DESIGNING APPROPRIATE FINANCIAL INSTRUMENTS FOR MODERN BEEKEEPING IN ETHIOPIA

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Development Discussion Paper: 2013-16

Abstract

The aim of this study is to estimate the economic feasibility of modern beekeeping activities versus traditional beekeeping in the context of pro-poor interventions directed to improve the livelihood of the chronically food insecure group of households in Ethiopia. The option of the initial use of a transitional (less expensive) technology with a later move to the modern beekeeping practices was also evaluated. This transition option initially looked as a promising mechanism taking into consideration limited capital savings and access to financial resources of the target group of beneficiaries. The study, however, revealed that the option of using transitional beehives eventually faces the same level of the financial constraint, while significantly reducing the income of the households during the first three years.

Acknowledgements

This study was financed by USAID's "Learning, Evaluation, and Analysis Project (LEAP). The report was prepared by Cambridge Resources International Inc., under a subcontract to Optimal Solutions Group. Contract Number: AID-OAA-C-11-00169. Special thanks for the comments and suggestions received from Mark Carrato, Cullen Hudges, Christabel Dadzie, Richard Barichello and Katarzyna Pankowska during the completion of this study. The assistance received from many people during its field visits to Tigray and Amhara, Ethiopia in July 2012, including the representatives of USAID, CARE, SNV, Holeta and Andasa Research Centers, Zembaba Union of Cooperatives, Ethiopian Apiculture Board, and the owners of agribusiness enterprises in the honey sector: Beza Mar, Comel, Dimma, Tsedey-Mar, and Rahi Honey Agro Industry is highly appreciated.

Keywords: cost-benefit analysis, investment appraisal, stakeholder analysis, small holders' honey production, honey value chain, modern beekeeping, transitional beekeeping, pro-poor interventions, chronic food insecurity, modern beehives, poverty reduction, sustainable development, Ethiopia.

JEL Classification: D13, D31, D61, D62

ACRONYMS

AGP	Agriculture Growth Program
CARE	Implementing Organization
CBA	Cost Benefit Analysis
CF	Conversion Factor
CRS	Catholic Relief Services
CSA	Central Statistical Agency of Ethiopia
ENPV	Economic Net Present Value
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 (Project)
Ha	Hectare
kg	Kilogram
MFI	Microfinance Institutions
NPV	Net Present Value
ORDA	Organization for Rehabilitation and Development in Amhara
PSNP	Productive Safety Net Program Plus
REST	Relief Society of Tigray
RUSACCO	Rural Saving and Credit Cooperatives
SADSCR	Semiannual Debt Service Coverage Ratio
SNV	Netherlands Development Agency
US$	United States Dollar
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

Project Description: USAID/Ethiopia started to implement the Graduation With Resilience to Achieve Sustainable Development (GRAD) project in 2012. The main purpose of the GRAD project is to graduate 50,000 chronically food-insecure Ethiopian households (out of the 65,000 targeted) by facilitating an increase in their yearly income by US$365/household/year. The main objectives that the project aims to achieve are

1. to enhance livelihood options of chronically food-insecure households in Highlands areas;
2. to improve household and community resilience; and
3. to strengthen an enabling environment to promote scale-up and sustainability.

A special emphasis of this project is the inclusion of women and the creation of non-gender-biased income opportunities, improved cooperation between stakeholders, and the creation of accountability for the beneficiaries of the project.

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-credit guarantee fund that will be available to lending institutions, microfinance institutions (MFI), and rural savings and credit cooperatives (RUSACCO) so these institutions can supply the necessary loans to the targeted households for undertaking the GRAD interventions.

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

The GRAD project proposes interventions in four commodity value chains: honey, meat, vegetables, and pulses. The investment plan for GRAD households designed by SNV Ethiopia proposes fattening interventions for small ruminants as well as for cattle in the meat value chain, but the analysis for the meat value chain has been carried out for the shoats-fattening intervention only. These value chains—honey, meat, vegetables, and pulses—were chosen because of their suitability for chronically food-insecure households and the rather low initial investment costs necessary for their implementation.[1]

Strategic Context and Rationale: The GRAD project is a part of USAID's wider Feed the Future (FtF) agenda, which prioritizes investments in agriculture and nutrition. The project particularly aims to facilitate improvements in the commodity value chains to make them more inclusive and efficient for chronically food-insecure households.

Promotion of these inclusive commodity value chains will facilitate market access for these households, which in turn will increase their yearly income, decrease their current food insecurity, and allow them to profit from newly established or improved market linkages.

The GRAD project proposes two intervention packages in the honey value chain. Intervention A will introduce three modern beehives with tools and appropriate training regarding modern honey-production methods, starting in year 1. Intervention B will initially introduce two transitional beehives and one modern beehive with tools and training, but by the beginning of the year 3, participants will transition to the use of modern beehives only.

[1] Suitability is defined in terms of the ease in implementation. Preferably a number of the food-insecure households already have experience producing some of these commodities.

Description of the Interventions: Regardless of which of the two interventions proposed for the honey value chain are selected, each of the chronically food-insecure households targeted in this project will receive an investment loan for the initial purchase of beehives and necessary tools. Intervention A includes the initial purchase of three modern beehives and necessary tools at year 1 of the project. The amount of the loan required for the investment is above the amount that MFIs of Ethiopia are willing to provide for new clients. It has been assumed that targeted households will contribute 28 percent equity capital of the total investment required, hence reducing the required borrowing. The household will repay this loan on a per-round basis (1 round = 6 months), with the first round being a grace period.

Intervention B proposes the initial purchase of one modern beehive and two transitional beehives and necessary tools in year 1 of the project. The transitional beehives will be replaced with two modern beehives at the end of year 2 of the project. Two Intervention-B scenarios were analyzed: Under the first scenario, the households again have been assumed to contribute 28 percent of the required investment from the equity capital; the second scenario was designed by eliminating 28 percent of the equity contribution from Intervention B. The required funds for the replacement of transitional beehives, under both scenarios, will be obtained through an additional loan taken by the households from the MFIs after repayment of the initial loan. In the following text, the first scenario of intervention B is referred to as Intervention B, and the second scenario is referred to as Intervention C.

Financial and Economic Analysis Results: The appraisal has been carried out over an 11-year period. The analysis shows that at a financial discount rate of 12 percent, each household's financial net present value (FNPV) for Intervention A is US$906.40. The FNPV of Intervention B is US$796.66, while the FNPV of Intervention C is US$790.02. The economic net present value (ENPV) for Intervention A is US$1,130.92, while it is US$1,007.74 for Interventions B and C.

In summary, the FNPVs and ENPVs are positive for all proposed interventions, with Intervention A showing a higher FNPV and ENPV.

Table A. SADSCR/round for household for the interventions

Intervention A	Year 1, round 1	Year 1, round 2	Year 2, round 1	Year 2, round 2
SADSCR	-	**0.93**	**1.00**	**1.71**
Intervention B	Year 1, round 1	Year 1, round 2	Year 2, round 1	Year 2, round 2
SADSCR (first loan)	-	**0.93**	**0.93**	**1.41**
SADSCR (second loan)		**1.26**	**1.74**	**2.71**
Intervention C	Year 1, round 1	Year 1, round 2	Year 2, round 1	Year 2, round 2
SADSCR (first loan)		**0.68**	**0.52**	**0.58**
SADSCR (second loan)		**1.27**	**1.75**	**2.72**

Table A describes the semiannual debt service coverage ratios (SADSCRs). The debt service obligations are defined here to be the interest and principal that are due in a given period plus the debt service from the previous period that could not be paid due to inadequate net cash flow. The opportunity cost of labor will be retained within the family and therefore can be treated as part of the cash flow available for debt servicing.

In the case of Intervention A, the households will face difficulty repaying their debt obligation only during the first repayment period. The debt service of the second repayment period together with the unpaid debt service from the previous period will be repaid in round 1 of year 2.

In the case of Intervention B, when repayments are due in the first two rounds, the SADSCRs are below one. If these farmers are going to be expected to repay the loan this quickly, they will have to draw on other sources of cash.[2] In round 2 of year 2, the SADSCR reaches a value above 1, indicating that the financial situation of the

[2] Other sources of cash refer to financial resources generated by the households' activities except beekeeping activities.

households will stabilize, and the initial loan will be repaid. After that round, the household will be able to get a new loan required for the complete transition toward modern beehives.

The SADSCRs of Intervention C are below a value of 1 in all rounds, indicating that households will not be able to repay their debt obligations without the contribution of financial resources generated by other activities. The second loan, however, will be provided only for the households that will repay the previous loan; hence, households will have to draw on other resources of cash to repay the initial loan.

The eventual necessity to contribute additional financial resources in Intervention C erases principal difference (no equity contribution) between Interventions B and C. Intervention B will require households to initially invest 28 percent equity capital, while Intervention C will split almost the same amount over two repayment rounds. The present value of the equity contribution for Intervention B is ETB 1,208.20 (US$69.04), while the present value of the amount under Intervention C is ETB 1,096.68 (US$62.67), with ETB 675.98 (US$38.63) in the second round of year 1 and ETB 420.70 (US$24.04) in the first round of year 2.

Beneficiary Analysis Results: The results of the analysis reveal that the income of the targeted households will increase. This annual increase in the income of the households under each intervention is presented in table B, below.

Table B. Annual increase in the income of the households, including opportunity cost of family labor (in US$)

Year	Intervention A	Intervention B	Intervention C
2012	–152.44	–119.27	–88.86
2013	53.72	34.92	–31.92
2014	276.94	206.50	207.33
2015	276.94	186.20	186.57
2016–2022	276.94	276.94	276.94

The net income decrease in the first years of the interventions will occur because of the equity contribution. The annual increase in income, presented in table B, includes the opportunity cost of family labor spent on the beekeeping activities. Each household's net income over the 11-year evaluation period will be US$1,213.04 for Intervention A, US$1,108.68 for Intervention B, and US$1,080.33 for Intervention C. The other beneficiary of the intervention will be the Ethiopian government, for the following reasons:

- The government will benefit directly from the taxes collected on the inputs and outputs of the intervention. Plastic containers, honey extractors, sugar, and so forth are importable to Ethiopia. The total tax rate applied to these inputs is higher than the foreign exchange premium. The inflow of taxes will reduce the economic cost below its financial cost and generate tax revenue for the government of Ethiopia.
- Modern beehives and smokers are produced domestically, so they are assumed to be internationally nontradable goods. The inputs used to produce beehives and smokers, such as stainless steel, nails, and covers, are exportable to Ethiopia. Again, the total tax rate applied to these inputs is higher than the foreign exchange premium, thus generating tax revenue for the government of Ethiopia.
- The government will also benefit indirectly, because honey is exported from Ethiopia. Exports allow the country to earn foreign exchange.

The total amount of government benefits from the intervention over the 11-year period per household is estimated to be US$229.28 for Intervention A and US$210.27 for Interventions B and C.

Conclusions and Recommendations: Expected returns on the modern beekeeping activities are dependent on the full list of inputs required for the proper implementation, so none of the tools can be eliminated from the

required investment. A missing input, such as a honey extractor, will directly result in decreased quality or yield of honey. Absence of other inputs, such as gloves or overall coats, may put the health of the beekeepers at risk because of the aggressiveness of Ethiopian bees. Taking into consideration the financial situation of the GRAD beneficiaries, it will be appropriate to share the most expensive inputs of production, such as a honey extractor and wax mold, between groups of farmers.

The loan amount from MFIs for new clients in 2012 is limited to ETB 4,000 (US$228.57), which is less than the required investment for all three interventions. The main group of the GRAD beneficiaries are chronically food-insecure households. The necessity of the equity contribution may limit the beneficiaries of the honey interventions to better-off groups of farmers. It is suggested that the interventions be redesigned to allow farmers access to sufficient financial resources to start modern beekeeping activities without equity contribution. If such loan amounts can be negotiated with MFIs by the implementers of the GRAD project, the term of the loan should also be expanded to 3 years.

In the case of Intervention B, the total initial investment cost is ETB 4,315. This amount is only slightly above the amount of ETB 4,000 usually provided by MFIs, hence reducing the requirements for an equity contribution. Intervention B, however, has been analyzed assuming an equity contribution of 28 percent; the analysis reveals that the households will be able to repay the loan, although they should be allowed to move small fractions of the debt service to the next repayment period, if necessary. The repayment of the loan, in turn, will give them access to the next loan.

In the case of Intervention C, the total initial investment cost is also ETB 4,315. Intervention C has been analyzed without assuming an equity contribution of 28 percent. The increased debt service will not allow the households to repay their loan obligations without contributing additional financial resources. If the first loan will not be repaid, the households will not have access to the next loan required for the purchase of two modern beehives at the end of the intervention year 2.

All three interventions require household equity contribution for successful implementation. If this requirement can be erased, Intervention A is recommended over Interventions B and C, because its benefits outweigh its costs and indicate the likely success of this project. Even though analyses of Interventions B and C also yield positive FNPV and ENPV values, these NPVs are lower than those obtained in the analysis of Intervention A.

There is no principal difference between Interventions B and C other than the distribution of the equity contribution over time. The minimum equity contribution for Intervention B that will allow the households to repay the loan is 24.63 percent.

If money from the loan-guarantee fund will be used to cover the unpaid fractions of the loan in Intervention C, thus allowing the households access to the loan required for the complete transition toward modern beehives, the FNPV of the intervention will be US$876.50, which is still below the FNPV of Intervention A. The increase in the FNPV in this case is just a financial subsidy from USAID to the targeted households.

THE GRAD HONEY VALUE CHAIN: COST-BENEFIT ANALYSIS

METHODOLOGY

Project Background

Ethiopia's economy is highly dependent on its agricultural production, with agriculture accounting for about 46 percent of the country's gross domestic product (GDP). About 80 percent of Ethiopia's total population lives in the rural areas, and agricultural activities generate about 85 percent of the total employment in Ethiopia (USAID, AGP-LGP/PRIME Summary Proposal, 2011).

USAID/Ethiopia is one of the major donors providing support for the goal of making Ethiopia's households more food self-sufficient. It supports various initiatives related to increasing access to food for Ethiopia's food-insecure households and emergency assistance. USAID's working agenda in Ethiopia involves promoting increased agricultural productivity and developing viable commodity value chains that in turn will increase the level of food security and reduce the negative impacts of famine.

Ethiopia is ranked among the top five fastest-growing countries in the world, with real GDP growth reaching 7.5 percent in 2011 (The World Factbook, CIA). Despite its currently impressive economic growth rate, Ethiopia has not been able to achieve a level of agricultural production that leads to food self-sufficiency. It still is home to about 8 million people who remain chronically food insecure, with the vast majority of them living in the rural areas. About 60 percent of rural households experience food shortages between June and October each year (USAID, AGP-LGP/PRIME Summary Proposal, 2011).

For these reasons, the GRAD project concentrates on improving the value chains for several commodities. The project addresses the need to develop profitable and functional value chains that include chronically food-insecure households to provide them with opportunities to profit from improved or newly established market linkages.

The majority of Ethiopian households in the rural areas cultivate low-value cash crops, and live with poor access to commodity markets and financial services. They often lack proper market information or are not able to benefit from available market linkages. Food-security improvements are likely to come from their inclusion in the commodity value chain cycle.

The GRAD project plans to first target 65,000 households, of which 58,500 are chronically food insecure and 6,500 are labeled as "Ultra Poor."[3] A secondary target group involves 10,000 households that can be categorized as food-sufficient households (6,000) or food-secure households (4,000). This second targeted group is intended to act as a role model for the first GRAD group of households. Of the 65,000 targeted households, the 5-year-long GRAD project aims to graduate 50,000 households.

Specifically, the GRAD project aims to achieve the following goals:

1. Enhance the livelihood options of chronically food-insecure households in Highlands areas
2. Improve household and community resilience
3. Strengthen the enabling environment to promote scale-up and sustainability

To ensure future success in the implementation of the GRAD project, USAID/Ethiopia plans to cooperate with several implementing agencies that are well-known experts in the areas of food security and commodity value

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

chain development. These technical partners—CARE, the Relief Society of Tigray (REST), the Organization for Rehabilitation and Development in Amhara (ORDA), Catholic Relief Services (CRS), and the Netherlands Development Agency (SNV)—possess the required expertise and hands-on experience from implementing similar projects in Ethiopia and elsewhere.

The chronically food-insecure families who are the subjects of the GRAD project are located in 16 *woredas* in four regions of Ethiopia: SNNPR, Tigray, Amhara, and Oromia.[4] The selection of these *woredas* was based on their proximity to the Agriculture Growth Program (AGP) and active markets that will facilitate opportunities for engaging in local based commodity trading.

The market linkages established during the lifetime of this project will connect chronically food-insecure households with locally based traders and facilitate the sales of commodities for income generation by this targeted group of households.

In addition, the GRAD project aims to correct the shortcomings experienced in the Productive Safety Net Program Plus (PSNP) project by facilitating an increase in the yearly income of chronically food-insecure households. The objective of the chosen interventions is to increase each household's yearly income by US$365 (or US$1/day) by the end of the project. It is possible that this objective will not be met if such households engage in just one additional commodity value chain. In such cases, a combination of commodity value chains will be suggested to achieve the desired increase in the households' income level.

The GRAD project will emphasize gender equality and the inclusion of women via cooperation between stakeholders and a widely understood accountability to beneficiaries.

USAID will facilitate the implementation of this project by establishing a credit-guarantee fund of US$2 million. This guaranteed fund will enable the flow of credit resources necessary for the chronically food-insecure households to engage in the commodity production. The distribution of financial resources will be handled by microlending institutions, MFIs, and RUSACCO. One additional benefit of this credit guarantee will be to spread the financial risk between the implementing agency and the financial organizations that are responsible for lending to the targeted households.

Four commodity value chains are being proposed for the GRAD project: honey, pulses, vegetables, and meat. The choice of these value chains is based on their simplicity in terms of the necessary knowledge required for their introduction and the rather low initial start-up costs needed to engage in their production. The value chains of these commodities show a good potential for postgraduation production increases and marketing. Demand for all these commodities is growing in the domestic market (Ethiopian) and export markets.

The list of the key FtF indicators proposed for monitoring and evaluating the GRAD project's performance is presented in table A in the appendix.

Commodity Background

Honey Production in Ethiopia

Ethiopia has a long tradition of honey production reaching back many centuries—in fact, the longest tradition of honey and beeswax marketing in Africa. Despite this long tradition, honey production in Ethiopia is still treated as a supplemental on-farm activity that is usually combined with crop cultivation and animal husbandry. A vast majority of the honey produced in Ethiopia comes from traditional beehives, which currently are the most common form of technology used for honey production in Ethiopia. As of 2011, Ethiopia possessed about 4.9 million traditional beehives, which constitutes about 95.57 percent of the total number of beehives in Ethiopia.

[4] As per the CARE proposal.

Currently, only about 81,500 transitional beehives (commonly called Kenya top bar hives) and 140,000 modern beehives exist (CSA Agricultural Survey Report, 2012). The total quantity of honey produced in Ethiopia in 2010–11 was about 39.9 million kilograms (kg). Almost all honey that is currently produced in Ethiopia (about 98 percent of the total yearly production) is consumed in the domestic market, with only about 2 percent of the total yearly production being exported.

Ethiopia has about 1.4–1.7 million households that are engaged in beekeeping and produce different types of honey that vary regionally as well as in terms of color, consistency, and purity. The most in-demand honey among Ethiopians comes from Eastern Tigray, where bees forage on the regionally specific Tebeb plant (*Basium clandiforbium*) and produce distinctive low-moisture white honey. Other types of honey produced include Lalibela honey (Acacia honey), multifloral yellow honey, dark brown honey, and crude red honey (mainly used for the production of tej, an Ethiopian drink with low alcohol content).

Current Market Situation in the Ethiopian Honey Sector

The sector's current market situation is characterized by a strong domestic demand and relatively low supply of table honey, resulting in rising domestic prices for honey. Producer prices differ by region and type of honey. The most expensive is Eastern Tigray's white honey, where the current retail price is ETB 170.00/kg. Lower retail prices (of around ETB 60–90.00/kg) are observed for other varieties of white honey, depending on the area and the honey's characteristics. The retail prices for yellow honey are around ETB 50–60.00/kg, while the least expensive red honey is sold at a price of around ETB 45–50/kg.[5] This current market situation in the Ethiopian honey sector and producers' overreliance on traditional technology are influenced by several factors:

1. **The use of traditional methods in the honey production.**
   The most commonly used method of honey production in Ethiopia relies on traditional beehives that are usually handmade from old logs found in the forest. These beehives present low-productivity rates (around 5–7kg/beehive/year) and low-quality honey that contains brood, wax, and other impurities. The yield from transitional and modern beehives is significantly higher (8–15kg/transitional beehive and 15–20kg/modern beehive), and these improved beehives produce better-quality honey as well.
2. **The lack of financial resources that would allow the beekeepers to obtain modern beehives.**
   Small-scale farmers who are interested in beekeeping find it difficult to obtain the financial resources necessary to acquire transitional or modern beehives. They possess few private financial resources and usually are unable to obtain the credit required to borrow capital. These financial barriers therefore do not allow them to switch from traditional to modern technology.
3. **Somewhat poor access to the tools necessary to start honey production with modern beehives.**
   Some beekeepers possess modern beehives (just boxes) yet do not have any of the tools required for the proper management of these beehives (e.g., smoker, queen excluder, honey extractor, etc.). This situation results in the production of honey within modern-style beehives but with yields and quality comparable to that of honey coming from traditional beehives.
4. **Lack of proper training on the management of the modern-style apiary.**
   Beekeepers who try to switch to modern-style honey production usually do not have the skills necessary for the proper management of modern beehives. They maintain their beehives poorly, using primitive harvesting methods and inappropriate tools. Due to their lack of training, they do not provide additional feed (water and sugar syrup) during droughts and have little knowledge of quality requirements in the honey market.
5. **Other associated obstacles.**
   Other barriers include the disappearance of desirable bee forage due to crop intensification and the growing use of agrochemicals, extreme weather conditions in some parts of Ethiopia (droughts), poor

[5] The honey retail prices were obtained during field interviews in Tigray and Amhara in July 2012.

transportation infrastructure, and the lack of knowledge about proper storage techniques (at both the farm and the local honey collectors/traders levels).

Project Description and Activities

The inclusion of the honey value chain in the GRAD project is based on several factors that positively affect this commodity's economic potential and its suitability for chronically food-insecure households. One of the factors contributing to the inclusion of the honey value chain is that the labor and land requirements for modern honey-production techniques are relatively low. The amount of land necessary for the establishment of an apiary with three modern beehives is 0.001 hectares (Ha), with labor requirements of about 107 hours/round.[6] These low land requirements are especially helpful in the case of food-insecure households, which on average possess no more than 0.25 Ha of land. Modern-style honey production is also able to create non-gender-biased employment and income opportunities. Honey production is neither physically strenuous nor culturally assigned to men, and it is a ready source of cash; hence, it is ideally suited for female participation. Given the traditional-style beekeeping experience that some of the households targeted in the GRAD project possess, the inclusion of the honey value chain in the GRAD project has a solid rational basis.

GRAD Project Interventions in the Honey Value Chain

Two honey value chain interventions in this GRAD project are being proposed for implementation, both with the goal of improving honey-production techniques. Intervention A will introduce three modern beehives, related maintenance tools, and appropriate training. All investments will be made starting in year 1 of the intervention in modern honey-production techniques. The amount of the investment required for the Intervention A is much higher than the usual amount available for new clients of MFIs operating in Ethiopia, thus necessitating household equity contribution. The main targeted beneficiaries of the GRAD project are chronically food-insecure households, which may not have financial resources to make the contribution. The second proposed intervention would overcome this barrier.

Intervention B will introduce two transitional beehives and one modern beehive, related maintenance tools and training. A progressive transition will be made toward the exclusive use of modern beehives at the beginning of year 3. The total initial investment cost of the Intervention B will be ETB 4,315, which is much lower than the total investment cost of Intervention A (ETB 7,205) and only slightly above ETB 4,000.[7] Two versions of Intervention B have been analyzed. Under the first scenario, the households have been assumed to contribute 28 percent of the required investment, but this contribution will be significantly smaller than 28 percent of the investment cost of the more expensive Intervention A. This scenario is referred to as Intervention B in the following text. The alternate scenario will eliminate the 28 percent equity contribution required for Intervention B and is referred to as Intervention C in the following text. The required funds needed for the replacement of transitional beehives under both scenarios will be obtained through an additional loan taken by the households from the MFIs after repayment of the initial loan.

Table 1, below, shows a detailed outline of the specific investment expenditures associated with each of the proposed interventions.

[6] A round refers to a 6-month period of time.
[7] The total amount of loan available for the new clients of MFIs is ETB 4,000.

Table 1. Total investment expenditures for Interventions A, B, and C[8]

Input	Intervention A	Intervention B and C (year 1)	Intervention B and C (year 3)
Modern beehives (3 for A, 1 for B)	3,300	1,100	2,200
Bee colony	2,100	700	
Queen excluder	330	110	220
Wax (ETB/kg)	405	135	270
Smoker	140	140	
Overall coat	150	150	
Veil	90	90	
Glove	80	80	
Extractor	320[9]	320	
Wax mold	150	150	
Bee forage seedling or seeds	50	50	
Plastic honey container	90	90	
Transitional beehives (2)	0	200	
Bee colony for transitional beehives (2)	0	1,000	
Total[10]	**7,205**	**4,315**	**2,690**

Assumptions for the Selected GRAD Interventions in the Honey Value Chain

1. The GRAD-targeted chronically food-insecure households that will engage in the modern-style honey production will each be provided with a microloan necessary to purchase the required inputs. It has been assumed that each targeted household possesses assets that can be sold to obtain cash (e.g., livestock) or has personal savings that can be used to provide a down payment.[11] The size of this loan will vary according to the intervention. With the required 28 percent participant contribution, the necessary loan for Intervention A (covering three modern beehives starting in year 1, maintenance tools, and training) will be ETB 5,825/household. In the case of Intervention B (covering two transitional beehives and one modern beehive, maintenance tools, training, and progressive transition into all modern beehives by the end of year 2), the size of the first loan will be ETB 3,495/household. For financing the investment needed for the transition to using all modern beehives, no equity contribution will be required, and the amount of the second loan will be ETB 3,028/household. The financing of the investment in Intervention C will occur without equity contribution. The ability of the households to repay the initial loan for Interventions B and C will be very critical, because it will determine the availability of the next loan required for the complete transition toward modern beehives.
2. Training will be provided free of charge, so targeted households will not incur any costs related to training (except the opportunity cost of time they spend being trained).
3. The microloan necessary for purchasing the required inputs will be provided at a subsidized interest rate of 15 percent. Additional fees associated with this loan will include a service charge (1 percent), loan

[8] Total investment expenditures for Intervention A: three modern beehives with tools and appropriate training starting in year 1. Total investment expenditures for Intervention B: two transitional beehives plus one modern beehive with tools and training starting in year 1, with progressive transition into all modern beehives by year 3 (in ETB).

[9] It has been assumed that an extractor and a wax mold will be shared by a group of households due to the equipment's relatively high prices.

[10] Total investment and operating costs (including labor and additional feed for bees) for the first year and first round of the intervention will be ETB 7,696.53 (nominal) for Intervention A and ETB 5,026.53 (nominal) for Intervention B.

[11] This "after down payment" loan amount in both cases includes investment expenditures as well as service charge, loan insurance, upfront savings, and passbook fee.

insurance (1 percent), upfront savings (10 percent), and a passbook fee (ETB 15). This loan will be for a period of 2 years, with a grace period of 6 months. Each household will make semiannual loan repayments, for a total of three repayments of the loan principal.[12] The upfront savings (10 percent) will be returned to the households after the loan has been repaid. There will be no interest renewed on the upfront savings.

4. In the case of Interventions B and C, households will need to replace the transitional beehives with modern ones in year 3. It has been assumed that they will cover the costs of the second loan after repaying the initial loan. It has also been assumed that a down payment will not be needed for the second loan, because the required amount is far below ETB 10,000 (the amount provided by MFIs to clients who repaid the first loan and have good reputations).
5. It has been assumed that in the case where a household is not able to repay the total amount of its loan principal due in a particular round, this amount will be transferred to the next round together with the incurred interest rate on the total outstanding amount. This procedure will be repeated until the total loan amount is repaid.[13]
6. It has also been assumed that each household will be able to harvest honey only one time in year 1 of Intervention A, B, or C. In subsequent years, it has been assumed that harvesting will happen twice annually. For Intervention A, it has been assumed that the average yield from each modern beehive/harvest will be 19 kg/year.[14] For Intervention B, the same yield has been assumed in the case of modern beehive, while the average yield from each transitional beehive has been assumed to be 8 kg/year.
7. The household consumption of honey for both interventions has been assumed to be 5 kg/household/round. For Interventions B and C, it has also been assumed that a household will consume lower-quality honey that comes from the transitional beehives and sell the honey from the modern beehives, because it will fetch a higher price and thus allow the farmer to repay the loan faster.
8. The necessary operating costs for both interventions in the first round will include bee-feeding costs of ETB 141.75, land-rental costs of ETB 0.40, and labor costs of ETB 349.38. It has been assumed that households will provide the necessary labor for beehive maintenance, so the labor required to maintain the beehives will not represent a cash burden.
9. The cost of beehive maintenance (per round) has been set at 5 percent of the initial cost of the beehive for both interventions. It has been assumed that households will use locally available materials and family labor for this purpose.
10. The lifespan for the modern beehive for both interventions has been assumed to be 11 years, which will be equal to the lifespan of the project.[15] In the case of Intervention B, the lifespan for the transitional beehive is 2 years, because at that point they will be replaced with modern beehives. It has been assumed that farmers will just replace transitional beehives with modern versions (not add two modern beehives) because of two reasons:
    a. Households keep modern beehives in the residential area to prevent them from being stolen. Such a security system puts a constraint on the quantity of bee colonies that can be held by households because of the potential danger to the families.
    b. The cost of the bee colony is much higher than the cost of transitional beehives, so moving existing bee colonies from transitional beehives to modern ones instead of obtaining new bee colonies makes economic sense.
11. In this analysis, the farm-gate price of yellow honey has been assumed to be ETB 45/kg for modern beehives and ETB 43/kg for transitional beehives.[16]

[12] In the first year of each intervention, only one repayment has been assumed (in round 2).
[13] Loan description provided by CARE.
[14] Such yield will be possible to obtain because of training that will improve a household's knowledge of modern beekeeping (e.g., the necessity for additional feedings and bee-forage planting).
[15] This lifespan was confirmed during the field interviews in July 2012.
[16] Honey prices have been based on field interviews conducted in July 2012 in Amhara and Tigray. The difference in prices has come from the assumption that honey produced in modern beehives has a bit higher quality, hence the higher price.

12. For Interventions B and C, it has been assumed that households will replace their transitional beehives with modern ones at the beginning of year 3. The bee colonies from the transitional beehives will be moved to the modern ones, so no additional costs will be incurred to replace the bee colonies.
13. It has been assumed that the initial price of a bee colony for a modern beehive will be ETB 700, while it will be ETB 500 for a transitional beehive. The difference in price results because the bee colony for a transitional beehive is smaller.
14. For the purpose of this analysis, the following macrolevel assumptions have been made: The expected average annual domestic inflation rate is 20 percent, and the U.S. inflation rate is 2.5 percent. The financial discount rate is a real rate of 12 percent, the economic discount rate is a real rate of 12 percent, the foreign exchange premium (FEP) is 6.5 percent (Kuo, 2011), and the exchange rate is US$1 = ETB 17.50.

PROJECT MODELING

The financial and economic feasibility of the GRAD honey interventions in this analysis has been established by constructing cash flows from the point of view of the project (total investment point of view) and the point of view of the targeted households (equity point of view). All revenues or potential revenue items have been treated as cash inflows, and all expenditures or potential expenditure items have been treated as cash outflows (Jenkins, Kuo, and Harberger, 2011). The analysis has been carried out for an 11-year period.

The cash flows have been constructed in nominal and real terms and on per-round (every 6 months) as well as annual bases (for total investment point of view and equity point of view). The cash flows have also been constructed for the total investment point of view with the exclusion of domestic consumption of honey (in nominal and real terms) to reflect the actual cash available for repayment of the loans.

The economy resource flow statements have been constructed by adjusting each of the line items in the cash-flow statements of the total investment point of view by the corresponding economic conversion factor (CF).[17]

The financial sustainability of an intervention has been analyzed by estimating the SADSCR of the project over the life of the loan used to finance the project and by calculating the FNPV of the project from the targeted households' (equity) point of view. If the ENPV of the project is positive, this means the total value of the benefits of the project (to whomever they accrue) will be greater than the combined costs required to implement and operate the intervention.

[17] Dividing the separately calculated economic value of a unit of an item by its financial price will yield the conversion factor.

FINDINGS

Financial Analysis

The appraisal has been carried out for an 11-year period. Based on assumptions established for the purpose of this analysis, all interventions will yield positive FNPVs. The FNPV has been calculated using 12 percent real financial discount rate. Table 2 presents the FNPVs for each intervention.

Table 2. FNPV/household/intervention (in US$)

	FNPV
Intervention A	906.40
Intervention B	796.66
Intervention C	790.02

The interventions in the honey value chain will also substantially increase the annual income of the targeted households. Stabilized additional yearly income of US$218.11 will be achieved by 2014 in the case of Intervention A, compared to 2016 for Interventions B and C. The resulting additional yearly income is presented in table 3, below.[18]

Table 3. Annual net cash flows resulting from the interventions (in US$)

Year	Intervention A	Intervention B	Intervention C
2012	–161.91	–123.03	–92.62
2013	34.36	3.13	–39.40
2014	218.11	147.67	148.50
2015	218.11	127.37	127.74
2016–2022	218.11	218.11	218.11

The negative annual net cash flows in 2012 for Interventions A and B will result from the 28 percent equity contribution needed to finance the initial investment. Intervention C will have two negative net cash flows, in 2012 and 2013, because farmers will not have adequate cash flows to finance their debt burden during these years. Although the initial equity contribution has been removed from Intervention C, targeted households will still need to contribute financial resources from other activities to repay their debt obligation.

Table 4 describes the SADSCRs. These indicators are very important from a program sustainability perspective, because they show each household's ability to repay the loan necessary for the financing of the initial investment in each of the interventions. The debt service obligations in a given period have been defined here to be the interest and principal that will be due in a given period plus the debt service from the previous period that cannot be paid due to inadequate net cash flow.

[18] Net cash flow from the household perspective has been measured as its revenue less operating expenses less debt service including both debt repayments and interest expense. In the early years, the net cash flows will be less than the strict accounting definition of income, which only subtracts interest expense. During these years, annual financial depreciation will be less than debt repayment, and hence net cash flow will be lower than net income.

Table 4. SADSCR/round for household for the interventions

Intervention A	Year 1, round 1	Year 1, round 2	Year 2, round 1	Year 2, round 2
SADSCR	-	**0.93**	**1.00**	**1.71**
Intervention B	Year 1, round 1	Year 1, round 2	Year 2, round 1	Year 2, round 2
SADSCR (first loan)	-	**0.93**	**0.93**	**1.41**
SADSCR (second loan)		**1.26**	**1.74**	**2.71**
Intervention C	Year 1, round 1	Year 1, round 2	Year 2, round 1	Year 2, round 2
SADSCR (first loan)		**0.68**	**0.52**	**0.58**
SADSCR (second loan)		**1.27**	**1.75**	**2.72**

In the case of Intervention A, the households will face difficulty repaying their debt obligation only during the first repayment period. The debt service of the second repayment period and the unpaid debt service from the previous period will be repaid in round 1 of year 2.

In the case of Intervention B, when repayments will be due in the first two rounds, the SADSCR will be below a value of 1. If the farmers will be expected to repay the loan this quickly, they will have to draw on other sources of cash. In round 2 of year 2, the SADSCR will reach a value above 1, indicating that the financial situation of the households will stabilize, allowing the initial loan to be repaid. This indicates that households by that time will be able to access the new loan required for the investment to replace transitional beehives with modern ones.

The SADSCR of Intervention C will be below a value of 1 in all rounds, indicating that households will not be able to repay their debt obligations without contributing financial resources generated by other activities. The second loan, however, will be provided only for the households that repay the previous loan; hence, households will have to draw on other cash resources to repay the initial loan.

The eventual necessity to contribute additional financial resources to repay the loan in Intervention C negates the principal difference (no equity contribution) between Interventions B and C. Intervention B will require households to initially invest 28 percent equity capital, while Intervention C will split almost the same amount over two repayment rounds. The present value of equity contribution for Intervention B will be ETB 1,208.20 (US$69.04), while the present value of contribution under Intervention C will be ETB 1,096.68 (US$62.67), with ETB 675.98 (US$38.63) in the second round of year 1 and ETB 420.70 (US$24.04) in the first round of year 2.

The SADSCR of the second loan of Interventions B and C will be above 1 in all rounds, indicating that the financial standing of the households will be good enough to repay the loan, although not in a timely manner.

Table 5 presents the annual scheduled debt service obligations versus the annual net cash flows, including the opportunity cost of labor, which reflect the actual financial resources generated by the activity in the given period and available for the loan repayment. It has been assumed that actual debt repayment will be made by the households without moving additional financial resources from other (non-honey-producing) activities to repay the loan, for both interventions. For Interventions A and B, these values confirm the status quo outlined in the discussion above about SADSCRs. Although in both cases the households cannot repay the full amount of debt service in timely manner, they will be able to cover the biggest part of payment and eventually will have adequate cash flow to pay back the loan. At this time, they will be refunded the upfront savings (10 percent of the initial loan's amount). For Intervention B, repayment of the loan will open access for the new loan required to finance investment in the two new modern beehives. The annual net cash flows of Intervention C will not allow the households to repay the loan, so they will not get access to the second loan.

Table 5. Annual debt repayment obligations versus net annual cash flows, including opportunity cost of family labor/round/intervention (in ETB)

	Year 1		Year 2	
Intervention A	*Round 1*	*Round 2*	*Round 1*	*Round 2*
- Annual Debt Service Obl.		2,784.95	2,431.49	1,563.49
- Net cash flow		2,576.25	2,439.42	2,672.25
Intervention B	*Round 1*	*Round 2*	*Round 1*	*Round 2*
- Annual Debt Service Obl.		1,689.06	1,451.46	1,048.00
- Net cash flow		1,577.20	1,345.02	1,473.40
Intervention C	*Round 1*	*Round 2*	*Round 1*	*Round 2*
- Annual Debt Service Obl.		2,317.71	2,590.36	2,546.73
- Net cash flow		1,577.20	1,345.02	1,473.40

Note: The debt service obligations in a given period have been defined here to be the interest and principal that are due plus the debt service from the previous period that cannot be paid due to inadequate net cash flow.

Note: For the second loan of Interventions B and C, annual debt service obligations will be equal to the actual debt payments, because households will have sufficient cash flow to fully cover the obligations.

Table 6. Intervention A 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***
Receipts												
-Value of in-house honey consumption	225.00	450.00	450.00	450.00	450.00	450.00	450.00	450.00	450.00	450.00	450.00	***2,767.60***
-Revenue from honey sale	2,340.00	4,680.00	4,680.00	4,680.00	4,680.00	4,680.00	4,680.00	4,680.00	4,680.00	4,680.00	4,680.00	***28,783.04***
Total inflows	2,565.00	5,130.00	5,130.00	5,130.00	5,130.00	5,130.00	5,130.00	5,130.00	5,130.00	5,130.00	5,130.00	***31,550.64***
Expenditures												
Investment costs for modern beehives												
Modern beehive	3,300.00											***3,300.00***
Bee colony	2,100.00											***2,100.00***
Queen excluder	330.00											***330.00***
Wax	405.00											***405.00***
Smoker	140.00											***140.00***
Overall coat	150.00											***150.00***
Veil	90.00											***90.00***
Glove	80.00											***80.00***
Extractor	320.00											***320.00***
Wax mold	150.00											***150.00***
Bee forage seedling or seed to plant around backyard	50.00											***50.00***
Plastic honey container	90.00											***90.00***
Service costs for beehives												
Sugar for feeding	283.50	283.50	283.50	283.50	283.50	283.50	283.50	283.50	283.50	283.50	283.50	***1,885.34***
Beehive maintenance	165.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00	***2,029.57***
or cost	698.75	698.75	698.75	698.75	698.75	698.75	698.75	698.75	698.75	698.75	698.75	***4,646.84***
Rental value of land	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	***5.32***
Subsidized loan	–2,954.57	3,215.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***–83.47***
Total outflows	5,398.48	4,528.68	1,313.05	1,313.05	1,313.05	1,313.05	1,313.05	1,313.05	1,313.05	1,313.05	1,313.05	***15,688.60***
Net cash flows	–2,833.48	601.32	3,816.95	3,816.95	3,816.95	3,816.95	3,816.95	3,816.95	3,816.95	3,816.95	3,816.95	***15,862.04***
Net cash flows, real US$	–161.91	34.36	218.11	218.11	218.11	218.11	218.11	218.11	218.11	218.11	218.11	***906.40***

NPV @12% discount rate ETB	**15,862.04**
NPV @12% discount rate US$	**906.40**

Table 7. Intervention B 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
Receipts												
-Value of in-house honey consumption	215.00	430.00	450.00	450.00	450.00	450.00	450.00	450.00	450.00	450.00	450.00	***2,739.74***
-Revenue from honey sale	1,328.00	2,656.00	4,680.00	4,680.00	4,680.00	4,680.00	4,680.00	4,680.00	4,680.00	4,680.00	4,680.00	***25,963.90***
Total inflows	1,543.00	3,086.00	5,130.00	5,130.00	5,130.00	5,130.00	5,130.00	5,130.00	5,130.00	5,130.00	5,130.00	***28,703.64***
Expenditures												
Investment costs												
Modern beehive	1,100.00	0.00	2,200.00									***2,853.83***
Bee colony for modern beehive	700.00											***700.00***
Transitional beehive	200.00											***200.00***
Bee colony for transitional beehive	1,000.00											***1,000.00***
Queen excluder	110.00	0.00	220.00									***285.38***
Wax	135.00	0.00	270.00									***350.24***
Smoker	140.00											***140.00***
Overall coat	150.00											***150.00***
Veil	90.00											***90.00***
Glove	80.00											***80.00***
Extractor	320.00											***320.00***
Wax mold	150.00											***150.00***
Bee forage seedling or seed to plant around backyard	50.00											***50.00***
Plastic honey container	90.00											***90.00***
Service costs for beehives												
Sugar for feeding	283.50	283.50	283.50	283.50	283.50	283.50	283.50	283.50	283.50	283.50	283.50	***1,885.34***
Modern beehive maintenance	55.00	110.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00	***1,723.15***
Transitional beehive maintenance	10.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***27.86***
Labor cost	698.75	698.75	698.75	698.75	698.75	698.75	698.75	698.75	698.75	698.75	698.75	***4,646.84***
Rental value of land	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	***5.32***
Subsidized loan	–1,667.02	1,918.09	–1,457.29	1,587.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***14.09***
Total outflows	3,696.03	3,031.14	2,545.76	2,900.99	1,313.05	1,313.05	1,313.05	1,313.05	1,313.05	1,313.05	1,313.05	***14,762.04***
Net cash flows	–2,153.03	54.86	2,584.24	2,229.01	3,816.95	3,816.95	3,816.95	3,816.95	3,816.95	3,816.95	3,816.95	***13,941.60***
Net cash flows, real US$	–123.03	3.13	147.67	127.37	218.11	218.11	218.11	218.11	218.11	218.11	218.11	***796.66***

NPV @12% discount rate ETB	**13,941.60**
NPV @12% discount rate US$	**796.66**

Table 8. Intervention C annual cash-flow statement, equity point of view (real ETB)[19]

Line items Year<<<<	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	PV
Receipts												
-Value of in-house honey	215.00	430.00	450.00	450.00	450.00	450.00	450.00	450.00	450.00	450.00	450.00	***2,739.74***
-Revenue from honey sale	1,328.00	2,656.00	4,680.00	4,680.00	4,680.00	4,680.00	4,680.00	4,680.00	4,680.00	4,680.00	4,680.00	***25,963.90***
Total inflows	1,543.00	3,086.00	5,130.00	5,130.00	5,130.00	5,130.00	5,130.00	5,130.00	5,130.00	5,130.00	5,130.00	***28,703.64***
Expenditures												
Investment costs												
Modern beehive	1,100.00	0.00	2,200.00									***2,853.83***
Bee colony for modern beehive	700.00											***700.00***
Transitional beehive	200.00											***200.00***
Bee colony for transitional	1,000.00											***1,000.00***
Queen excluder	110.00	0.00	220.00									***285.38***
Wax	135.00	0.00	270.00									***350.24***
Smoker	140.00											***140.00***
Overall coat	150.00											***150.00***
Veil	90.00											***90.00***
Glove	80.00											***80.00***
Extractor	320.00											***320.00***
Wax mold	150.00											***150.00***
Bee forage seedling or seed to plant around	50.00											***50.00***
Plastic honey container	90.00											***90.00***
Services costs for beehives												
Sugar for feeding	283.50	283.50	283.50	283.50	283.50	283.50	283.50	283.50	283.50	283.50	283.50	***1,885.34***
Modern beehive maintenance	55.00	110.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00	***1,723.15***
Transitional beehive	10.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***27.86***
Labor cost	698.75	698.75	698.75	698.75	698.75	698.75	698.75	698.75	698.75	698.75	698.75	***4,646.84***
Rental value of land	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	***5.32***
Subsidized loan	–2,199.23	2,662.40	–1,471.77	1,581.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***130.32***
Total outflows	3,163.82	3,775.45	2,531.28	2,894.57	1,313.05	1,313.05	1,313.05	1,313.05	1,313.05	1,313.05	1,313.05	***14,878.27***
Net cash flows	–1,620.82	–689.45	2,598.72	2,235.43	3,816.95	3,816.95	3,816.95	3,816.95	3,816.95	3,816.95	3,816.95	***13,825.37***
Net cash flows, real US$	–92.62	–39.40	148.50	127.74	218.11	218.11	218.11	218.11	218.11	218.11	218.11	***790.02***

NPV @12% discount rate ETB	**13,825.37**
NPV @12% discount rate US$	**790.02**

[19] The only difference between tables 8 and 9 is the repayment of the loan (subsidized loan line). All other lines of the tables are the same.

Comparison of Interventions A, B, and C

Even though all interventions will yield positive FNPVs, with Intervention A resulting in a greater FNPV, the choice between the interventions will depend on several factors:

1. Intervention A will require higher initial investment expenditures than Intervention B (ETB 7,205 versus ETB 4,315). Within the lifespan of Intervention A, greater quantities of honey will be produced earlier, thus allowing for higher financial returns that will offset the costs associated with the higher initial investment. Such high initial investment requirements, however, will require an equity contribution from the household side, because current policies of MFIs in Ethiopia will allow households to borrow a maximum of ETB 4,000 in the first loan. If the households are able to repay, they will get access to a new loan up to ETB 10,000.
2. The main group of GRAD beneficiaries will be the households, for which the equity contribution required for Intervention A may be a constraint to participate in the program. For such households, Intervention B will be more attractive because of the reduced equity contribution.
3. The success of the complete transition toward modern beekeeping in Interventions B and C will entirely depend on the ability of the households to get a second loan from the MFIs. The MFIs will not provide an additional loan to households that fail to repay the first loan, so the households will need to contribute financial resources generated by other farm activities to repay the first loan. This erases the principal difference of no equity contribution between the two interventions. Some households, however, may prefer not to contribute 28 percent of the needed equity at the beginning of the project and will instead make this contribution in two installments to cover the debt burden, as in the case of Intervention C.
4. In addition to the higher FNPV, Intervention A will also result in GRAD households' achieving stable additional income of US$218 by 2014, as compared to 2016 for Intervention B. Total incremental earnings of Intervention A as compared to Intervention B calculated over the 4-year period of 2012–16 will be equal to US$146.81. (See table 3.) For those households that will be financially capable of making the equity contribution, it will be advantageous to choose Intervention A.
5. Although Interventions B and C will require a second loan to finance the complete transition toward modern beekeeping, this loan will not put a significant financial burden on the households, because the cash flows will be sufficient to cover the households' debt service obligations in full. For Intervention A, however, after the total repayment of the initial investment loan in round 2 of year 2, the household will be free of debt and can continue honey production, fully benefiting from the increased income from honey sales.

Economic Analysis

Differences have emerged between the financial and economic outcomes due to the fact that the financial values do not include all externalities present in the economy. In this case, the only externality will come from increased tax revenues, either directly from the taxation of inputs or indirectly via the FEP. Honey is an exportable commodity in Ethiopia. The FEP for Ethiopia has been estimated to be equal to 6.5 percent (Kuo, 2011). Hence, every incremental unit of foreign exchange (dollars) earned from increased exports will have an economic value to the country of 1.065 times the value of the revenues by the exporters when exchanging the foreign exchange for local currency at the market exchange rate.

To show the true economic impact of the proposed intervention on the Ethiopian economy, the economic values have been derived by adjusting the financial values by the appropriate economic conversion factors. If no distortions are present in the market, then the financial value of an item has been used to measure its economic value.[20]

Table 9 reports that the ENPV obtained in the analysis will be positive for both interventions. The economic opportunity cost of capital of 12 percent has been used while calculating the ENPV. If they are successfully implemented, both interventions will benefit the Ethiopian economy.

When the two interventions are compared, Intervention A will result in total higher production of honey through the full life of the project as compared to Intervention B, mainly because of the larger volume of output that will be produced by Intervention A during first 2 years of the project. On the cost side, farmers eventually will have to purchase the same equipment and the same number of modern beehives for Intervention B as they will for Intervention A. The net results have shown that Intervention A will have a greater ENPV than Intervention B will. The only difference between Interventions B and C is the way the interventions will be financed. This method of investment financing will just be a transfer of resources and hence will not bring any change to the economic outcomes of the interventions. As a result, there is no difference between Interventions B and C. Intervention A will be a better choice not only for the chronically food-insecure households targeted in the GRAD project but also for the Ethiopian economy as a whole, because it will be more productive and create a larger value of financial and economic net benefits.

The estimated ENPVs are presented in table 9, below.

Table 9. ENPVs for Interventions A and B (in US$)

	ENPV
Intervention A	1,130.92
Intervention B	1,007.74

[20] The list of CFs used for the purpose of this analysis is presented in table A in the appendix.

Table 10. Economic resources cash-flow statement for Intervention A (real, ETB)

Line items	CF	Year<<<<	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	PV
Receipts														
-Value of in-house honey consumption	1.09		245.83	491.66	491.66	491.66	491.66	491.66	491.66	491.66	491.66	491.66	491.66	**3,023.82**
-Revenue from honey sale	1.09		2,556.63	5,113.27	5,113.27	5,113.27	5,113.27	5,113.27	5,113.27	5,113.27	5,113.27	5,113.27	5,113.27	**31,447.75**
Total Inflows			2,802.46	5,604.93	5,604.93	5,604.93	5,604.93	5,604.93	5,604.93	5,604.93	5,604.93	5,604.93	5,604.93	**34,471.57**
Expenditures														
Investment costs														
Modern beehive	0.85		2811.85											**2,811.85**
Bee colony	1.00		2100.00											**2,100.00**
Queen excluder	0.85		281.18											**281.18**
Wax	1.06		431.04											**431.04**
Smoker	0.85		118.98											**118.98**
Overall coat	0.73		109.95											**109.95**
Veil	0.73		65.97											**65.97**
Glove	0.80		64.16											**64.16**
Extractor	0.82		262.44											**262.44**
Wax mold	1.00		150.00											**150.00**
Bee forage seedling or seed to plant around	1.00		50.00											**50.00**
Plastic honey container	0.75		67.24											**67.24**
Services costs for beehives														
Sugar for feeding	0.79		223.45	223.45	223.45	223.45	223.45	223.45	223.45	223.45	223.45	223.45	223.45	**1,486.00**
Beehive maintenance	1.00		165.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00	**2,029.57**
Labor cost	1.00		698.75	698.75	698.75	698.75	698.75	698.75	698.75	698.75	698.75	698.75	698.75	**4,646.84**
Rental value of land	1.00		0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	**5.32**
Total outflows			7,600.82	1,253.00	1,253.00	1,253.00	1,253.00	1,253.00	1,253.00	1,253.00	1,253.00	1,253.00	1,253.00	**14,680.55**
Net cash flows			-	4,351.93	4,351.93	4,351.93	4,351.93	4,351.93	4,351.93	4,351.93	4,351.93	4,351.93	4,351.93	**19,791.02**
Net cash flows, real US$			-274.19	248.68	248.68	248.68	248.68	248.68	248.68	248.68	248.68	248.68	248.68	**1,130.92**

ENPV @12% discount rate ETB	**19,791**
ENPV @12% discount rate $US	**1,130.92**

Table 11. Economic resources cash-flow statement for Intervention B (real, ETB)[21]

Line items	CF	Year<<<<	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	PV
Receipts														
-Value of in-house honey consumption	1.09		234.90	469.81	491.66	491.66	491.66	491.66	491.66	491.66	491.66	491.66	491.66	**2,993.39**
-Revenue from honey sale	1.09		1,450.94	2,901.89	5,113.27	5,113.27	5,113.27	5,113.27	5,113.27	5,113.27	5,113.27	5,113.27	5,113.27	**28,367.61**
Total inflows			1,685.85	3,371.70	5,604.93	5,604.93	5,604.93	5,604.93	5,604.93	5,604.93	5,604.93	5,604.93	5,604.93	**31,361.00**
Expenditures														
Investment costs														
Modern beehive	0.85		937.28	0.00	1,874.57									**2,431.67**
Bee colony for modern beehive	1.00		700.00											**700.00**
Transitional beehive	1.00		200.00											**200.00**
Bee colony for transitional beehive	1.00		1000.00											**1,000.00**
Queen excluder	0.85		93.73	0.00	187.46									**243.17**
Wax	1.06		143.68	0.00	287.36									**372.76**
Smoker	0.85		118.98											**118.98**
Overall coat	0.73		109.95											**109.95**
Veil	0.73		65.97											**65.97**
Glove	0.80		64.16											**64.16**
Extractor	0.82		262.44											**262.44**
Wax mold	1.00		150.00											**150.00**
Bee forage seedling or seed to plant around backyard	1.00		50.00											**50.00**
Plastic honey container	0.75		67.24											**67.24**
Services costs for beehives														
Sugar for feeding	0.79		223.45	223.45	223.45	223.45	223.45	223.45	223.45	223.45	223.45	223.45	223.45	**1,486.00**
Modern beehive maintenance	1.00		55.00	110.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00	330.00	**1,723.15**
Transitional beehive maintenance	1.00		10.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**27.86**
Labor cost	1.00		698.75	698.75	698.75	698.75	698.75	698.75	698.75	698.75	698.75	698.75	698.75	**4,646.84**
Rental value of land	1.00		0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	**5.32**
Total outflows			4,951.44	1,053.00	3,602.38	1,253.00	1,253.00	1,253.00	1,253.00	1,253.00	1,253.00	1,253.00	1,253.00	**13,725.51**
Net cash flows			–3,265.59	2,318.70	2,002.55	4,351.93	4,351.93	4,351.93	4,351.93	4,351.93	4,351.93	4,351.93	4,351.93	**17,635.49**
Net cash flows, real US$			–186.60	132.50	114.43	248.68	248.68	248.68	248.68	248.68	248.68	248.68	248.68	**1,007.74**

ENPV @12% discount rate ETB	**17,635**
ENPV @12% discount rate $US	**1,007.74**

[21] There is no difference between Interventions B and C from the economy point of view.

STAKEHOLDER AND BENEFICIARY ANALYSIS

An economic surplus in the economy is created by producing an output that has an economic value greater than the economic cost of the inputs, such as capital, land, and labor that are used to produce the item. The proposed interventions in the honey value chain will yield two groups of beneficiaries: the households engaged in the interventions and the government of Ethiopia.

The results of the analysis reveal that the income of the targeted households will increase. Table 3, presented above, has been designed by treating the opportunity cost of labor as a cash outflow. The opportunity cost of labor will be retained within the family and therefore can be included in the present annual income of the targeted families. Table 12 presents the annual family income profiles, including the opportunity cost of labor, which has been assumed to remain within the family.

Table 12. Annual income of the targeted households, including opportunity cost of family labor (in US$)

Year	Intervention A	Intervention B	Intervention C
2012	–152.44	–119.27	–88.86
2013	53.72	34.92	–31.92
2014	276.94	206.50	207.33
2015	276.94	186.20	186.67
2016–2022	276.94	276.94	276.94

The net income decrease in the first years of the interventions will occur because of the equity contribution. The annual increase in income, presented in table 12, includes the opportunity cost of family labor spent on the beekeeping activities. Each household's net income over the 11-year evaluation period will be US$1,213.04 for Intervention A, US$1,108.68 for Intervention B, and US$1,080.33 for Intervention C.

The other beneficiary of the intervention will be the government, for the following reasons:

- The government will benefit directly from the taxes collected on the inputs and outputs of the intervention. Plastic containers, honey extractor, sugar, and so forth are importable to Ethiopia. The total tax rate applied to these inputs is higher than the foreign exchange premium. The inflow of taxes will reduce the economic cost below its financial cost and generate tax revenue for the government of Ethiopia.
- Modern beehives and smokers are produced domestically, so they are assumed to be internationally non-tradable goods. The inputs used to produce beehives and smokers, such as stainless steel, nails, and covers, are exportable to Ethiopia. Again, the total tax rate applied to these inputs will be higher than the FEP, thus generating tax revenue for the government of Ethiopia.
- The government will also benefit indirectly, because honey is exported from Ethiopia. Exports allow the country to earn foreign exchange.

The total amount of government benefits from the interventions over the 11-year period per household has been estimated to be US$229.28 for Intervention A and US$210.27 for Interventions B and C.

The values of stakeholder gains under each of the interventions are presented in table 13, below.

Table 13. Stakeholder and beneficiary impacts of the project (in US$)

	Intervention A	Intervention B	Intervention C
Economic NPV (FNPV + externalities)	1,130.92	1,007.74	1,007.74
• **Financial NPV (households)**	906.40	796.66	790.02
• **Externalities**	224.51	211.08	217.72
○ **Government**	229.28	210.27	210.27
○ **Financing contribution**	–4.77	0.80	7.45

The financing contribution will be the amount of the interest and other charges paid on the three loans provided by MFIs over and above a real cost of 12 percent. This figure represents a transfer of resources between the households and the MFIs. USAID/Ethiopia generally negotiates subsidized interest rates for households benefiting from aid programs. The negative financing contribution in the case of Intervention A represents a direct subsidy to the targeted households that will be created through the submarket interest rate. In the case of the GRAD project, the subsidized interest rate will be 15 percent, which is 5 percent below the current level of inflation in Ethiopia. However, the additional fees charged by the MFIs to make them willing to provide loans will more than offset the subsidy content of the interest rate paid on the loan in the case of Interventions B and C.

Exact information regarding the number of households that will engage in beekeeping activities does not exist, but assuming that 70 percent of the chronically food-insecure households participate (the main group of the GRAD beneficiaries)—that is, 70 percent of 50,000 households will participate in beekeeping eventually (not necessary in year 1 of the project)—it is possible to calculate combined stakeholder and beneficiary impacts of the project. Figures are presented in Table 14.

Table 14. Combined stakeholder and beneficiary impacts of 35,000 households in the project (in thousands US$)

	Intervention A	Intervention B	Intervention C
Economic NPV (FNPV + externalities)	39,582.20	35,270.90	35,270.90
• **Financial NPV (households)**	31,724.00	27,883.10	27,650.70
• **Externalities**	7,857.85	7,387.80	7,620.20
○ **Government**	8,024.80	7,359.45	7,359.45
○ **Financing contribution**	–166.95	–28.00	260.75

SENSITIVITY ANALYSIS

A sensitivity analysis for the GRAD honey value chain intervention has been performed using the key variables that will be prone to change and likely to influence the situation of the households engaged in the project. These variables include the price and yield of honey as well as their joint impact. Details related to this sensitivity analysis are outlined in tables 15, 16, 17, and 18, below.

The Joint Impact of Honey Price and Yield of the FNPV for Intervention A

Because prices and yields of honey are two of the most important factors that will influence the households' income, it is prudent to consider the possible impacts of changing one of their values in a sensitivity analysis. The joint impact of these two variables for Intervention A is presented in table 15, below.

Table 15. The joint impact of honey price and yield on the FNPV of households for Intervention A

Yield (in kg)	**12.00**	**15.00**	**17.00**	**19.00**	**21.00**
43.00	**308.50**	518.91	659.18	828.23	1,005.99
45.00	349.24	569.43	721.74	906.40	1,094.17
50.00	**451.08**	695.75	896.59	1,104.71	**1,315.58**
60.00	654.77	1,000.66	1,252.32	1,505.35	1,758.39
70.00	877.99	1,315.58	1,610.79	1,906.00	**2,201.21**
Price (in ETB)					

Table 15 shows the joint impact of the honey price and honey yield on the FNPV under Intervention A (three modern beehives with related tools and training). The scenario for this analysis has assumed that the price of honey will be ETB 45/kg and the yield will be 19 kg/round. (This honey price has been based on the assumption that the household will produce yellow honey, which fetches lower prices in the domestic market.) Under these circumstances, the FNPV will be US$906.40. But it is safe to assume that given the current high demand and rather low supply of honey in the domestic market, the price of yellow honey will increase in the future. Therefore, the FNPV will likely be higher. Even in the worst-case scenario, if prices were to drop to ETB 43/kg and the yield were to decrease from 19 kg/round to 12 kg/round, the FNPV will still be positive at US$308.50, which indicates very low risk of intervention failure at the household level.

Table 16. The joint impact of honey price and yield on the net cash flow of households for Intervention A

Yield (in kg)	**12.00**	**15.00**	**17.00**	**19.00**	**21.00**
43.00	**101.88**	146.11	175.60	205.08	234.57
45.00	110.11	156.40	187.25	**218.11**	248.97
50.00	**130.68**	182.11	216.40	250.68	**284.97**
60.00	171.83	233.54	274.68	315.83	356.97
70.00	212.97	284.97	332.97	380.97	**428.97**
Price (in ETB)					

Table 16 presents the joint impact of honey yield and price on the net cash flow of the targeted households in 2014 and after, when the loan will be repaid and cash flows will be stable. Under the baseline scenario, the annual net cash flow will be US$218.11. If the price were ETB 70.00 and the yield were 19 kg, the net cash flow will reach US$380.97, which is even higher than the targeted income increase of US$365.00. Currently, however, only white honey will be able to fetch such high price levels in the domestic market. The findings suggest that households in the areas where bees produce white honey will easily reach the targeted increase in income.

Table 17 presents the joint impact of honey price and honey yield on the FNPV under Intervention B. The FNPV in this case will be US$796.66. In the worst-case scenario, the FNPV will be lower under Intervention B than under Intervention A but will still be positive at US$227.11, which again indicates low risk.

Table 17. The joint impact of honey price and yield on the FNPV of households for Intervention B

Yield (in kg)	**12.00**	**15.00**	**17.00**	**19.00**	**21.00**
43.00	227.21	437.62	577.90	729.36	881.69
45.00	266.36	486.55	637.25	**796.66**	956.44
50.00	364.22	610.69	787.81	965.34	1,144.29
60.00	559.95	876.37	1,090.59	1,305.42	1,520.25
70.00	770.09	1,144.29	1,394.93	1,645.57	1,896.21
Price (In ETB)					
Price (in ETB)					

Table 18 describes the joint impact of honey price and yield on the annual net cash flow of the beneficiaries of Intervention B after 2016, when both of the loans will be repaid and cash flows will be stable. The baseline scenario will yield a net annual cash flow of US$218.11. If the price of white honey were to reach ETB 70.00, the net increase in annual income, excluding the opportunity cost of family labor, will reach US$380.97, holding the yield constant. This figure is again higher than the targeted increase of US$365.00.

Table 18. The joint impact of honey price and yield on the FNPV of households for Intervention B

Yield (in kg)	**12.00**	**15.00**	**17.00**	**19.00**	**21.00**
43.00	101.88	146.11	175.60	205.08	234.57
45.00	110.11	156.40	187.25	218.11	248.97
50.00	130.68	182.11	216.40	250.68	284.97
60.00	171.83	233.54	274.68	315.83	356.97
70.00	212.97	284.97	332.97	380.97	428.97
Price (in ETB)					

If the nationwide production of honey continue to be limited, and with the increasing popularity of good-quality honey, the prices may go higher. In the best-case scenario for Intervention A, if prices were to reach ETB 70/kg (more relevant price for white honey) and yields were to reach 21 kg/round, the FNPV will be US$2,201.21. In Intervention B, under the same circumstances, the FNPV will reach US$1,896.21. The net annual cash flow accruing to the households at this combination of yield and price will provide an additional US$428.97 per year after the loan has been paid in 2013 under Intervention A and in 2015 under Intervention B. If domestic production could be substantially increased, it is likely that the processing costs and perhaps the fob price for honey exports will fall, allowing Ethiopian honey to become more competitive in the international market.

RECOMMENDATIONS

Interventions A and B show a good potential for a substantial increase in income and economic impact for the households targeted by the GRAD project. USAID should support their implementation. They appear to have the ability to improve the livelihood and food security of the targeted households. That said, regardless of their potential, Interventions A and B on their own may not guarantee an increase of US$365 in the households' yearly income, as hoped for in the GRAD proposal. However, when combined with other income-generating activities, they may allow households to achieve the additional US$365/year. Another important benefit of these interventions is the almost nonexistent requirements for land. Taking into consideration the very limited land holdings of GRAD beneficiaries and their almost complete reliance on this land as a source of income, these interventions are attractive, because they will allow households to earn additional income without changing their current land usage. An intervention will also allow households to benefit from an additional MFI loan in year 3, after complete repayment of the initial loan for honey production, for purchasing more beehives or participating in other proposed GRAD interventions, such as haricot beans production. Therefore, it will be advisable to combine this intervention with another commodity intervention proposed in the GRAD project, introducing them as a "package solution" to achieve the desired increase in households' yearly income.

It is debatable whether farmers will be able to repay a free market interest loan at 50 percent interest if they need to borrow their "equity" contributions. Taking into consideration that the farmers will first try to repay the free market loan, the risk of default on the USAID loan will be high. The debt service from the two loans will be so significant that farmers may either refuse to participate in the beekeeping intervention or fail to repay the USAID-backed loan. Many GRAD households have no access to free market loans, as their current financial situation is such that financial institutions are unwilling to lend money to them. Reducing the required amount of money necessary for a down payment might better facilitate the implementation of Intervention A, ensuring that the targeted households will be able to join the project and benefit from its outcome.

The analysis also reveals that Intervention B, which has been designed to eliminate the equity contribution for households that will not be able to take a financial stake in the investment, will eventually require the households to contribute other resources to repay their debt services. This structure, however, may be preferred by many farmers, because the equity contribution will be divided into two parts, thus making it easier for them to find the required financial resources.

In summary, it is recommended that the burden of the initial down payment (28 percent) that is required from each targeted household to participate in the GRAD intervention in the honey value

chain be lessened. An ideal financing package will eliminate the down-payment requirements by increasing the size of the USAID-backed loan and increasing the length of the repayment period for Intervention A to 3 years. In principal, it is a good practice to require households to take a financial stake in the project by forcing them to contribute their own money, yet such a system might prevent some farmers from choosing honey production as an intervention.

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APPENDIX

Table A. The FtF indicators proposed for the monitoring and evaluation of the GRAD project

Results	Indicator	Target
Overall objective: To graduate chronically food-insecure households from food support	Graduation of chronically food-insecure households from food aid by increasing their yearly household income	50,000 households that will experience an increase in yearly income of US$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) – delete it	Higher is better
	3.1.9.1-3 and 4.7-4 Prevalence of households with moderate or severe hunger (RiA)	Lower is better
Result 2: Improved community and household resilience	3.1.9-16 Prevalence of underweight children under 5 years of age (R)-delete it	Lower is better
	3.1.9-13 Prevalence of underweight women (R)	Lower is better
	3.1.9-4 and 3.1.9.1-4 Prevalence of exclusive breastfeeding of children under 6 months of age (RiA)	Lower is better
	3.1.9-11 Prevalence of stunted children under 5 years of age (R)	Lower is better
	4.5.2-14 Number of vulnerable households benefiting directly from USG assistance (S)	Lower is better
Result 3: Strengthened enabling environment	4.5 Women's Empowerment in Agriculture Index Score (R)	Higher is better

to promote scale-up and sustainability	4.5.1-27 and CBLD-5 Percentage of combined key areas of organization capacity among USG direct and indirect local implementing partner levels	Higher is better
	4.5.2-38 Value of new private sector investment in the agriculture sector or food chain leveraged by FtF implementation (RiA)	Higher is better

Table B. List of CFs used to make adjustments in the economic analysis for both interventions

Summary of CFs	
Honey	**1.09**
Transportation	**0.84**
Labor	**1.00**
Modern beehive	**0.85**
Transitional beehive	**1.00**
Bee colony	**1.00**
Queen excluder	**0.85**
Wax (ETB/kg)	**1.06**
Smoker	**0.85**
Overall coat	**0.73**
Veil	**0.73**
Glove	**0.80**
Extractor	**0.82**
Wax mold	**1.00**
Plastic honey container	**0.75**
Beehive maintenance	**1.00**
Rental value of land	**1.00**
Sugar	**0.79**