

COST-BENEFIT ANALYSIS OF SMALL RUMINANTS FATTENING WITH FEED CONCENTRATES IN THE HIGHLANDS OF ETHIOPIA

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Abstract

Ethiopia is characterized by the high cost and poor access or inaccessibility of livestock feed concentrates. The producers of the concentrates operating in the market claim that the limited demand for their products prevents the expansion of the sector. A very limited research has been made to determine whether the benefits from concentrate feed, i.e. higher weight gains, allow outweigh the high feeding cost to livestock producers. This study is financial and economic cost-benefit analysis to determine the feasibility of a small scale lambs and kids fattening exercise using concentrate feed. The study revealed that this livestock fattening activity produces results a negative net present value for the households. An incentive does not exist to use the concentrate feed. These findings explain the low demand for such feed by the rural households. A sensitivity analysis is used to test the range of feed prices that would enable the farmers to use it profitably. A distributive analysis shows that the government of the country would be the main beneficiary of the increased concentrate feed adoption. These benefits would come from the increased meat exports, i.e. increased foreign exchange earnings and taxes.

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

JEL Classification: 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
EOCK	Economic Opportunity Cost of Capital
ETB	Ethiopian Birr (Currency)
FEP	Foreign Exchange Premium
GRAD	Graduation With Resilience to Achieve Sustainable Development
FtF	Feed the Future (Program)
GDP	Gross Domestic Product
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
REST	Relief Society of Tigray
QDSCR	Quarterly Debt Service Coverage Ratio
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: USAID Ethiopia in 2012 started to implement the GRAD (Graduation with Resilience to Achieve Sustainable Development) project. The project has lifetime of 5 years and will be implemented 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, 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.

To facilitate the proper implementation of the project and the flow of necessary financial resources for the targeted households, USAID established a US\$2-million loan guarantee fund that will be available to lending institutions, microfinance institutions (MFI), and rural savings and credit cooperatives (RUSACCO) in order for these institutions to supply the necessary loans to the targeted households for undertaking the GRAD interventions.

Strategic Context and Rationale: The USAID Ethiopia GRAD project is part of the wider strategy of Feed the Future (FtF), which supports investments in viable and potentially easy to engage in and profit from agricultural value chains. There are four value chains selected. These value chains include honey, meat, vegetables and pulses. Interventions in these four value chains are proposed for implementation by the GRAD selected woredas.

The intervention suggested for the meat value chain proposes the fattening of shoats.¹ This specific intervention was chosen because it doesn't require much specific knowledge to be implemented at the household level. In addition the initial costs related to the intervention and the additional labour requirements at the household level are relatively low. Therefore this intervention is applicable for the GRAD chronically food insecure households.

Financial and Economic Analysis Results: The basic assumption in this analysis is that GRAD households will have four rounds of shoats fattening per year. They will receive a loan sufficient to purchase four heads of small ruminants in year one. After repayment of the loan at the end of the year households will have access to a new loan sufficient to purchase five and six small ruminants in the second and third year of the project respectively. In total the households would be given three loans during the three year period. Households will have to repay the loans semi-annually, with the first round (3 moths) being a grace period.

The analysis is carried out over the eleven years period. It shows that the case of shoats fattening yields a negative financial net present value (FNPV) of -846.70 US\$. The economic net present value (ENPV) is also negative with value of -340.69 US\$. The difference between financial and economic outcomes of the project due to the fact that the financial values don't include all externalities presented in the project. In the case of shoats fattening such significant differences are present because of two factors:

- Shoats are both input and output items of the project. The financial cost of shoats is almost 10 percent less than the true economic cost.
- The financial values of other inputs used for the shoats fattening, such as feed and veterinary expenses, as well as labor wages are different from their true economic values.

¹ Shoats is local terminology used to define sheep and goats.

The analysis shows that upon the implementation of the intervention these chronically food insecure households would observe a decrease in their yearly income of -90.02 US\$/per household/per year from the year 2015 till the end of the project. For the first three years (2012 – 2015) net cash flows is even lower, due to necessity of the loan repayments.

Beneficiary Analysis Results: The results of the analysis revealed that there will be no increase in the income of targeted households. Households may instead occur a loss and stop the activity. Household's net loss is estimated to be US\$846.70 over the eleven years. Another two groups of beneficiaries are government and labour:

- Government will benefit directly from the taxes collected on the inputs and outputs of the shoats fattening intervention. The indirect benefits to the government will arise because meat is exported from Ethiopia, which allows country to earn foreign exchange premium. The total amount of government benefits from the intervention over the eleven years period is estimated to be US\$338.93.
- The households/labor will additionally benefit by the US\$117.21. The benefit is created because the economic opportunity cost of labor is estimated to be 15 percent less than the wage rate used in the financial analysis. Adding this labor benefit to the household's financial negative position, yields a net loss of US\$ 729.49 per participating household.

Conclusions and Recommendations: The CBA analysis of the intervention in shoats fattening shows a negative FNPV, which suggests that the costs of the implementation of such intervention will outweigh the benefits. The households won't be able to repay their loan obligations related to the financing of the investments for shoats fattening. Instead of the expected increase in their yearly income they would experience a decrease in income.

It is possible that GRAD households may have one or two profitable rounds of fattening each year if they are tied to the crop harvesting period, when crop residues can be used as a source of livestock feed. Such production might give the households additional income per year, but this income will be much below US\$365. The assumption that households will have four rounds/year cannot be outstated together with the assumption that feed source used will be the crop residues. An intensive production system (4 rounds/year) the households will need to use a commercial feeding system.

The Government of Ethiopia will be the main beneficiary through increased taxes from this intervention, if it will take place. The estimated present value of a US\$338.93 would arise if GRAD households were to participate in the unprofitable activity for eleven years. This clearly will not take place.

The GRAD project's goal that aims to graduate chronically food insecure households by increasing their yearly income by 365.00 US\$/per household/per year, within three years after the households will start receiving support from the project, cannot be achieved by the implementation of the intervention for shoats fattening. Therefore it is recommended to remove this intervention from the USAID sponsored FtF GRAD project agenda.

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%. Ethiopia, however, is still one of the poorest countries in the world. Currently about 8 million Ethiopians out of the total population of 93 million² live in chronic food insecurity (The World Factbook, CIA). Each year, between June and October more than 60% 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 Mission Ethiopia supports various initiatives to increase food security for Ethiopia's most vulnerable inhabitants.

The GRAD (Graduation with Resilience to Achieve Sustainable Development) project is part of the USAID broader Feed the Future (FtF) agenda. It focuses on a group of initiatives that have been specifically developed to support chronically food insecure Ethiopian households.³

The GRAD project specifically aims to target 65,000 households that were previous recipients of support from the PSNP (Productive Safety Net Program). The 58,500 households that are categorized as chronically food insecure are combined with 6,500 households that are classified as "Ultra Poor" (landless youth and female headed households) to form the primary target of the GRAD project. 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 target 65,000 households the GRAD project aims to progressively graduate 50,000 (77% 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 crops production with small landholdings. They lack financial services, and also proper market information for the outputs they produce.

The families targeted in this project are located in 16 woredas within Ethiopia.⁴ The project's woredas were selected on the basis of this 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).

A special emphasis in the GRAD project is put on gender equality and women inclusion. The GRAD project considers women to be a sub-target group, which translates into developing interventions to address their specific needs and roles in the society.

² As per CIA estimation from July 2012.

³ Food security is defined as access to sufficient food by all members of the household for an active and healthy lifestyle in normal or moderately bad year (as per GRAD Technical Proposal, 2011).

⁴ The full list of selected woredas and commodities is presented in Table A in the appendix.

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.

To facilitate the implementation of the GRAD project the USAID will establish a loan guarantee fund of 2 million US\$. The main rationale behind the establishment of this fund is the idea that Microfinance Institutions (MFI) and Rural Saving and Credit Cooperatives (RUSACCO) that will be lending to the GRAD targeted households will need to have access 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 micro lending.

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.

To ensure monitoring and evaluation of expected achievements in the GRAD project, a set of key indicators aligned with the FtF has been proposed (see Table B in the appendix).

Commodity Background

Current Situation in the Ethiopian Livestock Production

Ethiopian farmers have had a long tradition of animal husbandry. It is estimated that Ethiopia possesses the largest number of livestock in Africa. It is composed of about 59 million cattle, 35 million sheep and 31 million goats (Negassa, Rashid and Gebremedhin, 2011). Given the population of Ethiopia, of 93 million people, the per capita livestock holding is still very low about 1.3 animals per capita. The livestock holdings per capita in Kenya, for example, is 1.43 animal/capita. The number of livestock at the smallholder level also remains low. The majority of smallholders in Ethiopia are engaged in some sort of animal husbandry, but they usually don't specialize in any branch of the livestock production. Ethiopia's small-scale farmers, including those who are chronically food insecure, treat their livestock as a resource that yields multiple benefits, including:

- Additional cash income that comes from the sales of live animals, wool or hides/skins,
- Natural fertilizer resource (manure),
- Food: milk and meat,
- a risk management and safety net resource when drought or crop failure occurs (a “walking bank”);and
- a hedge against inflation (a wealth accumulation resource in absence of available financial institutions, a “walking saving account”).

Main Obstacles in the Ethiopian Livestock Production

Ethiopia has the lowest livestock productivity of the least developed countries and one of the lowest in the world. (Negassa, Rashid and Gebremedhin, 2011). There is not much specialization in the livestock sector, which lowers its productivity potential. Any observed productivity growth happens because of increases in the total number of animals, not because of increases in the efficiency of livestock production. The commercial off-

take rate is only about 8 percent for Ethiopia. Such off-take rate indicates that household keep animals for other purposes (prestige, social status, liquid investment) but not for sale.

The majority (about 60%) of the Ethiopian small-scale livestock producers use green fodder as a main source of livestock's feed. Some supplement it with the crop residues available on their farms. The use of animal feed mixes (oilseed cakes, wheat bran, etc) is still very low. There exists significant regional productivity differences as well as productivity differences between various livestock breeds. Ethiopian small-scale farmers cater their livestock production largely to the domestic markets. The majority of sales are made in the local markets usually without establishment of advanced contractual agreements (Negassa, Rashid and Gebremedhin, 2011).

Several factors influence the low livestock productivity status quo in Ethiopia:

1. Livestock feed and water shortages

- Overgrazing and reduction in grazing areas due to land fragmentation caused by increasing population and a growing number of livestock
- Inconsistent quality of feed mixes (Ethiopia experiences problems with feed adulteration with such things as weed seeds, and animal droppings that degrade the nutritional value of feed mixes and can also negatively influence the livestock's health)
- Inadequate commercial feed supply (Of the 15 animal feed mixers in Ethiopia and only 5 of them produce for the market. The other 10 produce feed mainly for their own feedlots)
- Erratic weather patterns that cause droughts and reduce water availability,
- Improper policies in the water management. (For example: coffee producers in some areas overuse water resources and diminish water availability for the small scale farmers)
- Lack of awareness and skills in feed conservation (such as no production of silage, poor storage facilities)

2. Diseases combined with weak or not available veterinary services

- Most frequently observed diseases in sheep and goats: pneumonia, Contagious Caprine Pleuropneumonia, Ecthyma, Caseous Lymphadenitis and Brucellosis.
- High prices for veterinary services and lack of availability and accessibility.
- Poor access to modern animal medicines (unavailable supply).
- Widespread use of traditional, methods (herbs, medicinal plants) that is much less effective than commercial medicine, if at all.

3. Predators and parasites

- The main livestock predators in Ethiopia are leopards, hyenas and monkeys.
- Parasitic problems include ticks, mites, lice and insect flies – that cause livestock weight losses and negatively interfere with the overall health of animals.

4. Poor market information and lack of marketing outlets

- Season specific demand for livestock and livestock that generate quality requirements that vary throughout the year.
- Livestock price estimations are done by “eye-balling” of weight without use of scales.
- Small-scale livestock producers depend on price information from traders. This tends to exert downward pressures on prices if any collusion exists from the area traders.

5. Poor livestock feeding and management at farm level due to lack of trainings and financial resources to obtain improved livestock feed.

- The majority of Ethiopian farmers don't possess modern knowledge on livestock nutritional requirements. They practice traditional feeding methods using leftover crops residues and available grass. Such systems allow households to keep animals for a long period of time (until they face the need to sell the animal) without investing financial resources. Although such system produces benefits for the farmers, it is not the one proposed as a GRAD intervention.
- Low productivity of hay, absence of knowledge for silage production and insignificant use of commercial feed, due to high prices and unavailability, add to the problem.

6. Low level of specialization in the livestock sector.

- Ethiopian households normally don't specialize in the meat production. Instead they pursue traditional animal husbandry.

Ethiopian Meat Consumption

The annual meat consumption per capita in Ethiopia is currently very low. For urban areas, it is about 7kg of meat per person annually, while in rural areas it is just 2kg/person/year. The meat consumption usually increases during the religious holidays and falls afterwards. The peak meat – consumption periods are: Easter, Christmas, Meskel, Ed Al fetir and Arafa. During that time the demand for and supply of livestock in the market is high (Gemedu, 2009).

Nevertheless, with steadily growing population and increasing per capita income, Ethiopia's demand for meat is expected to increase and thus opportunities are developing for investments in the livestock sector. For such opportunities to work out, the commercial feed sector needs to be developed and efficiencies achieved (along with change in trade policies). This will lower the prices of the key inputs.

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 commercial feeding system. This intervention is planned for all woredas included in the GRAD project (unlike the interventions in other GRAD value chains that require specific location e.g.: proximity of water resource in 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.

The details of the planned GRAD intervention in fattening shoats are outlined in Table 1 below.

Table 1. GRAD Interventions in the Livestock (Meat) Value Chain.

	Intervention
	Shoats fattening
Quantity of animals per one round, Year 1	4-5 ⁵
Quantity of animals per one round, Year 2	5-6
Quantity of animals per one round, Year 3	6-7
Fattening period	3 months
Fattening rounds	4 per year

*As per SNV GRAD investment plan form July 31, 2012.

⁵ For the first year generally it is assumed that household will buy 4 shoats.

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

1. The GRAD targeted chronically food insecure households will have a choice regarding which animal they will be fattening (goats or sheep or both). The intervention in shoats fattening will be introduced in the following woredas: Hawale Tula, Mareko and Loka Abaya (SNNPR), Lay Gayint (Amhara) and Zeway Dugda, Arsi Negele, Shalla and Adami Tulu (Oromia).
2. The purchase of both types of animals will be pursued during the non- holiday periods when the prices of livestock tend to be lower. In addition, the animals that will be purchased will be healthy, with no visible defects and they will be 7 months – 2 years old with weight: 15-20kg/animal.
3. Average fattening period for shoats is established at 90 days. After that period the households will sell fattened shoats and buy new animals for the next round of fattening. During one calendar year, four rounds of shoats fattening are possible.
4. Calculation of feed cost was based on assumption that small ruminants will be able to gain up to 150 grams per day. Much of the feed used is to be purchased commercially.
5. The cost of feed required for the weight gain was calculated based on the current market prices and adequate feed requirements.
6. The assumption that main source of feed will come from whatever is available around the house, was rejected. It is over optimistic to assume weight gain of 250 grams/day⁶ under such feeding system. In addition, crop residues and good quantity of grass is not available around the house throughout a year.
7. To participate in this intervention the targeted households will obtain a loan for the initial purchase of animals. The level of this initial loan will be set to allow the initial purchase of 4 shoats. The household engaged in the shoats fattening, for the first year of fattening will need to borrow 4,309.53ETB to purchase 4 shoats with necessary inputs for their fattening (animal feed and vet services). The loan necessary for the second and third year of shoats fattening is at the level of 6456.79 ETB and 9291.18 ETB, respectively.
8. The total value of the initial loan includes costs associated with borrowing: service charge (1%), insurance (1%), Pass Book fee (15.00 ETB) and upfront savings (10%). The loan will be given for one year with bi-annual repayment schedule. The repayment schedule will be aligned with seasonality of fattening activities and will be somewhat flexible. The financing institution will take under consideration special circumstances such as when prices of livestock fall making it difficult to fetch a good price for fattened animals, In addition farmers will be allowed to pay with a delay to fetch a higher price when market price goes up. The interest rate on the loan is established at the level of 15%. It is a subsidized level of interest negotiated for the purpose of financing the investment needed for the GRAD interventions.
9. For the purpose of this analysis the following macro level assumptions are made: domestic inflation is 20%, the US inflation rate is 2.5%, the real financial discount rate is 12%, economic real discount rate is 12%, the foreign exchange premium (FEP) is 6.5%, Exchange rate in 2012 is 1 USD= 17.50 ETB, land tax is 85.00 ETB/year. The Microfinance Institutions charge a nominal interest rate of 18%, the nominal market interest rate is 48%.

⁶ Assumption from SNV GRAD investment plan.

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 2 below.

Table 2. Parameters Used in the CBA Analysis of the GRAD Meat Value Chain.⁷

Average Fattening period (days)	90
Number of rounds per year	4
Number of animals per round (shoats)	
Year 1	4
Year 2	5
Year 3	6
Year 4	6
Input Cost ETB/animal	
Cost of shoat	500.00
Feeding Cost ETB/kg	
Roughage	1.00
Ground corn grain	7.20
Wheat bran	4.00
Noug Seed Cake	3.00
Haricot Beans	5.00
Salt	5.00
Feeding Requirements	
kg/round/animal	
Roughage	54.00
Ground corn grain	45.00
Wheat bran	6.30
Noug Seed Cake	6.30
Haricot Beans	6.30
Salt	1.00
Labor requirements	
Time required hours/day	2.00
Working Day	8.00
Labor Cost ETB/day	25.00
Full Labor days/round	22.50
Veterinary Services	
ETB/round/animal	
Anti-worm drugs	8.00
Losses due to Livestock Diseases	
Mortality Rate	2%
Feeding Sunk Cost	1%
Selling Price ETB/animal	
Selling Price of fatten Shoats	1000.00
ETB/animal	

⁷ The values of parameters were based on the SNV proposal and field interviews pursued in July 2012 in SNNPR and Oromia.

The main indicator of the success of the intervention in the GRAD shoats fattening intervention will be the ability of households involved in the livestock fattening to achieve the planned increase in their annual income of US\$ 365.00 at 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 MODELLING

The financial and economic feasibility of the GRAD shoats 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 is carried out for an eleven years’ 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 financial net present value (FNPV) of the project.

The cash flows statements in the financial analysis have been constructed from the viewpoint of: the total Investment/Project and Equity’s/Household’s Point of view. Cash flow statements presented in both nominal and real terms for “without”, “with” and incremental basis .

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

INTERVENTION

The purpose of this modeling exercise is to estimate the net benefit of a USAID intervention in shoats fattening and to estimate the impact of this intervention on the income of the households. Shoats fattening is suitable for those who already engaged in the activity as well as for those who didn’t practice it before. It is necessary to estimate the benefits of the intervention on an incremental basis. Then need to distinguish between what would be earned by the household in its existing practice as opposed to what would be earned due to the intervention. The shoats fattening intervention, allows farmers either to increase scale of their existing activity or, for those who didn’t practice fattening before, participate in a new activity. Those there is no difference between the benefits arising to these two different groups of the participants. This intervention does not affect other activities of the farmers.

INTERVENTION SCENARIO

The proposed intervention will allow farmers to obtain funds required to purchase and consequent fatten of shoats. It is assumed that such a small quantity of animals can be kept on marginal land, so there is no land cost associated with intervention. The details of the expenditures and incomes “with” intervention scenario are as follows:

Income: The income for the family is the value of the fatten animals at the end of the fattening period/round of three month. It is expected that shoats will be sold at the holidays period that will allow to get some premium over the usual price. The selling price is assumed to be 1,000 ETB per shoa. This price 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 shoats 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 in order to minimize financial costs. Shoats usually sold later, when household faces a need for cash. Such a system will not allow households to have a stable source of income from this activity. The intervention scenario is to have four rounds of shoats fattening per year, with a feed supply adequate for the animals to gain up to 150 grams of live weight per day.⁸ The per kilogram cost of feed together with quantity of feed required per animal per round is presented in Table 2 above.

PREPARATORY TABLES

In the CBA model, tables 3 to 8 are preparatory information about shoats fattening intervention, required loans and projected incomes and expenditures related to the project analysis.

Table 3 contains the projected nominal costs of fattening intervention inputs, such as the cost of feed, not fatten shoats, anti-worm drugs and labor. Costs are presented per one animal per fattening period (3 month). Nominal values are calculated by adjustment of present cost over corresponding price index.

Table 4 presents the required amount of loans, for the years 2012, 2013 and 2014, to purchase live animals together with all other inputs of the production. Total loan amount in each of the years also includes charges collected by Micro Finance Institutions (MFIs), when they provide loan to the household. Such charges are a service charge of 1 percent, an insurance of 1 percent, a pass book fee of 15 ETB and a upfront saving of 10 percent. The amount of upfront savings is returned to the household upon the loan repayment.

Table 5 calculates the scheduled debt service on the loans at the subsidized interest rate of 15 percent. It is assumed that households have one round (three month) of grace period. They will pay only the accrued interest rate at the end of the second round. Households will have to repay half of the loan principal together with interest occurred at the end of the round three. Eventually farmers will repay the rest of the loan and interest occurred at the end of the round four, which is also the end of the year.⁹

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

Table 7 presents the nominal costs associated with shoats fattening. The top three ranking cost items are purchase of the non – fatten shoats, ground corn feed and the opportunity cost of the labor. Their relative shares of cost, for the round one in the year 2012, are 45, 29 and 11 percent respectively. Any real decrease/increase in the price of non – fatten animals will not change the situation, because the price of meat will proportionally change for both non – fatten as well as fatten animals. The second main cost item, which is ground corn, is the one that actually determines the profitability of the intervention. A decrease in the price or the quantity required or the ability of farmers to substitute it with a cheaper option that can provide the same nutrition, may change activity from being unprofitable to a profitable one.

FINANCIAL ANALYSIS

Table 8 of the model depicts the cash flow statement from the total investment or project point of view in nominal values. This is necessity to examine if households will be able to repay loan. The resulted net cash flows are later used in Table 9 to derive Quarterly Debt Service Coverage Ratios (QDSCR). The net cash flows are negative throughout the project life, indicating that farmers will occur losses instead of profit. The only

⁸ SNV assumption. The GRAD investment plan assumed a live weight gain equal to 250 grams/day. This appears to be overoptimistic.

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

positive net cash flow will happen during the last round of the fattening in year 2022. During this period there are no costs but only income from the previously fatten animals.

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 secured. It takes into account all financial benefits and costs of the project in order to determine the financial feasibility of the project, the need for loans and the likelihood of repayment on loan and interest.

Table 14 is a 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 repayment 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 is estimated at -14,817 ETB or -846.70 USD with discount rate of 12 percent. The intervention definitely does not pass the USAID test of 12 percent real discount rate for funding. These results are presented in Table 3 below:

Table 3: Annual Cash Flow Statement – Equity point of view, Real ETB

Line Items	Year<<<<	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	PV
<u>Receipts</u>													
Revenue from livestock sales		12000.00	19000.00	23000.00	24000.00	24000.00	24000.00	24000.00	24000.00	24000.00	24000.00	6000.00	136548.35
Loan		3824.40	4793.00	5751.60									12699.00
<u>Expenditures</u>													
Operating Cost													
Purchase price of livestock		8000.00	10000.00	12000.00	12000.00	12000.00	12000.00	12000.00	12000.00	12000.00	12000.00	0.00	70153.28
Roughage		864.00	1080.00	1296.00	1296.00	1296.00	1296.00	1296.00	1296.00	1296.00	1296.00	0.00	7576.55
Ground corn grain		5184.00	6480.00	7776.00	7776.00	7776.00	7776.00	7776.00	7776.00	7776.00	7776.00	0.00	45459.33
Wheat bran		403.20	504.00	604.80	604.80	604.80	604.80	604.80	604.80	604.80	604.80	0.00	3535.73
Noug seed cake		302.40	378.00	453.60	453.60	453.60	453.60	453.60	453.60	453.60	453.60	0.00	2651.79
Haricot Beans		504.00	630.00	756.00	756.00	756.00	756.00	756.00	756.00	756.00	756.00	0.00	4419.66
Salt		80.00	100.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	0.00	701.53
Anti-warm drugs		128.00	160.00	192.00	192.00	192.00	192.00	192.00	192.00	192.00	192.00	0.00	1122.45
Labor Cost ETB/round		2025.00	2025.00	2025.00	2025.00	2025.00	2025.00	2025.00	2025.00	2025.00	2025.00	0.00	12814.71
Cost of Livestock Mortality		160.00	200.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	0.00	1403.07
Feeding Sunk Cost		74.66	93.32	111.98	111.98	111.98	111.98	111.98	111.98	111.98	111.98	0.00	654.67
Debt Service Repayment		4102.68	5121.92	6141.58									13571.86
Total Outflows		17993.54	21979.24	25965.37	25575.38	25575.38	25575.38	25575.38	25575.38	25575.38	25575.38	0.00	151365.62
Net Cash Flows		-5993.54	-2979.24	-2965.37	-1575.38	-1575.38	-1575.38	-1575.38	-1575.38	-1575.38	-1575.38	6000.00	-14817.27
Net Cash Flows, real USD		-342.49	-170.24	-169.45	-90.02	-90.02	-90.02	-90.02	-90.02	-90.02	-90.02	342.86	-846.70

NPV @12% discount rate	-
ETB	14,817
NPV @12% discount rate	
\$US	-846.70

FINDINGS

Financial Analysis

The financial analysis performed for the shoats fattening intervention in the GRAD meat value chain yields a negative financial net present value (FNPV) from the Equity's point of view of - 846.70 US\$ using a discount rate of 12 percent. This negative value suggests that the project is not sustainable, because over the life of the project the financial costs will outweigh the financial benefits for the target households.

The case against the implementation of the intervention in the shoats fattening is supported by the values of the Quarterly Debt Service Coverage Ratios (QDSCRs). Table 4 below presents the values of the QDSCRs that were calculated for the purpose of this analysis. The QDSCRs are below the value of one, which shows that the households won't be able to repay their financial obligations and they will likely default on the loans obtained for the purpose of fattening shoats.

Table 4. Quarterly Debt Service Coverage Ratios (QDSCRs) for Shoats Fattening.

QDSCR			
Shoats fattening	Year 1	Year 2	Year 3
Round 1	n/a	n/a	n/a
Round 2	0.24	0.24	0.24
Round 3	0.03	0.03	0.03
Round 4	1.12	1.10	1.08

The low QDSCRs for the round 2 and 3 is because the households have to finance purchase of the animals for the next fattening round. During these periods households cannot service their debt obligation in full amount. There is no such necessity in the round 4 because households will finance purchase of new animals by obtaining a new loan. This explains sudden increase in ADSCR for the round 4. The opportunity cost of labor is added back to the households net cash flow for the purpose of QDSCR calculation. The opportunity cost of labor though deducted is retained within the family and can be treated as a cash income for debt servicing. The QDSCR above one in the round 4 indicate that eventually the households may be able to repay full amount of loan, although delaying intermediate payments.

Households will observe annual decrease in income of US\$ 90.02 for the period of 2015 - 2022. Figures are presented in Table 5:

Table 5. Annual income decrease at the household level due to intervention US\$

Year	Net Cash Flow
2012	-342.49
2013	-170.24
2014	-169.45
2015 - 2022	-90.02

Such a situation suggests that the main goals of the GRAD project won't be met if this intervention is implemented. The income level and the food security of the households engaged in

this intervention won't increase. It is possible that GRAD households will obtain the loan to participate in the shoats fattening, but only for the one period just after they harvest their crops. Such system will allow them to feed animals with crops residues and not incur additional financial costs for feed. Such a possibility, if implemented, will allow households to earn some amount of additional income, but only once in a year. The proposed intervention as now defined by GRAD, will require the purchase of feed since the quantity of residues collected after harvesting by GRAD households will not be enough for four fattening rounds. Such an Intervention where the farmers will need to purchase almost all the feed required for fattening, will only cause the financial situation of the households to deteriorate.

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, labour externalities etc.) that are changed by this project. 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.¹⁰

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

- The proposed intervention is designed to increase meat production. Meat is exportable commodity, which benefit economy of Ethiopia by bringing FEP into 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 meat produced should be attributed with the positive externality of 6.5 percent. There is a big transportation cost, however, when meat is exported from the country. Because of the high tariffs almost on all imports in Ethiopia, the financial cost of the transportation is much higher than true cost to the economy. This also adds to the difference between financial and economic outcomes. The total difference between the financial value of shoats and true economic value is almost 10 percent.
- The financial values of other inputs used for the shoats fattening, such as feed and veterinary cost, as well as labour wages are different from the true economic values.

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

¹⁰ The list of CFs used for the purpose of this analysis is presented in table B in the appendix. The foreign exchange premium for Ethiopia has been calculated to be 6.5 percent. The value of the foreign exchange generated is used by the project (Kuo, 2012).

Table 6: Resource Flow Statement – Economy point of view, Real ETB

Line Items	CF	Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	PV
Receipts														
Revenue from livestock sales	1.10		13157.95	20833.42	25219.41	26315.90	26315.90	26315.90	26315.90	26315.90	26315.90	26315.90	6578.98	149,724.73
Expenditures														
Operating Cost														
Purchase price of livestock	1.10		8771.97	10964.96	13157.95	13157.95	13157.95	13157.95	13157.95	13157.95	13157.95	13157.95	0.00	76,922.80
Roughage	1.00		864.00	1080.00	1296.00	1296.00	1296.00	1296.00	1296.00	1296.00	1296.00	1296.00	0.00	7,576.55
Ground corn grain	0.99		5143.22	6429.03	7714.84	7714.84	7714.84	7714.84	7714.84	7714.84	7714.84	7714.84	0.00	45,101.76
Wheat bran	1.09		438.50	548.13	657.75	657.75	657.75	657.75	657.75	657.75	657.75	657.75	0.00	3,845.30
Noug seed cake	1.00		302.40	378.00	453.60	453.60	453.60	453.60	453.60	453.60	453.60	453.60	0.00	2,651.79
Haricot Beans	1.08		544.30	680.37	816.44	816.44	816.44	816.44	816.44	816.44	816.44	816.44	0.00	4,773.02
Salt	0.76		60.72	75.90	91.07	91.07	91.07	91.07	91.07	91.07	91.07	91.07	0.00	532.43
Anti-worm drugs	1.07		136.32	170.40	204.48	204.48	204.48	204.48	204.48	204.48	204.48	204.48	0.00	1,195.41
Labor Cost ETB/round	0.85		1721.25	1721.25	1721.25	1721.25	1721.25	1721.25	1721.25	1721.25	1721.25	1721.25	0.00	10,892.50
Cost of Livestock Mortality	1.10		175.44	219.30	263.16	263.16	263.16	263.16	263.16	263.16	263.16	263.16	0.00	1,538.46
Feeding Sunk Cost	1.00		74.89	93.62	112.34	112.34	112.34	112.34	112.34	112.34	112.34	112.34	0.00	656.76
Total Outflows			18233.01	22360.95	26488.89	26488.89	26488.89	26488.89	26488.89	26488.89	26488.89	26488.89	0.00	155686.78
Net Cash Flows			-5075.06	-1527.53	-1269.48	-172.99	-172.99	-172.99	-172.99	-172.99	-172.99	-172.99	6578.98	-5962.06
Net Cash Flows, real USD			-290.00	-87.29	-72.54	-9.88	-9.88	-9.88	-9.88	-9.88	-9.88	-9.88	375.94	-340.69

NPV @12% discount rate ETB	-5,962
NPV @12% discount rate \$US	340.69

Thus, the distortion adjusted net resource flows, when discounted by the 12 percent real economic opportunity cost of capital for Ethiopia, yields economic net present value (ENPV) of ETB -5,962 or US\$ -340.69.

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 shoats fattening and the Government of Ethiopia with government being the main beneficiary of the intervention. The GRAD households in this case have negative benefits, so they actually bear the cost.

The FNPV plus the labor externality represents the benefits accruing to the households. In this case it has a negative value of US\$ 729.49. The greater economic values are due to additional benefits arising from greater 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 by the lower than market interest rate on the loans through the submarket interest rates and 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.

In the case, such as shoats fattening, when Intervention has negative results, financial contribution will not result on subsidy. In turn repayment of the loan for the project with negative return on capital will only increase negative financial outcome at the farm level.

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) accruing on the foreign exchange earnings of the project. This foreign exchange premium is simply a measure of the increase in indirect tax revenue in the economy that occur 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\$)

Economic NPV (FNPV + Externalities)	-340.69
• Financial NPV (Households)	-846.70
• Externalities	506.01
○ Government	338.93
○ Labor/households	117.21
○ Financing Contribution	49.88

SENSITIVITY ANALYSIS

A Sensitivity analysis for the GRAD shoats – 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 price of shoats, the price of ground corn and the ground corn requirements per round. Details related to the sensitivity analysis are outlined in Tables 8 and 9, below.

Table 8 presents the results of sensitivity analysis that has been calculated based on the purchase and selling price of animals (jointly). Under the assumptions of a purchase price of 500.00 ETB/shoat and sale price of 1000.00 ETB/shoat, which were used at the financial analysis discussed above, the FNPV is negative, at -846.70 US\$. The sensitivity analysis yields positive values for the FNPV if the purchase price is 450.00 ETB/shoat or lower and the sales price of the animal increases to 1100.00-1200.00 ETB/shoat. At the selling price equal to 1200 ETB/shoat the only negative NPV arises if purchase price is 600 ETB/shoat. All other purchase and sale prices tested in this sensitivity analysis yield negative FNPVs. Given the current level of population growth in Ethiopia and the associated high domestic demand in the meat sector coupled with low livestock productivity level, it is unlikely that purchasing prices of shoats will be lower than 500.00 ETB/shoat. Therefore it is rather improbable that the intervention in shoats fattening will yield a positive FNPV.

Table 8. The Joint Impact of Purchasing and Selling Price of Shoats on the FNPV, in US\$.

FNPV US\$=-846.70 ()					
<i>Intervention in Shoats Fattening</i>	Purchase Price of Animal				
Selling Price of Animals	400.00	450.00	500.00	550.00	600.00
850.00	-1,194.34	-1,605.73	-2,017.12	-2,428.50	-2,839.89
900.00	-804.20	-1,215.59	-1,626.98	-2,038.37	-2,449.76
1000.00	-23.92	-435.31	-846.70	-1,258.09	-1,669.48
1100.00	756.35	344.96	-66.42	-477.81	-889.20
1200.00	1,536.63	1,125.24	713.85	302.46	-108.93

Table 9 below presents sensitivity analysis for the FNPV that has been calculated based on the joint impact of the ground corn requirements per round and the final sale price of the shoats. Under the assumed scenario, with the ground corn requirements at 45.00 kg/round and the sale price of the shoats at 1000.00 ETB/shoat the FNPV is negative, at -846.70 US\$. If the ground corn requirements decreases to 25.00-30.00 kg (because of sufficient quantity of crop residues, able to provide the same level of nutrition) and the selling price of animals is 1000.00-1200.00 ETB each it is possible to achieve a positive FNPV. Similarly it is possible to obtain a positive FNPV if the requirements of ground corn per round stays at the level of 35.00-40.00 kg with selling price of animal at the level of 1100.00-1200.00 ETB/animal and with ground corn requirements of 45.00 kg/round and the sale price of animal of 1200.00 ETB/animal.

Table 9. Joint Impact Selling Price of Livestock & Requirements of Ground Corn Grain on NPV US\$.

FNPV US\$=-846.70					
<i>Intervention in Shoats Fattening</i>	Ground Corn Requirements kg/round				
Selling Price of Animals	25.00	30.00	35.00	40.00	45.00
850.00	-843.86	-1,137.17	-1,430.49	-1,723.80	-2,017.12
900.00	-453.72	-747.04	-1,040.35	-1,333.66	-1,626.98
1000.00	326.55	33.24	-260.07	-553.39	-846.70
1100.00	1,106.83	813.52	520.20	226.89	-66.42
1200.00	1,887.11	1,593.79	1,300.48	1,007.17	713.85

RECOMMENDATIONS

The proposed intervention in the GRAD shoats fattening shows negative FNPV and QDSCRs which suggest that such intervention won't be successful and won't achieve the goals set by the GRAD project. The proposed intervention if implemented will add additional hardship to the selected chronically food insecure households. These households won't be able to repay their financial obligations associated with the initial investment in shoats fattening. The planned by the GRAD project target income increase of 365.00 US\$ per year/per household won't be achieved and financial resources invested into implementation of this intervention will be lost.

It is possible that GRAD households may have one round of fattening tied to the crop harvesting period, when crop residues can be used as a source of livestock feed. Such production may give the households additional income, but it will be much below targeted US\$365/year. The assumption that households will have four rounds/year cannot be made together with assumption that the feed source used will come from the crop residues. In case of such intensive production system (4 rounds/year) households need to use commercial feeding system.

Therefore it is recommended that the GRAD program remove this intervention from its implementation strategy.

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APPENDIX

Table A. GRAD Selected Woredas and Their Choice of Commodities (as per CARE Plan).

on	Woreda	Type of Value Chains Selected for GRAD woredas
SNNPR	Shebedino	Fattening (Shoat and cattle), vegetables (potato and onion), honey
	Hawassa Zuria	Shoat Fattening, red pepper, vegetables (potato and onion),
	Loka Abaya	Shoat Fattening, Pulse (beans) , honey
	Hawale Tula	Vegetables (potato and onion), fattening (shoat and cattle), honey
	Mareko	Red Paper, Fattening (shoat and cattle), Onion
	Meskan	Red Pepper, Shoat and Cattle fattening, Vegetables (Onion and Tomato)
Tigray	Alamata	Vegetables (onion & tomato), Cattle fattening, Honey
	Ofla	Shoat rearing, honey, vegetables (garlic and pepper), fattening (shoat and cattle), pulse (faba beans)
	Enda Mehoni	Vegetables (potato and garlic), shoat rearing, cattle fattening, honey, pulse (faba bean)
	Raya Azebo	Shoat fattening and shoat rearing, cattle fattening
Amhara	Lay Gayint	Cereals (Malt barley), Pulse (white pea beans) , potato, Shoat fattening,
	Libokemkem	Cattle fattening, honey, vegetables (onion)
Oromia	Arsi Negele	Shoat fattening, Pulse (white pea beans) , red Pepper
	Zeway Dugda	Pulse (white pea beans) , Vegetables (Tomato and Onion), shoat fattening
	Shalla	Shoat Fattening, Pulse (white pea beans) , Potato
	Adami Tulu	red pepper, Pulse(white pea beans) , Shoat fattening

Table B. The FtF Indicators Proposed for the Monitoring and Evaluation of the GRAD project

Results	Indicator	Target
Objective 1: To graduate chronically food insecure households from food support.	Graduation of chronically food insecure households from food aid by increasing their yearly household income	50,000 households that will have increase in yearly income of \$365 by year 5.
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 five 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 six months of age (RiA)	Lower is better
	3.1.9-11 Prevalence of stunted children under five 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 amongst USG direct and indirect local implementing partner level	
	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. Summary of Conversion Factors Used for Economic Analysis of the Intervention in Shoats Fattening in the GRAD Meat Value Chain.

<i>Summary of Conversion Factors</i>	
Livestock	1.10
Roughage	1.00
Ground corn grain	0.99
Wheat bran	1.09
Noug seed cake	1.00
Haricot Beans	1.08
Salt	0.76
Anti-worm drugs	1.07
Labor Cost ETB/round	0.85
Cost of Livestock Mortality	1.10
Feeding Sunk Cost	0.89