house as well as post-harvest residues. The households will utilize approximately 150 grams of concentrated feed/day/animal.
7. The total value of the initial loan includes costs associated with borrowing: service charge (1 percent), insurance (1 percent), Pass Book fee (US\$0.86), and upfront savings (10 percent). The loan will be given for 1 year with a bi-annual repayment schedule that is somewhat flexible and aligned with seasonal fattening activities. The financing institution will take under consideration special circumstances, such as when prices of livestock fall and make it difficult to fetch a good price for fattened animals. In addition, farmers will be allowed to repay their loans on a delayed schedule to fetch a higher price when market price goes up. The interest rate on the loan is set at 15 percent, which is a subsidized rate negotiated for the purpose of financing the investment needed for the GRAD interventions.
8. For the purpose of this analysis, the following macrolevel assumptions have been made: Domestic inflation is 20 percent, the U.S. inflation rate is 2.5 percent, the real financial discount rate is 12 percent, the economic real discount rate is 12 percent, the FEP is 6.5 percent, the exchange rate is US\$1 = 17.50 ETB, and land tax is US\$4.86 (ETB85.00) /year.

The list of parameters used for the purpose of the CBA analysis in the shoats fattening intervention of the GRAD project is presented in Table 1, below.

Table 1. Parameters Used in the CBA Analysis of the GRAD Meat Value Chain

Average fattening period (days)	90.0
Number of rounds per year	3.0
Number of animals per round (shoats)	
<i>Jun–Sept</i>	6.0
<i>Oct–Dec</i>	6.0
<i>Jan–Mar</i>	6.0
<i>Apr–Jun</i>	0.0
Input Cost ETB/animal	
Cost of shoat	
<i>Jun–Sept</i>	500.0
<i>Oct–Dec</i>	500.0
<i>Jan–Mar</i>	500.0
<i>Apr–Jun</i>	500.0
Feeding Cost ETB/kg	
<i>Jun–Sept</i>	
Roughage	1.00
Concentrate (industrial by-products)	3.00
Acacia pod	1.00
Sweet potato vines	1.00
Salt	5.00
<i>Oct–Dec</i>	
Roughage	1.00
Concentrate (industrial by-products)	3.00
Acacia pod	1.00
Sweet potato vines	1.00
Salt	5.00
<i>Jan–Mar</i>	
Roughage	1.00
Concentrate (industrial by-products)	3.00
Acacia pod	1.00
Sweet potato vines	1.00
Salt	5.00
<i>Apr–Jun</i>	
Roughage	1.00
Concentrate (industrial by-products)	3.00
Acacia pod	1.00
Sweet potato vines	1.00
Salt	5.00
Feeding Requirements kg/feeding period/animal	
<i>Jun–Sept (free grazing)</i>	
Roughage	10.00
Concentrate (industrial by-products)	0.00
Acacia pod	0.00
Sweet potato vines	0.00
Salt	5.00
<i>Oct–Dec (residues after harvest)</i>	
Roughage	50.00
Concentrate (industrial by-products)	0.00
Acacia pod	0.00
Sweet Potato Vines	0.00
Salt	5.00

Jan-Mar (Supplementary Feeding)	
Roughage	10.00
Concentrate (industrial by-products)	15.00
Acacia pod	20.00
Sweet potato vines	20.00
Salt	5.00
Apr-Jun (supplementary feeding)	
Roughage	10.00
Concentrate (industrial by-products)	15.00
Acacia pod	20.00
Sweet potato vines	20.00
Salt	5.00
Labor requirements	
Time required (hours/day)	2.0
Working day duration (hours)	8.0
Labor cost (ETB/day)	15.0
Full labor days/round	22.5
Veterinary services ETB/round/animal	
Anti-worm drugs	8.0
LOSSES DUE TO LIVESTOCK DISEASES	
Mortality rate	2.00%
Feeding sunk cost	1.00%
Selling price ETB/animal	
Price of shoats	
<i>Jun-Sept</i>	800.0
<i>Oct-Dec</i>	800.0
<i>Jan-Mar</i>	800.0
<i>Apr-Jun</i>	800.0
Financing	
Repayment period years	1
Grace period years	0
Number of equal repayments/year	2
Service charge	1.00%
Insurance ETB	1.00%
PB fee	15.00
Upfront savings (of total loan)	10.00%
Mean size of the loan (ETB)	
GRAD project information	
Total guarantee fund transferred (US\$ as of October 11, 2013)	
Total MFI contribution to GRAD loans (US\$ as of October 11, 2013)	
Total amounts of funds available for disbursement (US\$)	
Share of funds obtained for shoat fattening	20.00%
Macro information	
Inflation rates	
Domestic inflation	20.00%
U.S. inflation	2.50%
Discount rates	
Financial discount rate	12.00%
Economic discount rate	12.00%
Exchange rate	
Real exchange rate ETB/US\$	17.50
Nation parameters	
Foreign exchange premium	6.50%
Interest rates	
Subsidized interest rate (ETB), nominal	15.00%

The main indicator of success for the GRAD shoat-fattening intervention will be the ability of households involved in the project to achieve the desired increase in their annual income of US\$365.00 by the end of the project.

The purpose of this CBA is to determine whether this proposed intervention will yield benefits that outweigh its costs and to measure the resulting increase in the incomes of the chronically food-insecure households in the target woredas.

PROJECT MODELING

The financial and economic feasibility of the GRAD shoat-fattening intervention has been estimated using a practical framework as outlined by Jenkins, Kuo, and Harberger in “Cost Benefit Analysis for Investment Decision.” 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 has been carried out for an 10year time period.

To estimate the financial sustainability of the intervention in the meat value chain, the quarterly debt service coverage ratio (QDSCR) of the project over the life of the loans used to finance it has been calculated together with the project’s FNPV.

The cash-flow statements in the financial analysis have been constructed from the viewpoint of the total investment/project and equity/household. Cash-flow statements are presented in both nominal and real terms.

The economy resource-flow statements have been constructed by adjusting each of the line items in the cash-flow statements for the total investment point of view by the corresponding economic conversion factors.

EXCEL MODEL ADJUSTMENT

The Excel model that accompanies this report is designed to allow implementing partners of the GRAD project as well as the USAID Ethiopia project monitoring unit to adjust the model. The corresponding adjustments will allow the incorporation of the latest project findings to properly assess the intervention’s outcomes. In addition, it allows analysis of the cash-flow profile, income increase, and financial and economic returns of the households pursuing different fattening strategies (e.g., different number of animals, different number and timing of fattening rounds, etc.).

The model is logically structured according to the feeding calendar advised by the GRAD project. The four fattening periods are from June to September, October to December, January to March, and April to June. All the model inputs—including the number of animals per period, input costs, output prices, feeding requirements, and so forth—are disaggregated with respect to the particular feeding period. A few examples of model adjustments follow:

1. The base line scenario of the analysis assumes three fattening periods per year. The number of fattened animals during the period of April to June (Cell D16 of the Excel model) is therefore set to zero. Changing the value of the cell will allow the calculation of FNPV (Cell D444), ENPV (Cell D557), family income profiles (Table 21 of the Excel model), and so forth for the households pursuing four annual rounds of shoat fattening. The outcomes of the intervention for households with two rounds of shoat fattening can be estimated by changing the number of fattened animals in any other period (cells D13 to D16) to zero.

2. The price of the livestock both as input and output of the intervention is subject to change according to regional differences and significant seasonal fluctuations of the price of meat in Ethiopia. The cost of livestock inputs for the corresponding fattening period (cells D20 to D26) and price of the fattened animals (cells D106 to D112) can be altered to incorporate required changes.
3. The cost of feeding ingredients and the required quantities can also be adjusted according to the feeding calendar (cells D31 to D86).

The simultaneous update of all the parameters mentioned above will allow full customization by region, timing, and even household level.

INTERVENTION SCENARIO

The proposed intervention will allow farmers to obtain funds required to purchase and then fatten shoats. It is assumed that such a small quantity of animals can be kept on marginal land, so no land costs are associated with the intervention. The expenditure and income details are as follows:

Income: The income for the family is the value of the fattened animals at the end of the 3-month fattening period/round. It is expected that shoats will be sold around the holidays to allow sellers to get some premium over the usual price. The selling price is assumed to be 800 ETB (US\$45.71) per shoat, which is treated as a cash inflow. The net cash flow is calculated by deducting all expenses associated with the fattening operation from the cash inflow. The net cash flow, in the case of shoat fattening, is the income/loss for the household.

Expenditures: Under the existing production system, farmers purchase very young ruminants and keep them for a long period of time, almost with no provision of additional purchased food to minimize financial costs. Shoats are usually sold later when the household needs cash. Such a system will not allow households to have a stable source of income from this activity. The intervention scenario includes two to four rounds of shoat fattening per year. The cost of feed per kilogram together with the quantity of feed required per animal per round is presented in Table 2, below.

PREPARATORY TABLES

In the CBA model (Excel file that accompanies this report), Tables 3 to 8 show preparatory information about the shoat-fattening intervention, required loans, and projected revenues and expenditures related to the analysis.

Table 3 shows the projected nominal costs of fattening intervention inputs, such as the cost of feed, unfattened shoats, anti-worm drugs, and labor. Costs are presented per one animal per 3-month fattening period. Nominal values are calculated by adjusting the present cost over the corresponding price index.

Table 4 presents the amount of loans required to purchase live animals together with all other inputs of the production for 2012, 2013, and 2014. The mean loan size in 2012 was 4,000 ETB (US\$228.57)/household. The analysis assumes that the loan amounts for 2013 and 2014 will be adjusted for the corresponding inflation rate and therefore would be equal to 4,800 ETB and 5,760 ETB in nominal terms, respectively. The total loan amount in each of the years includes charges collected by MFIs when they provide loans to the households, such as a service charge of 1 percent, insurance of 1 percent, a Pass Book fee of 15 ETB, and upfront savings of 10 percent. The amount of upfront savings is returned to the household upon the loan's repayment.

Table 5 calculates the scheduled debt service on the loans at the subsidized interest rate of 15 percent. The households will have to repay half the loan principal plus interest incurred at the end of second round.

Eventually farmers will repay the rest of the loan and interest incurred at the end of the fourth round, which is also the end of the year.⁷

Table 6 depicts nominal revenues from the sale of fattened animals. It is assumed that farmers will purchase all production inputs at the beginning of the 3-month period and sell fattened ruminants at the beginning of the next period.

Table 7 presents the nominal costs associated with shoat fattening. The main production cost is the purchase price of unfattened animals. Any real decrease/increase in the price of unfattened animals will not change the situation, because the price of meat will proportionally change for unfattened as well as fattened animals.

FINANCIAL ANALYSIS

Table 8 of the model depicts the quarterly cash-flow statement from the total investment or project point of view in nominal values to determine whether the households will be able to repay their loans. The resulting net cash flows are later used in Table 9 to derive the QDSCR. The net cash flows are positive throughout the project life, except during the first round (Jun–Sept) of fattening every year. The negative cash flow in these periods occurs because the base line scenario assumes three fattening cycles per year; hence, there is no revenue from the sale of livestock in these periods.

Tables 9 to 12 present quarterly cashflow statements from total investment point of view and equity point of view. These tables are required to derive annual cashflow statements.

Table 13 of the model presents the annual cash-flow statement from the total investment or project point of view. The cash inflows and outflows were derived by combining the respective fattening rounds of net cash flows that occur during the year. The cash-flow statement from the total investment or project point of view is constructed to determine the overall strength of the project and to assess whether the potential loans to the project are secure. It takes into account all financial benefits and costs of the project to determine its financial feasibility, the need for loans, and the likelihood of repayment on loans and interest.

Table 14 is the annual cash-flow statement from the equity or owner point of view. It adds the loan to the net cash flows from the total investment point of view as cash receipts and subtracts payments of interest and loan repayments as cash outlays. Therefore, the only difference between the analysis from the owner's point of view and total investment point of view is financing.

The net present value from the equity point of view (households' point of view) is estimated at 16,487.34 ETB (US\$942.13) with the discount rate of 12 percent. The intervention definitely achieves the USAID standard of 12 percent real discount rate for funding. These results are presented in Table 2, below:

⁷ Note: This is a scheduled loan repayment, which is calculated without taking into consideration actual cash flows at the household level. Table 9 presents the households' real ability/inability to repay the loans.

Table 2: Annual Cash Flow Statement – Equity Point of View (Households’ Point of View), Real ETB

[illegible]

FINDINGS

Financial Analysis

The financial analysis performed for the shoat-fattening intervention in the GRAD meat value chain yields a positive FNPV from the equity point of view of US\$942.13 using a discount rate of 12 percent. This positive value suggests that the project is sustainable, because over the life of the project, the financial benefits will outweigh the financial costs for the target households.

Table 3, below, presents QDSCRs for 2012.

Table 3. Quarterly Debt Service Coverage Ratios (QDSCRs) for Shoat Fattening

Line Items/Year	2012			
	<i>Jun-Sept</i>	<i>Oct-Dec</i>	<i>Jan-Mar</i>	<i>Apr-Jun</i>
Nominal NCF during loan repayment period (Excluding labor cost)		1294.71	1056.36	5503.35
Debt repayment obligation for subsidized loan	0.00	2300.00	1005.29	2150.00
Actual Debt Repayment		1294.71	1005.29	2150.00
Quarter Debt Service Coverage Ratio (QDSCR)		0.56	1.05	2.56

The analysis assumes that the loan will be taken at the beginning of the first fattening period (June–Sept). The first loan repayment is scheduled for 6 months later, at the end of December, which is also the end of the second fattening period. The analysis reveals that the households will not have sufficient cash flow at this point to repay 100 percent of the first scheduled loan payment. The $QDSCR_{Oct-Dec}$ is 0.56, indicating that the households will be able to cover only 56 percent of the required payment. The residual fraction of the payment will be paid at the end of the next fattening round. The households will be able to fully cover the second scheduled loan repayment (50 percent of the principle + interest). The $QDSCR_{Apr-June}$ is 2.56, indicating that the household would have a net cash flow that is 2.56 times higher than the corresponding debt service.

The low QDSCRs for Rounds 2 and 3 are due to the necessity of financing the purchase of additional animals for the next fattening round. During these periods, households cannot service their debt obligation in full. No such purchase is needed at the beginning of the year (Round 1), because households will finance the purchase of new animals by obtaining new loans. This explains the sudden increase in ADSCR for the Apr–June round. The opportunity cost of labor has been added back to the household's net cash flow for the purpose of QDSCR calculation. Although it is deducted, the opportunity cost of labor is retained within the family and can be treated as cash income for debt servicing. A QDSCR value above 1 in Round 4 indicates that eventually the households may be able to repay their loans in full, although intermediate payments will be delayed.

Taking into consideration the insufficient cash flow for the loan repayment scheduled for the Oct–Dec period, the loan repayment schedule should be restructured to allow the households to repay 20 percent of the loan principle and interest accrued during the first two fattening rounds. The third loan repayment will consist of 60 percent of the loan principle and interest accrued. The resulting adjusted QDSCRs for 2012 are presented in Table 4, below:

Table 4. Quarterly Debt Service Coverage Ratios (QDSCRs) for the Proposed Loan Structure

Line Items/Year	2012			
	<i>Jun-Sept</i>	<i>Oct-Dec</i>	<i>Jan-Mar</i>	<i>Apr-Jun</i>
Nominal NCF during loan repayment period (Excluding labor cost)		1294.71	1056.36	5503.35
Debt repayment obligation for subsidized loan	0.00	1089.52	913.79	2485.34
Actual Debt Repayment		1089.52	913.79	2485.34
Quarter Debt Service Coverage Ratio (QDSCR)		1.19	1.16	2.21

The proposed loan restructuring results in QDSCR values that are all above 1, which indicates that the households will have sufficient cash flow to cover their debt obligations. Restructuring the loans will also reduce their default rate. The situation in 2013 and 2014 is identical to the one presented in Tables 3 and 4, above.

Households will observe an annual income increase of US\$152.47 for the period between 2015 and 2022. Figures are presented in Table 5, below.

Table 5. Annual Income Increase at the Household Level Due to Intervention (US\$)

Year	Net cash flow
2012	143.89
2013	144.03
2014	144.15
2015–2022	152.47

Such a situation suggests that the main goals of the GRAD project will be met if this intervention is implemented. The income level and the food security of the households engaged in this intervention will increase. The analysis reveals that the households will also build sufficient financial resources to continue the fattening operation after 2015 even without support from MFIs.

Economic Analysis

Differences between the financial and economic outcomes are due to the fact that the financial values do not include all externalities that are present in the economy (e.g., government, labor externalities, etc.) that this project will change. To show the proposed intervention's true economic impact on the Ethiopian economy, 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 its economic value.⁸

The difference between financial and economic outcomes of the project arises because of a number of factors:

- The proposed intervention is designed to increase meat production. Meat is an exportable commodity, which benefits the Ethiopian economy by bringing an estimated 6.5 percent FEP into the country (Kuo, 2011). This FEP of 6.5 percent means that every incremental dollar earned on exports has an economic value of 1.065 dollars. If there are no other

⁸ The list of CFs used for the purpose of this analysis is presented in Table B in the appendix. The FEP for Ethiopia has been calculated as 6.5 percent.

distortions, this means that every incremental kilogram of meat produced should be attributed with a positive externality of 6.5 percent. Significant transportation costs are incurred, however, when meat is exported from the country. Because of the high tariffs assessed on almost on all imports in Ethiopia, the financial cost of the transportation is much higher than its true cost to the economy. This variable also adds to the difference between financial and economic outcomes. The total difference between the financial value of shoats and their true economic value is almost 10 percent.

- The financial values of other inputs used for shoat fattening, such as salt and veterinary costs as well as labor wages, differ from the true economic values.

Table 6 (Table 16 of the model) is presented below.

Table 6. Resource Flow Statement – Economy Point of View, Real ETB

Line Items	CF	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	PV
	Receipts												
Revenue from livestock sales	1.10	15,904.82	15,904.82	15,904.82	15,904.82	15,904.82	15,904.82	15,904.82	15,904.82	15,904.82	15,904.82	0.00	100,649.65
Loan Disbursement	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Cash Inflow		15,904.82	15,904.82	15,904.82	15,904.82	15,904.82	15,904.82	15,904.82	15,904.82	15,904.82	15,904.82	0.00	100,649.65
	Expenditures												
Operating Cost													
Livestock Cost	1.10	9,940.51	9,940.51	9,940.51	9,940.51	9,940.51	9,940.51	9,940.51	9,940.51	9,940.51	9,940.51	0.00	62,906.03
Roughage	1.00	420.00	420.00	420.00	420.00	420.00	420.00	420.00	420.00	420.00	420.00	0.00	2,657.86
Concentrate (industrial by-products)	1.00	270.00	270.00	270.00	270.00	270.00	270.00	270.00	270.00	270.00	270.00	0.00	1,708.63
Acacia pod	1.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	0.00	759.39
Sweet Potato Vines	1.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	0.00	759.39
Salt	0.76	343.12	343.12	343.12	343.12	343.12	343.12	343.12	343.12	343.12	343.12	0.00	2,171.34
Anti-worm drugs	1.07	153.36	153.36	153.36	153.36	153.36	153.36	153.36	153.36	153.36	153.36	0.00	970.50
Labor Cost ETB/round	1.00	1,012.50	1,012.50	1,012.50	1,012.50	1,012.50	1,012.50	1,012.50	1,012.50	1,012.50	1,012.50	0.00	6,407.35
Cost of Livestock Mortality	1.10	198.81	198.81	198.81	198.81	198.81	198.81	198.81	198.81	198.81	198.81	0.00	1,258.12
Feeding Sunk Cost	0.87	13.32	13.32	13.32	13.32	13.32	13.32	13.32	13.32	13.32	13.32	0.00	84.29
Loan Repayment	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
Total Outflows		12,591.62	12,591.62	12,591.62	12,591.62	12,591.62	12,591.62	12,591.62	12,591.62	12,591.62	12,591.62	0.00	79,682.91
Net Cash Flows		3,313.20	3,313.20	3,313.20	3,313.20	3,313.20	3,313.20	3,313.20	3,313.20	3,313.20	3,313.20	0.00	20,966.74
Net Cash Flows, real USD		189.33	189.33	189.33	189.33	189.33	189.33	189.33	189.33	189.33	189.33	0.00	1,198.10
NPV @12% discount rate ETB	20,967												
NPV @12% discount rate \$US	1,198.10												

Thus, the distortion-adjusted net resource flows, when discounted by 12 percent using real EOCK for Ethiopia, yields an ENPV of 20,967 ETB (US\$1,198.10)/household.

STAKEHOLDER AND BENEFICIARY ANALYSIS

A surplus is also created in the economy by employing capital, land, and labor and paying financial prices for these inputs that are greater than the value of their opportunity costs. The GRAD interventions yield three groups of beneficiaries: the households engaged in shoat fattening, the government of Ethiopia, and MFIs.

The FNPV represents the benefits accruing to the households. According to this analysis, it has a positive value of US\$942.13/household.

The financial contributions presented in Table 7, below, refer to the present value of the revenue earned by the MFI/household over the 3-year period (assuming that three consequent loans will be provided to the household). The reason for such small revenue is the subsidized interest rates on the loans. It is important to note that such a low interest rate is only possible due to USAID's support. MFIs will benefit from the funds transferred by USAID in the form of the loan guarantee fund. In the absence of this support, MFIs would be faced with a net loss, because the additional revenue of US\$22.75/household over 3 years is unlikely to cover operational costs as well as the default risk on the loans. This situation is likely to result in an immediate increase in interest rates on the loans after the completion of GRAD project, unless new government or donor support is not secured.

The Ethiopian government benefits from the additional inflow of taxes that accrues directly through the taxation of inputs purchased by the households and indirectly because of the FEP accruing on the project's foreign exchange earnings. 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 under each of the interventions are presented in Table 7, below:

Table 7. Stakeholder and Beneficiary Impacts of Project (in US\$/Household)

Economic NPV (FNPV + externalities)	1,198.10
• Financial NPV (households)	942.13
• Externalities	255.97
○ Government	233.22
○ Financing contribution	22.75

GRAD MEAT VALUE CHAIN AGGREGATED RESULTS

As of October 11, 2013, implementers of the GRAD project have transferred approximately US\$2.12 million to the MFIs via the loan guarantee fund. These funds not only act as a backup mechanism to cover MFIs' losses from defaulted loans but fully utilize to provide loans to the GRAD benefiting households. The total amount of MFI funds utilized by the GRAD project has already reached US\$5.02 million, and the total GRAD fund available for loan disbursement is US\$7.13 million. The mean loan size available for disbursement to each household is US\$228.57; therefore, as of now, 31,203 households have already received loans from the GRAD project. This analysis assumes that 20 percent of these households represent units benefiting from the shoat-fattening intervention. Therefore, the total number of benefiting households is estimated at 6,241.

The ENPV of the shoat-fattening intervention, discounted at 12 percent EOCK, is equal to US\$9.00 million at the country level. The present value of the total benefits realized by 6,241 households is estimated at US\$7.4 million over 10 years. The government of Ethiopia will benefit by US\$1.46 million. The present value of MFIs' revenue, using the discounted rate of 12 percent, is US\$142,000 over 3 years.

These figures represent the GRAD project's countrywide achievement up to date. However, these figures are expected to climb higher by the end of the project. The total amount of financial resources available for loan disbursement is expected to increase through three channels:

1. Additional transfers of funds from the GRAD project
2. Additional involvement of MFI funding
3. GRAD beneficiaries' savings⁹

Table 8, below, presents a countrywide economy resource-flow statement for the GRAD project.

⁹ The targeted households are make a 10 percent (of the size of the loan) up-front saving. These funds are also used to distribute loans to other beneficiaries.

Table 8. Countrywide Economy Resource-Flow Statement (Real ETB Mill)

[illegible]

SENSITIVITY ANALYSIS

A sensitivity analysis for the GRAD shoat-fattening intervention has been performed using key variables that are prone to change and therefore likely to influence the situation of the households engaged in the project. These variables include the purchase and selling prices of shoats, the price of concentrate feed/industrial by-products, and the amount of concentrate feed/industrial by-products required per fattening round. Details related to this sensitivity analysis are outlined in Tables 9 and 10, below.

Table 9 presents the results of sensitivity analysis that have been calculated based on the purchase and selling prices of animals (jointly). With an assumed purchase price of 500.00 ETB/shoat and an assumed sale price of 800.00 ETB/shoat, which were used in the financial analysis discussed previously, the FNPV is positive, at US\$942.13. The sensitivity analysis yields positive values for the FNPV for the whole range of tested values unless the initial purchase price is 600.00 ETB/shoat and the sale price of the animal decreases to 750 ETB/shoat or lower. At a selling price of 900 ETB/shoat and a purchase price of 400 ETB/shoat (best-case scenario), the FNPV per household is equal to US\$2,253.41. Given the current level of population growth in Ethiopia and the associated high domestic demand in the meat sector coupled with the existing low livestock productivity level, however, it is unlikely that the purchase price of shoats will be lower than 500.00 ETB/shoat.

Table 9. The Joint Impact of Purchase and Selling Prices of Shoats on the FNPV/household (US\$)

SELLING PRICE	PURCHASE PRICE				
	400	450	500	550	600
700	958.09	630.33	303.05	-24.23	-351.50
750	1,281.49	950.11	622.43	295.16	-32.12
800	1,604.89	1,273.51	942.13	614.54	287.26
850	1,928.29	1,596.91	1,265.53	934.15	606.64
900	2,253.41	1,920.31	1,588.93	1,257.55	926.17

Table 10, below, presents a sensitivity analysis for the FNPV that has been calculated based on the joint impact of the concentrate/industrial by-product requirements per round and the shoats' final sale price. The current study assumes that the concentrate/industrial by-products will be fed to animals only in the periods of January to March and April to June. Under the assumed scenario, with the concentrate/industrial by-products requirements at 15.00 kg/round and the sale price of the shoats at 800.00 ETB/shoat, the FNPV is positive, at US\$942.13/household. If the concentrate/industrial by-product requirements decrease to 12.50 kg/round (subject to the availability of cheap substitutes that are able to provide the same level of nutrition) and the selling price increases to 900 ETB/shoat (best-case scenario), the FNPV will reach US\$1,605.37/household. The sensitivity analysis did not yield a negative FNPV within the tested range of values.

Table 10. Joint Impact of Selling Price of Livestock and Concentrate/By-product Requirements on FNPV/Household (US\$)

CONCENTRATE REQUIREMENTS (JAN–MAR)					
SELLING PRICE	12.50	15.00	30.00	40.00	50.00
700	319.18	303.05	206.31	141.81	77.32
750	638.56	622.43	525.69	461.19	396.70
800	958.57	942.13	845.07	780.57	716.08
850	1,281.97	1,265.53	1,166.92	1,101.18	1,035.46
900	1,605.37	1,588.93	1,490.32	1,424.58	1,358.83

RECOMMENDATIONS

The CBA of the proposed shoat-fattening intervention a positive FNPV, which suggests that the benefits of implementing such an intervention will outweigh the costs. The ENPV of the project, discounted at a 12 percent EOCK, is also positive. Therefore, the shoat-fattening intervention does meet USAID's requirements for implementation.

The participating households eventually will be able to repay their loan obligations related to the financing of the investments for shoat fattening. More importantly, the analysis reveals that by the end of 2015, the households will have sufficient financial resources to continue these fattening activities without obtaining loans from MFIs. This important finding suggests that one of the GRAD project's main objectives—to develop financial stability at the household level—will be achieved.

The GRAD project allowed not only to minimize risk premium factor on the loans faced by MFIs (which by default is very high, because the main beneficiaries are food-insecure households) but to reduce the interest rate below the average inflation rate in Ethiopia. Hence, MFIs after the end of the GRAD project (December 2016) are likely to increase interest rates, unless a new donor or government support is secured.

The analysis also reveals that the current loan structure will impose additional difficulties for their successful repayment. A semiannual loan structure implies two equal principle repayments every 6 months. Each household will need to purchase inputs for production at the end of each fattening round. They will have sufficient cash flow to cover 100 percent of the second half of the loan principle and corresponding interest from the livestock sales revenue, because they will receive a subsequent loan at the beginning of the next year to purchase the inputs needed for production. However, the first scheduled loan repayment (50 percent of the principle and interest accrued) will force the households either to reduce the scale of production for the consequent fattening period or default on the loan. It is recommended that the loan repayment schedule be restructured to allow the households to make three principle repayments. The first two repayments should not exceed 20 percent of the loan principle plus interest. The remaining 60 percent of the principle plus corresponding interest should be paid at the end of the year. The GRAD "Quarterly Narrative Report" reported a loan repayment rate of 70 percent, which may improve if the loan repayment schedule is adjusted, as recommended above, to be more consistent with the fattening calendar.

The GRAD project's goal of graduating chronically food-insecure households by increasing their yearly income by US\$365.00/per household/per year within 3 years after they start receiving support from the project cannot be achieved by solely implementing the shoat-fattening intervention. However, the shoat-fattening activity complements additional activities for households engaged in other GRAD value chains, particularly crop-production activities, because post-harvest crop residues can be used to feed the animals.

This intervention would also benefit landless households, who are not able to participate in other production-based GRAD interventions. The total income increase for this group of households will be lower, because they will need to purchase more feed for the animals unless they have access to free-grazing areas.

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APPENDIX

Summary of Conversion Factors Used for Economic Analysis of the Intervention in Shoa Fattening in the GRAD Meat Value Chain

<i>Summary of Conversion Factors</i>	
Livestock	1.10
Roughage	1.00
Concentrate (industrial by-products)	1.00
Acacia pod	1.00
Sweet Potato Vines	1.00
Salt	0.76
Anti-worm drugs	1.07
Labor Cost ETB/round	1.00
Cost of Livestock Mortality	1.10
Feeding Sunk Cost	0.87