



**USAID** | **ETHIOPIA**  
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**COST-BENEFIT ANALYSIS OF THE  
MILK-PROCESSING PLANT ENHANCEMENT  
IN JIJIGA CITY, ETHIOPIA**

**PASTORALISTS RESILIENCE IMPROVEMENT AND  
MARKET DEVELOPMENT (PRIME)**

**FINAL REPORT**

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**UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT**

***LEARNING, EVALUATION, AND ANALYSIS PROJECT***

**(AID-OAA-C-11-00169)**

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IN JIJIGA CITY, ETHIOPIA**

**FINAL REPORT**

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## ACRONYMS

ADSCR	Annual Debt Service Coverage Ratio
CBA	Cost-Benefit Analysis
CF	Conversion Factor
CIF	Cost, Insurance, and Freight
ENPV	Economic Net Present Value
EOCK	Economic Opportunity Cost of Capital
ETB	Ethiopian Birr (Currency)
FEP	Foreign Exchange Premium
FIFO	First-in-First-out
FNPV	Financial Net Present Value
FtF	Feed the Future (Program)
GDP	Gross Domestic Product
GRAD	Graduation With Resilience to Achieve Sustainable Development
NCF	Net Cash Flow
NPV	Net Present Value
PRIME	Pastoralists Resilience Improvement and Market Development
TOP	Transiting Out of Pastoralism
VAT	Value Added Tax
UHT	Ultra-High Temperature Processing
US\$	United States Dollar
USAID	United States Agency for International Development

## EXECUTIVE SUMMARY

USAID/Ethiopia started to implement a 5-year US\$48.75-million Pastoralists Resilience Improvement and Market Development (PRIME) project in 2012. PRIME's overall goal is to reduce hunger and poverty, and this specific project's objectives are to increase household incomes and enhance resilience to climate change through market linkages. The design and implementation of the project is based on the interaction between climate change, pastoralism/livestock, and chronic vulnerability. The project will attain these objectives through a multifaceted approach that includes

- fostering the growth and competitiveness of livestock value chains;
- addressing the needs of very poor and chronically food-insecure households through value-chain interventions; and
- improving the policy environment through a continuous evaluation and learning process via collaboration and linkages.

The key livestock value chains are cattle, camels, and sheep/goats. Livestock products include live animals, meat, milk, hides, skins, and leather.

**Project Description:** The objective of this commercial milk-processing plant analysis is to understand the situation at the ground level and to analyze a number of possible PRIME interventions designed to reduce potential risks of the private investor operating in the highly undeveloped region of the country. Field visits were used to collect primary data that were compared with credible publications and, when necessary, suitably adjusted. The adjusted data were then used to construct cost-benefit analysis (CBA) models of the proposed interventions. The CBA models were designed to assess financial and economic outcomes of the interventions, such as the financial net present value (FNPV) and the economic net present value (ENPV), as well as to conduct a beneficiary's analysis. The CBA models were built to be easily updated by changing the key parameters of the interventions in each model's table of parameters. The models can then automatically recalculate all corresponding figures.

The key observations from the field visits were as follows:

1. The region surrounding Jijiga City has an excess raw-milk supply. The interviewed raw-milk traders claimed that they currently are able to purchase only about 50 to 60 percent of the raw milk that pastoralists bring to the milk-collection area. The traders in one of the milk-collection points also stated that they are easily able to collect an additional 4,000 liters of raw milk per day for the milk-processing plant during the dry period of the year, while in the wet season, the amount of milk in the area is almost unlimited.
2. The milk-processing plant collects raw milk from more than 10 raw-milk collection points and cooperatives. The head of the interviewed cooperative stated that per day, it collects around 12,000 liters of raw milk. The smallholders of only one woreda supply this quantity of raw milk.
3. The field visits did not reveal any potential constraints on the raw-milk supply side.
4. The pastoralists frequently smoke plastic jerricans to clean them, which produces a specific taste in the milk.
5. The traders also stated that due to the large quantities of raw milk demanded by the milk-processing plant, because of the economies of scale, they provide milk at a discounted price level. The current price of raw camel's/cow's milk is Ethiopian Birr (ETB) 65.00/5 liters, or US\$3.61/5 liters; however, the traders sell large quantities at ETB 55.00/5 liters, or US\$3.05/5 liters.

6. The small local shops in Jijiga City also sell imported ultra-high temperature processed (UHT) milk, despite the region's excess supply of raw milk. The reason is, perhaps, the cultural preferences of pastoralists; they prefer to drink milk throughout the day, but raw milk is available only in mornings and evenings. The local pasteurized milk production in this case could represent a substitute for imported UHT milk.
7. The milk-processing plant will be the first-mover in the region, particularly in the case of camel's milk in Ethiopia. Pastoralist communes located in different urban areas of the country have great demand for pasteurized camel's milk, so the facility will target this market niche. In addition, 40 percent of the pasteurized camel's milk will be exported to Somalia, mainly to Hargessa City.

**Strategic Context and Rationale:** The USAID/Ethiopia PRIME project is part of the wider strategy of the Feed the Future (FtF) program, which supports investments in profitable and relatively easy-to-implement interventions in agricultural value chains. FtF's goal is to reduce poverty and hunger in a sustainable manner.

The intervention evaluated in this study proposes enhancement of the commercial milk-processing facility in Jijiga City. The Somali region of Ethiopia is largely undeveloped. For a long time, the unstable economic environment prevented private investors from investing in the region. The PRIME intervention will reduce the potential risks for the private investor in an attempt to create a successful demonstration mechanism to attract other private investors. In addition, the increased demand for raw milk is expected to allow the milk-supplying households to sell part of the raw milk that would otherwise be used in a less remunerative ways, thereby creating net benefits for the households.

**Intervention:** The proposed intervention is the enhancement of the milk-processing plant operations. Two scenarios of the interventions have been analyzed:

1. **Moderate enhancement intervention:** Under the moderate enhancement intervention, USAID would provide a financial subsidy for the purchase of four refrigerator trucks to allow the processing plant to reach an operating capacity of 10,000 liters/day without delay. Without the USAID subsidy, the processor will be able to process 3,000 liters/day in year 1 (30 percent of production capacity), 5,000 liters/day in year 2 (50 percent of capacity), and 7,500 liters/day in year 3 (75 percent of capacity), eventually reaching full production capacity (10,000 liters/day) in year 4. With USAID's support, the processing plant will be able to operate at full capacity starting in year 1 of the project.
2. **Aggressive enhancement intervention:** Under the aggressive enhancement intervention, USAID would provide a financial subsidy for the purchase of eight refrigerator trucks and equipment to allow the processing plant to increase production gradually from 11,250 liters/day to 16,250 liters/day. With USAID's support, the processing plant will start operating at 11,250 liters/day in year 1 (45 percent of production capacity) and increase to 12,500 liters/day in year 2 (50 percent of production capacity), 15,000 liters/day in year 3 (60 percent of production capacity), and 16,250 liters/day in year 4 and thereafter (65 percent of production capacity). It is assumed that the processing plant will never reach 100 percent operating capacity due to the limited demand for the pasteurized milk in the area. Without this additional financing, the baseline operations will be the same as in the moderate intervention above.

**Financial and Economic Analysis Results:** The CBA has been carried out for a 20-year project life span. The main assumption of this analysis is that the private entrepreneur would receive a financial subsidy from USAID to cover part of the investment cost. The analysis has been conducted on an incremental basis. Two scenarios of the intervention have been analyzed; the total investment cost and the corresponding USAID subsidy for each scenario are presented in table A, below.

**Table A. Total investment cost of the milk-processing plant establishment (million ETB, real)**

Line item	“Without intervention” scenario	Moderate enhancement	Aggressive enhancement
Land	0.45	0.45	0.45
Electricity connection	0.25	0.25	0.25
Buildings	1.90	1.90	1.90
Cost, insurance, and freight (CIF) cost of machinery and equipment	6.30	6.30	<b>9.90</b>
Vehicles (2012)	1.90	<b>6.98</b>	<b>12.05</b>
Vehicles (2014)	1.27	-	-
Vehicles (2015)	1.27	-	-
Vehicles (2016)	2.54	-	-
Borehole construction	1.20	1.20	1.20
Generator	0.45	0.45	0.45
Office furniture	0.30	0.30	0.30
Local transportation of the machinery to the project site (ETB)	0.08	0.08	0.12
<b>Total investment cost</b>	<b>17.91</b>	<b>17.91</b>	<b>26.62</b>
<b>Total USAID investment required (thousands US\$)</b>	<b>0</b>	<b>282.00</b>	<b>766.22</b>

The private entrepreneur without the USAID subsidy will be able to purchase only one refrigerator truck, which will put a constraint on operational capacity. With only one truck, the milk-processing plant will not be able to collect 10,000 liters of raw milk and distribute 10,000 liters of pasteurized milk per day. Under the moderate enhancement scenario, the USAID subsidy will be used to purchase four trucks and enable the facility to operate at full capacity starting the first day of the operations. In the aggressive enhancement scenario, the USAID subsidy will be used to purchase eight refrigerator trucks and additional equipment to reach an increase in production potential to 25,000 liters per day.

The analysis has been carried out over a 20-year period. The incremental FNPV has been calculated using a 12 percent real discount rate, and the incremental ENPV has been calculated using a 12 percent real economic opportunity cost of capital (EOCK). The FNPV and the ENPV for both scenarios are presented in table B, below.

**Table B. Incremental FNPVs and ENPVs of the interventions (US\$ million)**

Intervention	FNPV	ENPV
<b>Moderate enhancement (owner point of view)</b>		
“Without intervention” scenario (A)	2.70	-
“With intervention” scenario (B)	4.12	-
Incremental Analysis (A–B)	1.42	1.99
<b>Aggressive enhancement (owner point of view)</b>		
“Without intervention” scenario (A)	2.70	-
“With intervention” scenario (B)	5.74	-
Incremental analysis (A-B)	3.04	6.53

The positive FNPV of the “without intervention” scenario suggests that the investment by itself will generate tangible financial returns for the private investor. However, significant risks are associated with any first-mover investments. Risks are also associated with the region’s historically unstable situation.



The incremental FNPV of US\$1.42 million, with the moderate enhancement intervention, suggests that the financial returns to the entrepreneur would increase by 52.6 percent due to the financial subsidy of US\$282,000.00. Such a big increase in the financial returns to the entrepreneur indicates that USAID’s support would enable the project to better utilize its production capacity, hence reducing the risks for the private investor. With the aggressive enhancement intervention, the financial returns would increase by 112.6 percent, with the incremental FNPV equal to US\$3.04 million.

The ENPV is also positive in the both scenarios, using a 12 percent EOCK. The differences between the financial and the economic outcomes of the project arise from the fact that the financial values do not include all the externalities presented in the project. In the case of the milk-processing plant operations, the differences would develop because of three factors:

- Milk is an internationally tradable good. Ethiopia currently imports significant amounts of dairy products. Internationally tradable goods, when imported, use foreign exchange resources of the country. The foreign exchange premium (FEP) for Ethiopia was reported to be 6.5 percent (Kuo, 2011), so every incremental dollar spent on imports would have an economic cost of 1.065 times the market exchange rate.
- Forty percent of the camel’s milk would be exported to Somalia. The project therefore would convert previously nontradable camel’s milk into an exported commodity. The increased exports would bring foreign exchange to the country. Every incremental dollar earned on exports would have a financial value of 1.065 times the market exchange rate.
- Transportation costs are also incurred when milk is collected and distributed to different markets. High tax rates are assessed on fuel required for transportation. Although these taxes on fuel are a component of the financial cost of transportation, they have not been included in the project’s economic cost.
- The financial cost of the inputs used in the facility operations would differ from their true economic costs due to taxes.

The project will also borrow ETB 6.38 million, or US\$0.35 million, from the Ethiopian Development bank at an interest rate of 8.5 percent. The repayment period is 8 years, with the first year being a grace period.

The financial analysis reveals that without USAID’s support, the milk-processing facility will have insufficient net cash flow to cover the loan repayment obligation for the first year of the facility operations. The annual debt service coverage ratios (ADSCRs) for the “without intervention” scenario as well as for the moderate and aggressive facility-enhancement scenarios are presented in table C, below.

**Table C. Annual debt service coverage ratios**

<b>Intervention</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>
“Without intervention”	-1.32	1.18	8.96	17.86	34.20	28.81	36.87
Moderate enhancement	3.77	16.64	21.11	26.82	34.21	28.62	36.70
Aggressive enhancement	1.63	16.50	25.67	39.25	53.10	44.15	56.56

The only negative ADSCR would occur in 2013 in the “without intervention” scenario. The ADSCR of 1.18 (in the same case) in 2014 has been derived by adding the unpaid fraction of the debt service in 2013 to the debt service in 2014. The assumption has been made that the development bank will not apply any penalties to the project because of the late repayment. The project will not have any difficulties with repayment of the loan under both the moderate and the aggressive enhancement scenarios.

**Beneficiary Analysis Results:** The results of the analysis reveal six main stakeholders in the interventions. The first beneficiary of the intervention would be the entrepreneur, who will benefit because of the subsidy from USAID.

The second group of beneficiaries would be the households supplying raw cow's and camel's milk to the project. Limited demand for raw milk in the region is forcing the households to use milk in a less productive manner. Excess milk that cannot be sold is fed to the heifers or processed to make butter and cheese. Part of the milk may also spoil. The milk-processing facility will increase the demand for raw milk, yielding a net benefit to the milk-supplying households that has been assumed to be 20 percent of the value of the raw milk.

The milk traders would also benefit from the increased demand for the raw milk. The net profit margin for the traders has been estimated at 5 percent of the milk price. Traders currently purchase raw milk at ETB 10.00/liter, or US\$0.56/liter, and would sell to the facility at ETB 11.00/liter, or US\$0.61/liter. The gross trader's margin has therefore been estimated to be 10 percent. The traders, however, also have operating costs, which should be deducted to realistically represent the net benefits.

The milk-processing facility would need to pay a higher wage rate to attract suitable labor. The government of Ethiopia would also require the facility make a social insurance contribution. Some of the labor employed by the project may be sourced from people who would otherwise spend a greater fraction of their time unemployed.

The milk-processing plant would contribute 5 percent of its annual net income to the local community, perhaps in the form of schools, small hospitals, and other public places in collaboration with the government and other private investors. This 5 percent contribution, in addition to the charity basis, has some business logic behind it; for this type of the business, it is important to form relationships with a reliable set of raw-material suppliers. The contribution would assist the facility by helping it develop a culture of trust within the community.

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

- The government would benefit directly from the taxes collected on the inputs and outputs of the intervention. The government will also collect the income tax after the 5-year tax holiday period ends.
- The government would also benefit indirectly, because 40 percent of the pasteurized camel's milk will be exported from Ethiopia. Exports allow the country to earn foreign exchange; hence, the taxes reflected by the FEP will be an additional benefit.
- Significant quantities of dairy products are imported to Ethiopia, which pays foreign exchange when importing them. The project will increase the pasteurized milk production, which to some extent can serve as a close substitute for the imported UHT milk, hence reducing the quantity of imports and saving foreign exchange for the country.

The analysis assumes that the total benefits arising to the government of Ethiopia would be distributed among the Ethiopian population. The Ethiopian government's spending is reported by the World Bank to be US\$33.79 per capita. The present value of US\$33.79 over the 20-year period that has been analyzed is equal to US\$283.00.

The last stakeholder of the interventions is USAID. In this case, USAID would incur a negative financial externality, because it would provide the financial subsidy to the private investor.

The total number of beneficiaries, the present value of benefits per beneficiary, and the total economic benefits of the intervention are reported in tables D and E for the moderate enhancement and aggressive enhancement interventions, respectively.

**Table D. Impact analysis of moderate enhancement of the milk-processing plant**

Value chain/intervention	Number of households	Present value of benefits/unit	Total present value of economic benefits
1. Smallholders supplying cow's milk	490	US\$343.30	US\$0.17 mill
2. Smallholders supplying camel's milk	569	US\$549.28	US\$0.31 mill
3. Milk traders supplying cow's milk	30	<b>US\$1,381.08</b>	<b>US\$0.04 mill</b>
4. Milk traders supplying camel's milk	28	US\$2,762.17	US\$0.08 mill
5. Recipients of the government expenditures	600	US\$283.00	US\$0.17 mill
6. Jijiga City community	NA	NA	US\$0.08 mill
7. Private entrepreneur	1	US\$1.42	US\$1.42 mill
<b>TOTAL</b>	<b>1,718</b>		<b>US\$2.27 mill</b>

**Table E. Impact analysis of aggressive enhancement of the milk-processing plant**

Value chain/intervention	Number of beneficiaries	Present value of benefits/unit	Total present value of economic benefits
1. Labor	83	US\$2,354.43	US\$0.20 mill
2. Smallholders supplying cow's milk	578	US\$1,187.45	US\$0.69 mill
3. Smallholders supplying camel's milk	670	US\$1,899.92	US\$1.27 mill
4. Milk traders supplying cow's milk	41	US\$4,186.53	US\$0.17 mill
5. Milk traders supplying camel's milk	46	US\$6,977.55	US\$0.32 mill
6. Recipients of the government expenditures	5,143	US\$283.00	US\$1.46 mill
7. Jijiga City community	NA	NA	US\$0.16 mill
8. Private entrepreneur	1	US\$3.04 mill	US\$3.04 mill
<b>TOTAL</b>	<b>6,562</b>		<b>US\$7.31 mill</b>

**Conclusions and Recommendations:** The CBA analysis of the milk-processing plant shows that the enhancement interventions would produce a positive incremental FNPV. A significant reduction of the financial risk facing the private investor would be derived.

The CBA also reveals that donor support would allow the facility to overcome a projected cash shortage during the first year of the loan-repayment period. This important finding suggests that the project would face financing problems without donor funds.

The positive incremental ENPV of the interventions suggests that, in addition to reducing risk for the entrepreneur, the interventions would benefit a number of stakeholders, including the pastoralist households.

The market study conducted by the entrepreneur suggests that exports of the pasteurized camel's milk can be sold at a price of US\$1.50 per liter. Such a high price can be explained by the current absence of camel's milk in Hargessa City in Somalia and the strong cultural preferences for camel's milk among the Somalia people. The CBA reveals that the government of Somalia would charge a 10 percent value-added tax (VAT) payment and other taxes for the imported milk, so the net after-tax price of camel's milk used in the analysis is US\$0.97/liter. This is, however, still a very high price for the milk. If the price of camel's milk in the export market were to drop, it would have a strong negative impact on the facility's profitability.

The facility will also need to compete with raw milk traders for market share. The actual ability of this producer of pasteurized-milk products to compete for market share with less-expensive raw milk should be monitored and evaluated by the local implementer of the PRIME project.

The facility cannot currently penetrate the large market for pasteurized milk in Addis Ababa due to the high cost of raw materials; the raw milk supplied to the facility comes at a price of ETB 11.00 per liter. In contrast, the milk-processing companies supplying pasteurized milk to the Addis Ababa market are able to purchase raw milk at prices in the range of ETB 5.00 to ETB 8.50/liter, depending on the supply area.

# **PRIME ENHANCEMENT OF THE MILK-PROCESSING PLANT: COST-BENEFIT ANALYSIS**

## **Project Background**

The growth rate of Ethiopian real gross domestic product (GDP) in 2011 was 7.5 percent. Ethiopia, however, is still one of the poorest countries in the world. Currently, about 8 million Ethiopians, out of the total population of 93 million,<sup>1</sup> live with chronic food insecurity (CIA World Fact Book, 2012). Each year between June and October, more than 60 percent of Ethiopian rural households experience significant food shortages (USAID Ethiopia GRAD CBA 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 situation is one of the main reasons that USAID/Ethiopia supports various initiatives to increase food security for Ethiopia's most vulnerable inhabitants.

USAID/Ethiopia was awarded a 5-year US\$48.75-million contract under the U.S. government's Feed the Future (FtF) Initiative, which will serve as part of USAID's own FtF program. Specifically, Pastoralists Resilience Improvement and Market Development (PRIME) is part of the second component of the USAID/Ethiopia FtF strategy: linking vulnerable populations to the markets. Under this component, USAID/Ethiopia seeks to build capacity and promote the "market readiness" of targeted households that are transiting out of pastoralism (TOP) by supporting the development of sustainable livelihoods and creating economic linkages between the chronically food-insecure regions of pastoral Ethiopia and productive areas of Ethiopia.

The project's objective is to increase household incomes and enhance resilience to climate change through market linkages. The project's design and implementation are based on the interaction between climate change, pastoralism/livestock, and chronic vulnerability. The project will attain these objectives through a multifaceted approach that includes

- fostering the growth and competitiveness of livestock value chains;
- addressing the needs of the very poor and chronically food-insecure households through value-chain interventions; and
- improving the policy environment via a continuous evaluation and learning process through collaboration and linkages.

The key livestock value chains are cattle, camels, and sheep/goats. Livestock products include live animals, meat, milk, hides, skins, and leather.

## **Commodity Background**

### ***Current Situation in Ethiopian Dairy Production***

Ethiopian farmers have had a long tradition of animal husbandry. It is estimated that Ethiopia possesses the largest number of livestock in Africa, comprising about 59 million cattle, 35 million sheep, and 31 million goats (Negassa, Rashid, and Gebremedhin, 2011). Given the total Ethiopian population of 93 million people, the per-capita livestock holding is still very low (about 1.3 animals per capita); the livestock holding per capita in Kenya, for example, is 1.43 animals.

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<sup>1</sup> Per CIA World Fact Book estimation from July 2012.

Ethiopia has about 10 million dairy cows, which produce 3.2 billion liters of milk per year. The production per cow is estimated at approximately 1.54 liters per day for an average lactation period of 6 months.

The Ethiopian pastoralists' milk-production system is based on free grazing, with very limited (and frequently zero) provision of additional feed for the cattle. Cattle rearing play a central role in the pastoralism and agro-pastoralism livelihoods. The reduced mobility of this population over time has resulted in the households' selling more milk to generate cash to purchase grains and other food. The share of the marketed milk is about 70 percent of the total milk collected, contributing considerably to the households' income.

## **Project Description and Activities**

### ***PRIME Interventions in the Milk Value Chain***

The objective of the analysis of the commercial milk-processing plant is to understand the situation at the ground level and to analyze a number of possible PRIME interventions designed to reduce potential risks for the private investor operating in this highly undeveloped region of the country.

The proposed intervention is the enhancement of milk-processing plant operations. Two different intervention scenarios have been analyzed:

- 1. Moderate enhancement intervention:** Under the moderate enhancement intervention, USAID would provide a financial subsidy for the purchase of four refrigerator trucks to allow the processing plant to reach an operating capacity of 10,000 liters/day without delay. Without the USAID subsidy, the processor would be able to process 3,000 liters/day in year 1 (30 percent of production capacity), 5,000 liters/day in year 2 (50 percent of capacity), and 7,500 liters/day in year 3 (75 percent of capacity), eventually reaching full production capacity (10,000 liters/day) in year 4. With USAID's support, the processing plant would be able to operate at full capacity starting in year 1 of the project.
- 2. Aggressive enhancement intervention:** Under the aggressive enhancement intervention, USAID would provide a financial subsidy for the purchase of eight refrigerator trucks and equipment to allow the processing plant to increase production gradually from 11,250 liters/day to 16,250 liters/day. With USAID's support, the processing plant would start operating at 11,250 liters/day in year 1 (45 percent of production capacity), 12,500 liters/day in year 2 (50 percent of production capacity), 15,000 liters/day in year 3 (60 percent of production capacity), and 16,250 liters/day in year 4 and thereafter (65 percent of production capacity). It has been assumed that the processing plant would never reach 100 percent operating capacity due to the limited demand for pasteurized milk in the area. Without this additional financing, the baseline situation would be the same as in the moderate intervention, above.

Field visits were used to collect primary data that were compared with credible publications and, when necessary, suitably adjusted. The adjusted data were then used to construct cost-benefit analysis (CBA) models of the proposed interventions. The CBA models were designed to assess financial and economic outcomes of the interventions, such as financial net present value (FNPV), economic net present value (ENPV), and annual debt service coverage ratios (ADSCRs), as well as to conduct a beneficiary's analysis. The CBA models were built to be easily updated by changing the key parameters of the interventions in each model's table of parameters. The models can then automatically recalculate all corresponding figures.

The total investment cost and the corresponding USAID subsidy for each scenario are presented in table 1, below.

**Table 1. Total investment cost of the milk-processing plant establishment (million ETB, real)**

Line item	“Without intervention” scenario	Moderate enhancement	Aggressive enhancement
Land	0.45	0.45	0.45
Electricity connection	0.25	0.25	0.25
Buildings	1.90	1.90	1.90
<b>Cost, insurance, and freight (CIF) cost of machinery and equipment</b>	6.30	6.30	<b>9.90</b>
Vehicles (2012)	1.90	<b>6.98</b>	<b>12.05</b>
Vehicles (2014)	1.27	-	-
Vehicles (2015)	1.27	-	-
Vehicles (2016)	2.54	-	-
Borehole construction	1.20	1.20	1.20
Generator	0.45	0.45	0.45
Office furniture	0.30	0.30	0.30
Local transportation of the machinery to the project site (ETB)	0.08	0.08	0.12
<b>Total investment cost</b>	<b>17.91</b>	<b>17.91</b>	<b>26.62</b>
<b>Total USAID investment required (thousands US\$)</b>	<b>0</b>	<b>282.00</b>	<b>766.22</b>

Without the USAID subsidy, the private entrepreneur would be able to purchase only one refrigerator truck, which would put a constraint on operational capacity. The milk-processing plant, having only one truck, would not be able to collect 10,000 liters of raw milk and distribute 10,000 liters of pasteurized milk per day. Under the moderate enhancement scenario, the USAID subsidy would be used to purchase four trucks and enable the facility to operate at full capacity starting on day one of the operations. Under the aggressive enhancement scenario, the USAID subsidy would be used to purchase eight refrigerator trucks and additional equipment that would facilitate an increase in production to 25,000 liters per day.

### Technical Coefficients

The milk-processing plant would produce five different products; cheese, butter, yogurt, and pasteurized milk would be produced from cow’s milk, and only camel’s milk would be pasteurized.

- **Production coefficients:** One liter of raw cow’s milk would yield the following range of products:
  - ✓ Pasteurized cow’s milk, 0.72 liters
  - ✓ Cheese, 8.57 grams
  - ✓ Yogurt, 60 grams
  - ✓ Butter, 11.40 grams
- Yogurt would be packaged in 250 milliliter and 500 milliliter units in proportion of 30 percent and 70 percent of the total quantity produced, respectively.
- **Inventory:** The project would need to keep some inventory of finished goods to be able to provide a stable supply to the customers:

- ✓ Pasteurized milk inventory would be 0 percent due to the perishable nature of the product.
- ✓ Yogurt inventory would be 2 percent of the annual production.
- ✓ Butter inventory would be 5 percent of the annual production.
- **Packaging:** Pasteurized milk would be packed into 500 milliliter plastic containers, so two plastic containers would be used to package one liter of pasteurized milk. Cheese and butter would be packed into 250 gram paper packages. Yogurt containers would be either 250 or 500 milliliters.
- **Production potential utilization:** This analysis assumes that the project would be able to start its operation with 100 percent capacity only in the moderate enhancement scenario. Table 2, below, presents the operating capacity utilization over time for all scenarios.

**Table 2. Annual production potential utilization**

Year	“Without intervention” scenario	Moderate enhancement	Aggressive enhancement
2012	0.00%	0.00%	0.00%
2013	30.00%	100.00%	45.00%
2014	50.00%	100.00%	50.00%
2015	75.00%	100.00%	60.00%
2016–2031	100.00%	100.00%	65.00%

The production capacity would be distributed between camel’s and cow’s milk in the proportion of 65 percent and 35 percent, respectively.

- **Vehicle purchase schedule:** This analysis assumes that without USAID’s support, the milk-processing plant would use the profits generated to purchase additional refrigerator trucks. The plant would purchase one truck in 2012, and the second truck would be purchased in 2014 from the profits of the previous year. One more vehicle would be obtained in 2015, and finally two vehicles would be purchased in 2016. In both scenarios, USAID’s support of the project would enable the purchase of the required number of vehicles at the beginning of the project.



- **Labor:** Labor requirements and wage rates for both scenarios are presented in table 3, below.

**Table 3. Labor requirements and annual wage rates**

Position	Requirements for 10,000 liters	Requirements for 25,000 liters	Annual wage
General manager	1	1	14,000.00
Deputy manager	1	1	10,000.00
Finance manager	2	2	10,000.00
Accountant	1	4	7,200.00
Cashier	2	2	3,375.00
Driver	4	20	3,375.00
Cleaner	10	20	2,250.00
Security	5	5	2,250.00
Purchaser	10	20	2,500.00
Machinery dept. head	1	2	7,200.00
Processing and packing	19	40	3,375.00
Laboratory tech.	2	4	3,600.00
On collection center	10	20	3,000.00
Milk receptionist	10	20	2,250.00

In addition to the wage rates listed above, the project would make a contribution of 8 percent for social insurance. The real increase in the wage rates is assumed to be 2 percent annually.

- **Production disposition and losses:** The raw-milk loss is assumed to be 1 percent. The milk-processing plant would target domestic and export markets. Pasteurized cow's milk and cow's milk by-products would only be sold domestically. Pasteurized camel's milk would be sold in the domestic and export markets in the proportions of 60 percent and 40 percent, respectively.
- **Output prices:** The output prices would be the same under the moderate enhancement and aggressive enhancement scenarios. The output prices of the goods produced are presented in table 4, below.

**Table 4. Milk-processing plant product's prices**

Line item	Price
Pasteurized cow's milk (ETB/500 mL)	11.00
Domestically sold pasteurized camel's milk	13.00
Yogurt (ETB/250 mL)	13.00
Yogurt (ETB/500 mL)	15.00
Cheese (ETB/250 mg)	42.00
Butter (ETB/250 mg)	40.00
Exported pasteurized camel's milk (US\$/500 mL)	0.97

- **Direct and indirect production costs:** Direct and indirect costs of the production are presented in table 5, below.

**Table 5. Production input costs**

	<b>10,000 liters production capacity</b>	<b>25,000 liters production capacity</b>
Price of raw cow's milk (ETB/liter)	12.00	12.00
Price of raw camel's milk (ETB/liter)	12.00	12.00
Average transportation cost of milk	0.50	0.50
Average domestic transportation cost market	2.10	2.10
Average transportation cost for export market	2.00	2.00
Yogurt cup (ETB/unit)	1.71	1.71
Liquid milk container, 500 mL (ETB/unit)	1.15	1.15
Butter package (ETB/unit)	0.25	0.25
Cheese package (ETB/unit)	0.18	0.18
Electricity (ETB/KW)	0.69	0.69
Fixed electricity consumption (KWh/year)	10,000.00	10,000.00
Variable electricity consumption (KWh/year)	48,000.00	96,000.00
Generator fuel consumption (liters/hour)	20.00	40.00
Number of hours running generator	180.00	180.00
Fuel (ETB/liter)	18.00	18.00
Uniforms (ETB/year)	70,000.00	152,000.00
Telephone and postage (ETB/year)	24,000.00	40,000.00
Printing and stationery (ETB/year)	25,000.00	50,000.00
<b>CIF cost of imported inputs (US\$)</b>		
Nitric acid (US\$/year)	9,028.00	9,028.00
Flosc ponicol (US\$/year)	500.00	500.00
Lactometer (US\$/year)	4,000.00	10,000.00
Portable pH meter (US\$/year)	455.56	1,167.00
Centrifuge (US\$/year)	612.00	1,528.00
<b>Overhead Costs (ETB/year)</b>		
Certifications and licenses	5,000.00	5,000.00
Health insurance for employees	59,000.00	121,000.00
Site insurance	70,000.00	100,000.00
Other office expenses	100,000.00	100,000.00
Advertising	300,000.00	450,000.00
Traveling	100,000.00	100,000.00
Medical	150,000.00	150,000.00

- **Working capital:** The milk-processing plant would pay its suppliers mainly on a cash basis to allow it to maintain a stable supply of raw milk to the factory. The accounts payable, therefore, are assumed to be 0 percent of the annual raw milk cost. The accounts receivable, however, are assumed to be 10 percent of the net sales, because not all the markets purchasing from the plant would be able to pay in cash immediately.

The cash balance is also assumed to be 10 percent of the total sales revenue.

## **PROJECT MODELING**

The purpose of this cost-benefit analysis (CBA) is to evaluate whether this private investment would be financially feasible for the investor, analyze the corresponding risks, and determine whether the financial subsidy from USAID would reduce the riskiness of the private investment. The economic outcomes of the interventions have also been estimated.

The financial and economic feasibility of the Pastoralists Resilience Improvement and Market Development (PRIME) milk-processing plant enhancement interventions have been estimated using a cost-benefit model in which all revenues or resource inflows have been treated as inflows and all expenditures or resource outflows have been treated as outflows (Jenkins, Kuo, and Harberger, 2011). The analysis has been carried out for a 20-year time period.

The cash-flow statements in the financial analysis have been constructed from the total investment/project and equity points of view.

The total investment point of view determines the overall strength of the project, because it sees a project as an activity that generates tangible financial benefits and absorbs tangible financial resources. It disregards any distinction in the sources of finance but asks whether the financial receipts generated from the operations of the project would be sufficient to cover the investment and operating expenditures and whether they would provide a sufficient return.

The owner of a project examines the incremental net cash flow from the investment relative to what would have been earned in the absence of the project. Unlike the total investment point of view, the owner adds the financial subsidy from USAID as a cash receipt. The owner would also add the loan as a cash inflow and subtract the loan's debt service as a cash outflow.

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

## **PREPARATORY TABLES IN THE CBA EXCEL MODEL**

The CBA model that accompanies this report is logically divided into five sections. The first section presents the "without intervention" scenario, which is required to determine the sustainability and general picture of the project in the case when USAID's support is not available.

The second section presents the "with intervention" scenarios, examining the financial and economic outcomes of the project in the presence of USAID's support.

The third section presents the incremental analysis, deriving the net benefits of the USAID intervention by subtracting the "without intervention" scenario from the "with intervention" scenario. This step is necessary to distinguish between the benefits that would be generated by the project as it currently exists versus what would be earned due to the intervention.

The fourth section presents a sensitivity analysis constructed to evaluate the impact of the change in the key variables of the project that are likely to change.

The last section describes the economic and stakeholder analysis of the project, which has also been constructed on an incremental basis.

Table 2 of the CBA model presents domestic and U.S. inflation for the evaluation period. The analysis has been carried out on an annual basis. The annual inflation rate in Ethiopia is reported to be 20 percent. The domestic price index has been used to adjust the current prices to reflect the impact of inflation over the evaluation period. The expected exchange rate of the Ethiopian Birr (ETB) to the U.S. dollar (US\$) has been derived by multiplying the current exchange rate by the relative price index. The relative price index, in turn, is the ratio of the price index of Ethiopia to that of the United States. Although a 20 percent rate of inflation is perhaps too high on average for the 20-year period of time, the model has been built in a consistent fashion so that impacts of the changes in inflation can be studied through a sensitivity analysis.

Tables 3 and 4 of the CBA model present the total investment cost for the “without intervention” scenario. The scenario assumes that the profits from the operations would be used to purchase additional refrigerator vehicles; hence, part B of tables 3 and 4 presents the additional investment required for this purpose.

Table 5 of the CBA model depicts the annual milk-processing plant capacity utilization. The raw milk available for the production has been derived as a difference between the total quantities of raw milk purchased and milk losses. Table 5 also serves as the basis for table 6, which shows annual production calculations.

Table 7 of the CBA model disaggregates the annual production into two categories. The first category represents production sold domestically, including pasteurized cow’s milk and dairy products produced from cow’s milk. The second category represents the share of production produced for the export market; this project would only export 40 percent of the pasteurized camel’s milk.

To stabilize delivery of the finished goods to the market, the project would keep certain levels of inventory. Table 8 of the CBA model disaggregates production into goods produced for inventory and for sale.

Table 9 of the CBA model derives the annual nominal value of production for the “without intervention” scenario. The amount of value-added tax (VAT) collected on the domestically sold share of the production is also calculated in the table.

Table 10 of the CBA model depicts the annual cost of inputs in nominal terms. The cost items are logically split into three categories as direct costs, indirect costs, and overhead costs.

The VAT in Ethiopia is set at 15 percent. Table 11 of the CBA model presents the VAT payment. The VAT credits collected on the inputs of production have been subtracted from the total VAT collected during the sale of the finished products, and the result is the net VAT payment to be made by the processing plant. The net VAT payment has been subtracted from the total revenues later to accurately calculate the tax liabilities of the project.

Table 12 of the CBA model presents the working capital. Accounts receivable have been calculated as 10 percent of the net sales. Cash balance has been assumed to be 10 percent of the total cost of inputs. The accounts payable have been assumed to be 0 percent, because the project would pay the raw-milk suppliers immediately.

Table 13 of the CBA model presents the real annual labor wages, calculating the figure using 2 percent real annual increase. Table 13 serves as the basis for table 14, which shows the cost of labor in nominal terms.

Table 15 of the CBA model calculates the unit cost of production, which is necessary to determine the cost of goods sold for the income statement to determine the project's tax liability. Table 16 presents the finished product inventory valuation using a first-in-first-out (FIFO) approach.

Table 17 of the CBA model presents the residual values of the project assets in real terms. The economic life of the milk-processing plant's assets is presented in table 6, below.

**Table 6. Economic service life of the project's assets**

<b>Asset</b>	<b>Economic service life</b>
Buildings	25
Machinery and equipment	20
Office furniture, fittings, and equipment	20
Vehicles' service life (years)	10
Vehicles' % annual depreciation	10%
Borehole	50

Most of the project's assets will have some use remaining at its closing date. In this case, the real future market value of the assets should be incorporated as part of the final year's net benefit. In the case of vehicles, however, the service life would be shorter than the project evaluation period, so the vehicles would need to be replaced before the end of the project evaluation period. Land also has residual value, but land is a specific asset. The residual value of land would be equal to the value of land at the beginning of the project, assuming that the value has not increased/decreased due to the project operations. Table 7, below, presents the nominal residual market values of the project's assets for all scenarios of the analysis.

**Table 7. Residual values of the milk-processing plant's assets (ETB mill, nominal)**

<b>Asset</b>	<b>"Without intervention"</b>	<b>Moderate enhancement</b>	<b>Aggressive enhancement</b>
Land	22.36	22.36	22.36
Buildings	17.00	17.00	17.00
Machinery and equipment	20.13	20.13	31.63
Vehicles	127.72	106.60	184.16
Generator	1.44	1.44	1.44
Borehole	24.54	24.54	24.54

Table 18 of the CBA model calculates the total annual amount of depreciation allowance. Table 8, below, presents the annual depreciation rates and methods used for different groups of project assets.

**Table 8. Depreciation rate and method**

<b>Asset</b>	<b>Rate (%)</b>	<b>Method</b>
Buildings	5.00%	Straight line
Machinery and equipment	20.00%	Pool
Office furniture, fittings, and equipment	20.00%	Pool
Motor vehicles	20.00%	Pool

The annual depreciation allowance in nominal terms is presented in table 9, below.

**Table 9. Annual depreciation allowance (ETB mill, nominal)**

<b>Year</b>	<b>“Without intervention”</b>	<b>Moderate enhancement</b>	<b>Aggressive enhancement</b>
2013	1.96	2.98	4.72
2014	1.97	2.41	3.81
2015	2.04	1.96	3.08
2016	2.72	1.60	2.49
2017	2.20	1.31	2.02
2018	1.79	1.08	1.65
2019	1.47	0.89	1.35
2020	1.20	0.75	1.11
2021	0.99	0.63	0.92
2022	2.65	7.25	12.36
2023	3.63	5.83	9.92
2024	4.61	4.69	7.97
2025	7.50	3.79	6.41
2026	6.03	3.06	5.16
2027	4.85	2.48	4.16
2028	3.91	2.01	3.36
2029	3.16	1.64	2.72
2030	2.56	1.34	2.20

Table 19 of the CBA model presents the loan schedule. The loan schedule would be the same for all scenarios, because USAID’s support would not affect the amount to be borrowed from the bank. The loan schedule is also presented in table 10, below.

**Table 10. Loan schedule (ETB, mill)**

	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>
<b>Nominal interest rate</b>	8.50%	8.50%	8.50%	8.50%	8.50%	8.50%	8.50%	8.50%
<b>Beginning debt</b>		6.38	5.47	4.56	3.65	2.73	1.82	0.91
<b>Loan disbursement</b>	6.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Interest accrued in the year</b>	0.00	0.54	0.46	0.39	0.31	0.23	0.15	0.08
<b>Principal paid</b>	0.00	0.91	0.91	0.91	0.91	0.91	0.91	0.91
<b>Interest paid</b>	0.00	0.54	0.46	0.39	0.31	0.23	0.15	0.08
<b>Total debt service</b>	0.00	1.45	1.38	1.30	1.22	1.14	1.07	0.99
<b>Outstanding debt at end of year</b>	6.38	5.47	4.56	3.65	2.73	1.82	0.91	0.00

The loan interest rate would be 8.50 percent, and the grace period would be 1 year. The loan would be taken for 8 years.

Table 20 of the CBA model presents the milk-processing plant’s income statement. The analysis of net income has not been done on an incremental basis but instead calculates the net income of the entire

operation for the different interventions. The net income for the “without intervention” scenario, the moderate enhancement scenario, and the aggressive enhancement scenario is presented in table 11, below.

**Table 11. Milk-processing plant net income (ETB mill, nominal)**

<b>Year</b>	<b>“Without intervention”</b>	<b>Moderate enhancement</b>	<b>Aggressive enhancement</b>
2013	0.04	0.96	0.83
2014	0.35	1.04	1.10
2015	0.73	1.10	1.54
2016	1.11	1.15	1.80
2017	1.17	1.19	1.87
2018	0.85	0.86	1.35
2019	0.88	0.89	1.38
2020	0.90	0.91	1.42
2021	0.93	0.93	1.45
2022	0.93	0.90	1.39
2023	0.95	0.93	1.45
2024	0.97	0.97	1.50
2025	0.98	1.00	1.54
2026	1.01	1.02	1.58
2027	1.04	1.05	1.62
2028	1.07	1.07	1.65
2029	1.09	1.10	1.69
2030	1.12	1.12	1.72

The net income has been calculated in nominal terms, so inflation is the reason for the stable increase in the income after the production potential utilization maximum has been reached. The sudden drop in the net income in 2018 will occur because that is when the 5-year tax holiday period will end and income taxes will increase. Another drop in the net income will occur in 2022, which will represent the end of the useful life of the refrigerator vehicles; hence, they will need to be replaced. These new vehicles will generate higher annual depreciation expenses than the vehicles they would replace.

## **INTERVENTION**

The purpose of this modeling exercise is to calculate the net cash flows and net resource flows of the project to estimate the net benefit of USAID's proposed support and to evaluate whether the risk to the private investor would be reduced. In addition, the cost-benefit analysis (CBA) evaluates the total economic benefits of the intervention and the distribution of these benefits between the different stakeholders

It is necessary to estimate the benefits of the intervention on an incremental basis, distinguishing between the benefits that would be created by the project in the absence of USAID's support and the benefits that would be created due to the intervention.

### **(a) “Without Intervention” Scenario**

The private entrepreneur is limited in the amounts of funds available for the project. Such limitations would constrain the project and prevent its reaching full operational capacity before 2017, so the economic benefits of the intervention would be smaller. In addition, the CBA reveals that without USAID's support, the project would have difficulty meeting its debt repayment obligations in the first year of the project operations. This issue is discussed in detail later in the report.

Table 12, below, presents the cash-flow statement from the total investment point of view for the “without intervention” scenario. The analysis reveals that, although the financial net present value (FNPV) would be positive, without USAID's support, the project would have a negative net cash flow in the second year of operations due to the low-capacity utilization and the necessity of purchasing the refrigerator vehicles.

The cash-flow statement from the total investment point of view does not treat the loan as a cash inflow and the loan payments as cash outflows; instead, it looks at the investment without considering how it would be financed. The main objective of the total investment point of view is to determine whether the investment would be financially feasible.

The negative cash flow in year 2 also confirms that the project would have difficulty meeting its debt-repayment obligations.

Table 13, below, presents the cash-flow statement from the owner point of view. This time, the analysis considers the way in which project would be financed. The loan inflow, the loan debt service, and the interest payments have been added to the cash-flow statement. The nominal interest rate is 8.50 percent, which is less than the current rate of inflation in Ethiopia. The government of Ethiopia would provide such a subsidized interest rate to stimulate the development of domestic enterprises.



**Table 12. Cash-flow statement from the total investment point of view, “without intervention” scenario**

<b>RECEIPTS</b>	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
Gross sales	0.00	23.67	39.51	59.28	79.05	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.32	0.00
Changes in accounts receivable	0.00	-2.13	-1.78	-2.37	-2.67	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.21	5.96
<b>Liquidation values</b>																					
Land																					0.70
Buildings																					0.53
Machinery and equipment																					0.63
Vehicles																					4.00
Generator																					0.05
Borehole																					0.77
<b>TOTAL CASH INFLOW</b>	<b>0.00</b>	<b>21.53</b>	<b>37.73</b>	<b>56.90</b>	<b>76.38</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>78.12</b>	<b>12.63</b>	
<b>EXPENDITURES</b>																					
<b>Investment Cost</b>																					
Land	0.45																				
Electricity connection	0.25																				
Buildings	1.90																				
CIF cost of Machinery and Equipment	6.30																				
Vehicles	1.90	0.00	1.27	1.27	2.54	0.00	0.00	0.00	0.00	0.00	1.24	0.83	0.83	1.65	0.00	0.00	0.00	0.00	0.00		
Borehole construction	1.20																				
Generator	0.45																				
Office furniture	0.30																				
Local transportation of the machinery to the project site	0.08																				
<b>Operating Cost</b>																					
<b>Milk Cost</b>																					
Cow's milk	0.00	3.78	6.30	9.45	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	0.00
Camel's milk	0.00	7.02	11.70	17.55	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	0.00
<b>Transportation costs</b>																					
Cost of milk collection	0.00	0.45	0.75	1.13	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	0.00
Cost for domestic market delivery	0.00	1.25	2.08	3.13	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	0.00
Cost for export market delivery	0.00	0.46	0.77	1.16	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	0.00
<b>Packaging Cost</b>																					
Yogurt cup	0.00	0.08	0.14	0.21	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.00
Liquid milk container 500ml	0.00	1.84	3.07	4.61	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	0.00
Butter	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Cheese	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
<b>Utilities</b>																					
Fixed Electricity Cost	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Variable electricity Cost	0.00	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.00
Cost of running generator	0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.00
<b>Indirect costs</b>																					
Cost of uniforms	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.00
Telephone and Postage	0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.00
Printing and Stationery	0.00	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.00
Nitric Acid	0.00	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.00
Flosc Ponicol	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Lacto Meter	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.00
PH meter portable	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Centrifuge	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
<b>Overhead costs</b>																					
Certifications and Licenses	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Health Insurance for Employees	0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.00
Site insurance	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.00
Other office expenses	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
Advertising expense	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.00
Traveling expense	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
Medical Expense	0.00	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.00
<b>Total Labor Cost (Wages and Social Insurance)</b>																					
Total direct labor cost	0.00	2.02	2.06	2.10	2.15	2.19	2.23	2.28	2.32	2.37	2.42	2.46	2.51	2.56	2.62	2.67	2.72	2.78	2.83	2.83	0.00
Managerial Staff	0.00	0.57	0.58	0.59	0.61	0.62	0.63	0.64	0.66	0.67	0.68	0.70	0.71	0.72	0.74	0.75	0.77	0.78	0.80	0.80	0.00
Administrative staff	0.00	0.18	0.18	0.19	0.19	0.20	0.20	0.20	0.21	0.21	0.22	0.22	0.22	0.23	0.23	0.24	0.24	0.25	0.25	0.25	0.00
Other personnel	0.00	0.61	0.62	0.64	0.65	0.66	0.68	0.69	0.70	0.72	0.73	0.75	0.78	0.79	0.81	0.82	0.84	0.84	0.86	0.86	0.00
<b>Working Capital</b>																					
Changes in accounts payable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Changes in cash balance	0.00	2.13	1.78	2.37	2.67	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.21	-5.96
<b>Net VAT Payment</b>	0.00	1.53	2.69	4.13	5.57	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.62	0.00
<b>TOTAL CASH OUTFLOW</b>	<b>12.83</b>	<b>23.22</b>	<																		

(-) Corporate income tax	0.00	0.00	0.00	0.00	0.00	0.00	5.65	5.70	5.72	5.72	5.63	5.59	5.55	5.47	5.52	5.54	5.54	5.53	5.53	0.00
<b>NET CASH FLOW (AFTER TAX, BEFORE CONTRIBUTION TO THE COMMUNITY)</b>	<b>-12.83</b>	<b>-1.68</b>	<b>2.43</b>	<b>7.09</b>	<b>11.08</b>	<b>16.55</b>	<b>10.83</b>	<b>10.71</b>	<b>10.61</b>	<b>10.53</b>	<b>9.31</b>	<b>9.68</b>	<b>9.63</b>	<b>8.80</b>	<b>10.33</b>	<b>10.22</b>	<b>10.12</b>	<b>10.04</b>	<b>10.10</b>	<b>18.58</b>
(-) Contribution to the community		-0.08	0.12	0.35	0.55	0.83	0.54	0.54	0.53	0.53	0.47	0.48	0.48	0.44	0.52	0.51	0.51	0.50	0.50	0.93
<b>NET CASH FLOW (AFTER TAX, AFTER CONTRIBUTION TO THE COMMUNITY)</b>	<b>-12.83</b>	<b>-1.60</b>	<b>2.31</b>	<b>6.74</b>	<b>10.52</b>	<b>15.72</b>	<b>10.29</b>	<b>10.18</b>	<b>10.08</b>	<b>10.00</b>	<b>8.84</b>	<b>9.20</b>	<b>9.15</b>	<b>8.36</b>	<b>9.81</b>	<b>9.71</b>	<b>9.62</b>	<b>9.54</b>	<b>9.59</b>	<b>17.66</b>
<b>NET CASH FLOW (AFTER TAX, BEFORE FINACING) US\$</b>	<b>-0.71</b>	<b>-0.09</b>	<b>0.13</b>	<b>0.37</b>	<b>0.58</b>	<b>0.87</b>	<b>0.57</b>	<b>0.57</b>	<b>0.56</b>	<b>0.56</b>	<b>0.49</b>	<b>0.51</b>	<b>0.51</b>	<b>0.46</b>	<b>0.54</b>	<b>0.54</b>	<b>0.53</b>	<b>0.53</b>	<b>0.53</b>	<b>0.98</b>

NPV @12% discount rate ETB	45.27
NPV @12% discount rate \$US	2.52

**Table 13. Cash-flow statement from the owner point of view, “without intervention” scenario**

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
<b>RECEIPTS</b>																					
Gross sales	0.00	23.67	39.51	59.28	79.05	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.32	0.00	
Changes in accounts receivable	0.00	-2.13	-1.78	-2.37	-2.67	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.21	5.96	
<b>Liquidation values</b>																					
Land																				0.70	
Buildings																				0.53	
Machinery and equipment																				0.63	
Vehicles																				4.00	
Generator																				0.05	
Borehole																				0.77	
Loan inflow	6.38																				
USAID Subsidy																					
<b>TOTAL CASH INFLOW</b>	<b>6.38</b>	<b>21.53</b>	<b>37.73</b>	<b>56.90</b>	<b>76.38</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>78.12</b>	<b>12.63</b>	
<b>EXPENDITURES</b>																					
<b>Investment Cost</b>																					
Land	0.45																				
Electricity connection	0.25																				
Buildings	1.90																				
CIF cost of Machinery and Equipment	6.30																				
Vehicles	1.90	0.00	1.27	1.27	2.54	0.00	0.00	0.00	0.00	0.00	1.24	0.83	0.83	1.65	0.00	0.00	0.00	0.00	0.00		
Borehole construction	1.20																				
Generator	0.45																				
Office furniture	0.30																				
Local transportation of the machinery to the project site	0.08																				
<b>Operating Cost</b>																					
<b>Milk Cost</b>																					
Cow's milk	0.00	3.78	6.30	9.45	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	0.00
Camel's milk	0.00	7.02	11.70	17.55	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	0.00
<b>Transportation costs</b>																					
Cost of milk collection	0.00	0.45	0.75	1.13	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	0.00
Cost for domestic market delivery	0.00	1.25	2.08	3.13	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	0.00
Cost for export market delivery	0.00	0.46	0.77	1.16	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	0.00
<b>Packaging Cost</b>																					
Yogurt cup	0.00	0.08	0.14	0.21	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.00
Liquid milk container 500ml	0.00	1.84	3.07	4.61	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	0.00
Butter	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Cheese	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
<b>Utilities</b>																					
Fixed Electricity Cost	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Variable electricity Cost	0.00	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.00
Cost of running generator	0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.00
<b>Indirect costs</b>																					
Cost of uniforms	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.00
Telephone and Postage	0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.00
Printing and Stationery	0.00	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.00

Nitric Acid	0.00	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.00
Flosc Ponicol	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Lacto Meter	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.00
PH meter portable	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Centrifuge	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
<b>Overhead costs</b>																				
Certifications and Licenses	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Health Insurance for Employees	0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.00
Site insurance	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.00
Other office expenses	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
Advertising expense	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.00
Traveling expense	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
Medical Expense	0.00	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.00
<b>Total Labor Cost (Wages and Social Insurance)</b>																				
Total direct labor cost	0.00	2.02	2.06	2.10	2.15	2.19	2.23	2.28	2.32	2.37	2.42	2.46	2.51	2.56	2.62	2.67	2.72	2.78	2.83	0.00
Managerial Staff	0.00	0.57	0.58	0.59	0.61	0.62	0.63	0.64	0.66	0.67	0.68	0.70	0.71	0.72	0.74	0.75	0.77	0.78	0.80	0.00
Administrative staff	0.00	0.18	0.18	0.19	0.19	0.20	0.20	0.20	0.21	0.21	0.22	0.22	0.22	0.23	0.23	0.24	0.24	0.25	0.25	0.00
Other personnel	0.00	0.61	0.62	0.64	0.65	0.66	0.68	0.69	0.70	0.72	0.73	0.75	0.76	0.78	0.79	0.81	0.82	0.84	0.86	0.00
<b>Working Capital</b>																				
Changes in accounts payable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Changes in cash balance	0.00	2.13	1.78	2.37	2.67	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.21	-5.96
<b>Net VAT Payment</b>	0.00	1.53	2.69	4.13	5.57	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.62	0.00
<b>Loan Debt Service</b>	0.00	0.00	1.97	0.75	0.59	0.46	0.36	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>TOTAL CASH OUTFLOW</b>	<b>12.83</b>	<b>23.22</b>	<b>37.26</b>	<b>50.56</b>	<b>65.89</b>	<b>61.83</b>	<b>61.79</b>	<b>61.79</b>	<b>61.59</b>	<b>61.67</b>	<b>62.98</b>	<b>62.65</b>	<b>62.73</b>	<b>63.65</b>	<b>62.08</b>	<b>62.17</b>	<b>62.26</b>	<b>62.35</b>	<b>62.49</b>	<b>-5.96</b>
<b>NET CASH FLOW (BEFORE TAX AND FINANCING)</b>	<b>-6.45</b>	<b>-1.68</b>	<b>0.47</b>	<b>6.34</b>	<b>10.49</b>	<b>16.09</b>	<b>16.13</b>	<b>16.13</b>	<b>16.33</b>	<b>16.25</b>	<b>14.94</b>	<b>15.27</b>	<b>15.18</b>	<b>14.27</b>	<b>15.84</b>	<b>15.75</b>	<b>15.66</b>	<b>15.57</b>	<b>15.63</b>	<b>18.58</b>
(-) Corporate income tax	0.00	0.00	0.00	0.00	0.00	0.00	5.65	5.70	5.72	5.72	5.63	5.59	5.55	5.47	5.52	5.54	5.54	5.53	5.53	0.00
<b>NET CASH FLOW (AFTER TAX, BEFORE CONTRIBUTION TO THE COMMUNITY)</b>	<b>-1.68</b>	<b>0.47</b>	<b>6.34</b>	<b>10.49</b>	<b>16.09</b>	<b>10.47</b>	<b>10.43</b>	<b>10.61</b>	<b>10.53</b>	<b>9.31</b>	<b>9.68</b>	<b>9.63</b>	<b>8.80</b>	<b>10.33</b>	<b>10.22</b>	<b>10.12</b>	<b>10.04</b>	<b>10.10</b>	<b>18.58</b>	
(-) Contribution to the community	0.00	-0.08	0.12	0.35	0.55	0.83	0.54	0.54	0.53	0.53	0.47	0.48	0.48	0.44	0.52	0.51	0.51	0.50	0.50	0.93
<b>NET CASH FLOW (AFTER TAX, AFTER CONTRIBUTION TO THE COMMUNITY)</b>	<b>-1.60</b>	<b>0.35</b>	<b>5.98</b>	<b>9.93</b>	<b>15.26</b>	<b>9.93</b>	<b>9.90</b>	<b>10.08</b>	<b>10.00</b>	<b>8.84</b>	<b>9.20</b>	<b>9.15</b>	<b>8.36</b>	<b>9.81</b>	<b>9.71</b>	<b>9.62</b>	<b>9.54</b>	<b>9.59</b>	<b>17.66</b>	
<b>NET CASH FLOW (AFTER TAX, AFTER FINANCING) US\$</b>	<b>-0.36</b>	<b>-0.09</b>	<b>0.02</b>	<b>0.33</b>	<b>0.55</b>	<b>0.85</b>	<b>0.55</b>	<b>0.55</b>	<b>0.56</b>	<b>0.56</b>	<b>0.49</b>	<b>0.51</b>	<b>0.51</b>	<b>0.46</b>	<b>0.54</b>	<b>0.54</b>	<b>0.53</b>	<b>0.53</b>	<b>0.53</b>	<b>0.98</b>

NPV @12% discount rate	ETB 48.61
NPV @12% discount rate	\$US 2.70
IRR	53.65%

## **(b) Moderate Enhancement Scenario**

In the case of the moderate enhancement scenario, the USAID subsidy would allow the milk-processing plant to start operating at full capacity in year 1 by overcoming the constraint of the small number of vehicles it owns. The field visits revealed that the dairy farmers in the regions are currently facing a limited demand for their product. The milk traders interviewed stated that they are able to purchase only about 50 percent of what farmers could deliver every day. The milk processor's ability to fully utilize the production potential would not only increase the revenues of the plant itself but also allow the farmers to sell a bigger portion of their production. Therefore, all participating value-chain actors would benefit.

Table 14, below, presents the cash-flow statement from the total investment point of view under the moderate enhancement scenario. USAID's support would also allow the project to overcome the problem of negative cash flow in year 2.

Table 14 ignores the loan inflows and outflows as well as the inflow of USAID's support to determine whether the moderate enhancement scenario would be financially feasible for the investors without taking the financing of the project into consideration.

The only difference between the owner point of view and the total investment point of view in the case of the moderate enhancement scenario is the financing of the project.<sup>2</sup>

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<sup>2</sup> For table details, please see table 49 of the CBA model moderate enhancement sheet.

**Table 14. Cash-flow statement from the total investment point of view, moderate enhancement scenario**

RECEIPTS	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Gross sales	0.00	78.89	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.11	79.32	0.00
Changes in accounts receivable	0.00	-7.11	-1.20	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.19	-1.21	5.96
<b>Liquidation values</b>																				
Land																				0.70
Buildings																				0.53
Machinery and equipment																				0.63
Vehicles																				3.34
Generator																				0.05
Borehole																				0.77
<b>TOTAL CASH INFLOW</b>	<b>0.00</b>	<b>71.78</b>	<b>77.90</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>77.92</b>	<b>78.12</b>	<b>11.97</b>
<b>EXPENDITURES</b>																				
<b>Investment Cost</b>																				
Land	0.45																			
Electricity connection	0.25																			
Buildings	1.90																			
Clf cost of Machinery and Equipment	6.30																			
Vehicles	6.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Borehole construction	1.20																			
Generator	0.45																			
Office furniture	0.30																			
Local transportation of the machinery to the project site	0.08																			
<b>Operating Cost</b>																				
<b>Milk Cost</b>																				
Cow's milk	0.00	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	12.60	0.00
Camel's milk	0.00	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	23.40	0.00
<b>Transportation costs</b>																				
Cost of milk collection	0.00	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	0.00
Cost for domestic market delivery	0.00	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	0.00
Cost for export market delivery	0.00	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.54	0.00
<b>Packaging Cost</b>																				
Yogurt cup	0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.00
Liquid milk container 500ml	0.00	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	0.00
Butter	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Cheese	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
<b>Utilities</b>																				
Fixed Electricity Cost	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Variable electricity Cost	0.00	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.00
Cost of running generator	0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.00
<b>Indirect costs</b>																				
Cost of uniforms	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.00
Telephone and Postage	0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.00
Printing and Stationery	0.00	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.00
Nitric Acid	0.00	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.00
Flosc Ponicol	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Lacto Meter	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.00
PH meter portable	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Centrifuge	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
<b>Overhead costs</b>																				
Certifications and Licenses	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Health Insurance for Employees	0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.00
Site insurance	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.00
Other office expenses	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
Advertising expense	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.00
Traveling expense	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
Medical Expense	0.00	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.00
<b>Total Labor Cost (Wages and Social Insurance)</b>																				
Total direct labor cost	0.00	2.02	2.06	2.10	2.15	2.19	2.23	2.28	2.32	2.37	2.42	2.46	2.51	2.56	2.62	2.67	2.72	2.78	2.83	0.00

Managerial Staff	0.00	0.57	0.58	0.59	0.61	0.62	0.63	0.64	0.66	0.67	0.68	0.70	0.71	0.72	0.74	0.75	0.77	0.78	0.80	0.00
Administrative staff	0.00	0.18	0.18	0.19	0.19	0.20	0.20	0.20	0.21	0.21	0.22	0.22	0.22	0.23	0.23	0.24	0.24	0.25	0.25	0.00
Other personnel	0.00	0.61	0.62	0.64	0.65	0.66	0.68	0.69	0.70	0.72	0.73	0.75	0.76	0.78	0.79	0.81	0.82	0.84	0.86	0.00
<b>Working Capital</b>																				
Changes in accounts payable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Changes in cash balance	0.00	7.11	1.20	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.21	-5.96
<b>Net VAT Payment</b>	0.00	5.55	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.62	0.00
<b>TOTAL CASH OUTFLOW</b>	<b>17.91</b>	<b>66.97</b>	<b>61.17</b>	<b>61.22</b>	<b>61.29</b>	<b>61.36</b>	<b>61.44</b>	<b>61.51</b>	<b>61.59</b>	<b>61.67</b>	<b>66.29</b>	<b>61.83</b>	<b>61.91</b>	<b>61.99</b>	<b>62.08</b>	<b>62.17</b>	<b>62.26</b>	<b>62.35</b>	<b>62.49</b>	<b>-5.96</b>
<b>NET CASH FLOW (BEFORE TAX AND FINANCING)</b>	<b>-17.91</b>	<b>4.81</b>	<b>16.74</b>	<b>16.70</b>	<b>16.63</b>	<b>16.56</b>	<b>16.48</b>	<b>16.41</b>	<b>16.33</b>	<b>16.25</b>	<b>11.63</b>	<b>16.09</b>	<b>16.01</b>	<b>15.93</b>	<b>15.84</b>	<b>15.75</b>	<b>15.66</b>	<b>15.57</b>	<b>15.63</b>	<b>17.92</b>
(-) Corporate income tax	0.00	0.00	0.00	0.00	0.00	0.00	5.73	5.75	5.75	5.74	5.41	5.50	5.55	5.58	5.59	5.58	5.57	5.55	5.54	0.00
(-) Contribution to the community	-17.91	4.81	16.74	16.70	16.63	16.56	10.76	10.66	10.58	10.51	6.23	10.60	10.46	10.35	10.26	10.17	10.09	10.02	10.09	17.92
	-17.91	4.52	15.73	15.70	15.63	15.56	10.11	10.02	9.95	9.88	5.85	9.96	9.83	9.73	9.64	9.56	9.49	9.42	9.48	16.85
<b>NET CASH FLOW (AFTER TAX, BEFORE FINANCING) US\$</b>	<b>-0.99</b>	<b>0.25</b>	<b>0.87</b>	<b>0.87</b>	<b>0.87</b>	<b>0.86</b>	<b>0.56</b>	<b>0.56</b>	<b>0.55</b>	<b>0.55</b>	<b>0.33</b>	<b>0.55</b>	<b>0.55</b>	<b>0.54</b>	<b>0.54</b>	<b>0.53</b>	<b>0.53</b>	<b>0.52</b>	<b>0.53</b>	<b>0.94</b>

NPV @12% discount rate ETB65.17
NPV @12% discount rate \$US3.62

### **(c) Aggressive Enhancement Scenario**

The aggressive enhancement scenario, in contrast with the moderate enhancement scenario, would allow the plant not only to overcome the capacity-utilization constraint but also to expand its potential production capacity from 10,000 liters/day to 25,000 liters/day. The analysis assumes that the project would not be able to find sufficient demand for the production to fully utilize the capacity of 25,000 liters/day, but the capacity utilization would constantly increase during the first 5 years of the project and eventually would reach 65 percent of capacity, or 16,250 liters/day of production.

If the project were able to achieve this target, the number of milk-supplying households would increase along with all other positive outcomes of the intervention. The cash-flow statement from the total investment point of view is presented in table 15, below.

The only difference between the owner point of view and the total investment point of view in the case of the aggressive enhancement scenario is the financing of the project.<sup>3</sup>

### **(d) Incremental Analysis**

The “without intervention” scenario is the same baseline situation for the moderate enhancement and the aggressive enhancement interventions.

The incremental analysis has been constructed by subtracting the relevant line items of the “without intervention” scenario from the “with intervention” scenarios, thus determining the net benefits of USAID’s support. For the details of the incremental cash-flow statements, please refer to the CBA model that accompanies this report.

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<sup>3</sup> For table details, please see table 49 of the CBA model aggressive enhancement sheet.



**Table 15. Cash-flow statement from the total investment point of view, aggressive enhancement scenario**

<b>RECEIPTS</b>	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
Gross sales	0.00	88.75	98.86	118.61	128.52	128.55	128.55	128.55	128.55	128.55	128.55	128.55	128.55	128.55	128.55	128.55	128.55	128.55	128.90	0.00	
Changes in accounts receivable	0.00	-8.00	-2.24	-3.26	-2.67	-1.93	-1.93	-1.93	-1.93	-1.93	-1.93	-1.93	-1.93	-1.93	-1.93	-1.93	-1.93	-1.93	-1.96	9.68	
<b>Liquidation values</b>																					
Land																				0.70	
Buildings																				0.53	
Machinery and equipment																				0.99	
Vehicles																				5.76	
Generator																				0.05	
Borehole																				0.77	
<b>TOTAL CASH INFLOW</b>	<b>0.00</b>	<b>80.75</b>	<b>96.62</b>	<b>115.34</b>	<b>125.85</b>	<b>126.62</b>	<b>126.62</b>	<b>126.62</b>	<b>126.62</b>	<b>126.62</b>	<b>126.62</b>	<b>126.62</b>	<b>126.62</b>	<b>126.62</b>	<b>126.62</b>	<b>126.62</b>	<b>126.62</b>	<b>126.62</b>	<b>126.94</b>	<b>18.48</b>	
<b>EXPENDITURES</b>																					
<b>Investment Cost</b>																					
Land	0.45																				
Electricity connection	0.25																				
Buildings	1.90																				
CIF cost of Machinery and Equipment	9.90																				
Vehicles	12.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Borehole construction	1.20																				
Generator	0.45																				
Office furniture	0.30																				
Local transportation of the machinery to the project site	0.12																				
<b>Operating Cost</b>																					
<b>Milk Cost</b>																					
Cow's milk	0.00	14.18	15.75	18.90	20.48	20.48	20.48	20.48	20.48	20.48	20.48	20.48	20.48	20.48	20.48	20.48	20.48	20.48	20.48	20.48	0.00
Camel's milk	0.00	26.33	29.25	35.10	38.03	38.03	38.03	38.03	38.03	38.03	38.03	38.03	38.03	38.03	38.03	38.03	38.03	38.03	38.03	38.03	0.00
<b>Transportation costs</b>																					
Cost of milk collection	0.00	1.69	1.88	2.25	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44	0.00
Cost for domestic market delivery	0.00	4.69	5.21	6.25	6.77	6.77	6.77	6.77	6.77	6.77	6.77	6.77	6.77	6.77	6.77	6.77	6.77	6.77	6.77	6.77	0.00
Cost for export market delivery	0.00	1.74	1.93	2.32	2.51	2.51	2.51	2.51	2.51	2.51	2.51	2.51	2.51	2.51	2.51	2.51	2.51	2.51	2.51	2.51	0.00
<b>Packaging Cost</b>																					
Yogurt cup	0.00	0.31	0.35	0.42	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.00
Liquid milk container 500ml	0.00	6.92	7.69	9.22	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	0.00
Butter	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.00
Cheese	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
<b>Utilities</b>																					
Fixed Electricity Cost	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Variable electricity Cost	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.00
Cost of running generator	0.00	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.00
<b>Indirect costs</b>																					
Cost of uniforms	0.00	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.00
Telephone and Postage	0.00	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.00
Printing and Stationery	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.00
Nitric Acid	0.00	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.00
Flosc Ponicol	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00

Lacto Meter	0.00	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.00
PH meter portable	0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.00
Centrifuge	0.00	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.00
<b>Overhead costs</b>																				
Certifications and Licenses	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Health Insurance for Employees	0.00	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.00
Site insurance	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
Other office expenses	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
Advertising expense	0.00	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.00
Traveling expense	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
Medical Expense	0.00	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.00
<b>Total Labor Cost (Wages and Social Insurance)</b>																				
Total direct labor cost	0.00	4.13	4.21	4.30	4.38	4.47	4.56	4.65	4.75	4.84	4.94	5.04	5.14	5.24	5.34	5.45	5.56	5.67	5.79	0.00
Managerial Staff	0.00	0.57	0.58	0.59	0.61	0.62	0.63	0.64	0.66	0.67	0.68	0.70	0.71	0.72	0.74	0.75	0.77	0.78	0.80	0.00
Administrative staff	0.00	0.46	0.47	0.48	0.49	0.50	0.51	0.52	0.53	0.54	0.55	0.56	0.57	0.58	0.60	0.61	0.62	0.63	0.65	0.00
Other personnel	0.00	1.60	1.64	1.67	1.70	1.74	1.77	1.81	1.84	1.88	1.92	1.96	1.99	2.03	2.07	2.12	2.16	2.20	2.25	0.00
<b>Working Capital</b>																				
Changes in accounts payable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Changes in cash balance	0.00	8.00	2.24	3.26	2.67	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.96	-9.68
<b>Net VAT Payment</b>	0.00	6.18	6.93	8.37	9.10	9.10	9.10	9.10	9.10	9.10	9.10	9.10	9.10	9.10	9.10	9.10	9.10	9.10	9.15	0.00
<b>TOTAL CASH OUTFLOW</b>	<b>26.62</b>	<b>78.68</b>	<b>80.02</b>	<b>95.03</b>	<b>101.5</b>	<b>100.9</b>	<b>101.0</b>	<b>101.2</b>	<b>101.3</b>	<b>101.5</b>	<b>109.53</b>	<b>101.8</b>	<b>102.0</b>	<b>102.1</b>	<b>102.3</b>	<b>102.52</b>	<b>102.70</b>	<b>102.8</b>	<b>103.15</b>	<b>-9.68</b>
<b>NET CASH FLOW (BEFORE TAX AND FINANCING)</b>	<b>-</b>	<b>2.08</b>	<b>16.60</b>	<b>20.31</b>	<b>24.33</b>	<b>25.70</b>	<b>25.55</b>	<b>25.40</b>	<b>25.25</b>	<b>25.10</b>	<b>17.09</b>	<b>24.78</b>	<b>24.61</b>	<b>24.44</b>	<b>24.27</b>	<b>24.10</b>	<b>23.92</b>	<b>23.74</b>	<b>23.79</b>	<b>28.16</b>
(-) Corporate income tax	0.00	0.00	0.00	0.00	0.00	0.00	8.95	8.97	8.97	8.94	8.35	8.50	8.58	8.62	8.63	8.62	8.59	8.55	8.52	0.00
<b>NET CASH FLOW (AFTER TAX, BEFORE CONTRIBUTION TO THE COMMUNITY)</b>	<b>-26.62</b>	<b>2.08</b>	<b>16.60</b>	<b>20.31</b>	<b>24.33</b>	<b>25.70</b>	<b>16.60</b>	<b>16.43</b>	<b>16.28</b>	<b>16.15</b>	<b>8.74</b>	<b>16.27</b>	<b>16.03</b>	<b>15.82</b>	<b>15.64</b>	<b>15.48</b>	<b>15.33</b>	<b>15.18</b>	<b>15.27</b>	<b>28.16</b>
(-) Contribution to the community		0.12	1.00	1.22	1.46	1.54	1.00	0.99	0.98	0.97	0.52	0.98	0.96	0.95	0.94	0.93	0.92	0.91	0.92	1.69
<b>NET CASH FLOW (AFTER TAX, AFTER CONTRIBUTION TO THE COMMUNITY)</b>	<b>-26.62</b>	<b>1.95</b>	<b>15.60</b>	<b>19.09</b>	<b>22.87</b>	<b>24.15</b>	<b>15.60</b>	<b>15.45</b>	<b>15.31</b>	<b>15.18</b>	<b>8.21</b>	<b>15.30</b>	<b>15.06</b>	<b>14.87</b>	<b>14.70</b>	<b>14.55</b>	<b>14.41</b>	<b>14.27</b>	<b>14.35</b>	<b>26.47</b>
<b>NET CASH FLOW (AFTER TAX, BEFORE FINANCING)</b>	<b>-1.48</b>	<b>0.11</b>	<b>0.87</b>	<b>1.06</b>	<b>1.27</b>	<b>1.34</b>	<b>0.87</b>	<b>0.86</b>	<b>0.85</b>	<b>0.84</b>	<b>0.46</b>	<b>0.85</b>	<b>0.84</b>	<b>0.83</b>	<b>0.82</b>	<b>0.81</b>	<b>0.80</b>	<b>0.79</b>	<b>0.80</b>	<b>1.47</b>

NPV @12% discount rate	ETB
NPV @12% discount rate	\$US
4.74	

## FINDINGS

### Financial Analysis

The financial analysis performed for the milk-processing plant enhancement yields positive financial net present value (FNPVs) from both the total investment point of view and the owner point of view. The FNPV has been calculated using a 12 percent real discount rate. The FNPVs for the both scenarios are presented in table 16, below.

**Table 16. FNPVs from the total investment point of view (US\$ mill, real)**

Point of view	Scenario		
	“Without intervention	Moderate enhancement	Aggressive enhancement
Total investment	2.52	3.62	4.74
Owner	2.70	4.12	5.74

The FNPV from the owner point of view under the “without intervention” scenario would be higher than the FNPV from the total investment point of view (US\$2.70 million versus US\$2.52 million). This increase in the FNPV would result from the subsidized interest rate for the loan provided by the government of Ethiopia.

The incremental FNPVs, using a 12 percent real discount rate, for the moderate enhancement and the aggressive enhancement scenarios would be US\$1.42 million and US\$3.04 million, respectively.

The positive FNPV from the total investment point of view suggests that the project would be financially sustainable. Over the life of the project, the financial benefits would outweigh the financial costs of the project. The positive incremental FNPV, in turn, suggests that USAID’s support would increase the returns on the investment and therefore would reduce the project’s overall level of riskiness.

The cost-benefit analysis (CBA) also reveals that without USAID financial support, the milk-processing plant would face some difficulties covering its loan-repayment obligations. Table 17, below, presents the annual debt service coverage ratios (ADSCRs) for all scenarios.

**Table 17. Annual debt service coverage ratios for the “with intervention” and “without intervention” scenarios**

	Annual debt service coverage ratios						
	2013	2014	2015	2016	2017	2018	2019
“Without intervention”	-1.32	1.18	8.96	17.86	34.20	28.81	36.87
Moderate enhancement	3.77	16.64	21.11	26.82	34.21	28.62	36.70
Aggressive enhancement	1.63	16.50	25.67	39.25	53.10	44.15	56.56

The ADSCRs of the “without intervention” scenario in 2013 would be less than one. This implies that the project would have insufficient cash flow to cover the debt-repayment obligations in that year. The ADSCR of 1.18 in 2014 has been calculated by adding the unpaid fraction of the loan from 2013 to the

debt-service obligation of 2014. The analysis reveals that the project would be able to eventually repay the loan in full. The assumption has been made, however, that the lending bank would not charge any penalty for the late repayment.

With USAID's support, the ADSCRs would be higher than one during the whole loan-repayment period, meaning that USAID's support would also eliminate the problem of insufficient cash flow for the debt repayment in year 1 of the project.

## **Economic Analysis**

Differences emerge between the financial and economic outcomes due to the fact that the financial values do not include all the externalities that are present in the economy. In this case, a number of externalities would arise:

- a. The pastoralists producing milk currently are not able to sell the full quantity of milk produced. The interviewed milk traders stated that they are able to purchase only about 50 percent of the milk that households could supply. The result is a suboptimal utilization of milk by the households. For instance, milk is fed to calves. The project would increase the demand for milk in the region, resulting in a positive economic externality occurring to the pastoralist households supplying raw milk. This analysis estimates that the households would increase the value of the milk utilization to earn 20 percent more income.
- b. Some benefits would accrue to the traders supplying milk to the processing plant. Their net benefits have been calculated after deducting all operating expenses and the opportunity cost of the traders' labor. The net benefit in this case would be a transfer of resources from the project to the traders.
- c. The project would also increase the amount of taxes collected by the government of Ethiopia. These taxes would come either directly from the taxation of inputs or indirectly via the foreign exchange premium (FEP). The field visits revealed that imported ultra-high temperature processed (UHT) milk is available in the region; for instance, it is available in the markets in Jijiga City. The intervention would increase the supply of pasteurized milk, hence partly replacing UHT milk imports. The FEP for Ethiopia is reported to be 6.5 percent (Kuo, 2011), so every incremental dollar of import substitute would have an economic benefit of 1.065 times the foreign exchange saved.

The total benefits arising to the government of Ethiopia and other project stakeholders are described in more detail in the following section.

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 (CFs). If no distortions were present in the market, then the item's financial value was used to measure its economic value.<sup>4</sup>

The USAID subsidy, the contributions to the community, the income-tax payments, and loan inflow as well as loan disbursement represent resource flows from one stakeholder to the other. The CF for a transfer of resource items is zero.

Tables 18 and 19, below, present the economy resource-flow statements for the moderate enhancement and the aggressive enhancement scenarios, respectively. The economic resource-flow statement has been constructed on an incremental basis, so the net economic benefits would arise directly due to USAID's support.

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<sup>4</sup> The list of CFs used for the purpose of this analysis is presented in table F in the Appendix.

In the case of the moderate enhancement scenario, the incremental economic resource flow would differ from the financial cash flow from the total investment point of view in some line items, such as:

- a. revenues from the goods sold in the first 4 years of the project. The difference would arise because with USAID's support, the plant would be able to operate at full capacity starting in year 1 of the operation.
- b. the investment and the replacement cost as well as the liquidation value of the vehicles. USAID's support would enable the project to purchase the vehicles earlier. The economic life of the vehicles has been assumed to be 10 years, so the replacement of the vehicles would also happen earlier.
- c. increased production, resulting in increased costs of raw materials, packaging, and transportation.
- d. a change in the project's cash balance.

All other line items under the "without intervention" scenario would be exactly the same as with the moderate enhancement scenario.

Under the aggressive enhancement scenario, the incremental economic resource flow would differ from the incremental financial cash flow from the total investment point of view for almost all line items. In this case, USAID's support not only would enable the project to operate at a capacity of 10,000 liters/day from year 1 but also would increase the project's production capacity.

The analysis reveals that the incremental economic net present value (ENPV) using the 12 percent economic opportunity cost of capital (EOCK) would be positive. The ENPV for the moderate enhancement and the aggressive enhancement scenarios would be US\$1.99 million and US\$6.52 million, respectively.

**Table 18. Economic resource-flow statement, moderate enhancement (economy point of view, real ETB mill)**

	CF	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	PV	
<b>RESOURCE INFLOW</b>																							
Pasteurized cow's milk (500 ml)	0.87	0.00	9.95	7.11	3.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Pasteurized camel's milk sold domestically (500 ml)	0.87	0.00	18.33	13.09	6.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Yoghurt (500ml)	0.71	0.00	0.64	0.47	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Yoghurt (250ml)	0.71	0.00	0.48	0.35	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Cheese (250 mg)	0.71	0.00	0.71	0.54	0.28	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Butter (250mg)	0.71	0.00	0.90	0.69	0.35	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Pasteurized camel's milk exported(500ml)	1.07	0.00	20.10	14.36	7.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
<b>Gross sales</b>		<b>0.00</b>	<b>51.11</b>	<b>36.61</b>	<b>18.33</b>	<b>0.04</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>87.89</b>	
Changes in accounts receivable	0.87	0.00	-4.33	0.50	1.03	1.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.91	
<b>Liquidation values</b>																							
Land	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Buildings	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Machinery and equipment	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Vehicles	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.70	
Generator	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Borehole	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Loan inflow	0.00	0.00																					
USAID Subsidy	0.00	0.00																				0.00	
<b>TOTAL CASH INFLOW</b>		<b>0.00</b>	<b>46.78</b>	<b>37.12</b>	<b>19.36</b>	<b>1.33</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>-0.70</b>	<b>85.91</b>
<b>RESOURCE OUTFLOW</b>																							
<b>Investment Cost</b>																							
Land	1.00	0.00																				0.00	
Electricity connection	1.00	0.00																				0.00	
Buildings	1.00	0.00																				0.00	
CIF cost of Machinery and Equipment	1.06	0.00																				0.00	
Vehicles	1.06	5.40	0.00	-1.35	-1.35	-2.70	0.00	0.00	0.00	0.00	0.00	3.52	-0.88	-0.88	-1.76	0.00	0.00	0.00	0.00	0.00	0.00	1.90	
Borehole construction	1.00	0.00																				0.00	
Generator	1.06	0.00																				0.00	
Office furniture	1.04	0.00																				0.00	
Local transportation of the machinery to the project site	0.85	0.00																				0.00	
<b>Operating Cost</b>																							
<b>Milk Cost</b>																							
Cow's milk	0.75	0.00	6.62	4.73	2.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.35	
Camel's milk	0.75	0.00	12.29	8.78	4.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.09	
<b>Transportation costs</b>																							
Cost of milk collection	0.85	0.00	0.90	0.64	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.54	
Cost for domestic market delivery	0.85	0.00	2.49	1.78	0.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.27	
Cost for export market delivery	0.85	0.00	0.92	0.66	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.58	
<b>Packaging Cost</b>																							
Yogurt cup	0.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Liquid milk container 500ml	0.84	0.00	3.62	2.59	1.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.22	
Butter	0.87	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	
Cheese	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	

<b>Utilities</b>																						
Fixed Electricity Cost	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Variable electricity Cost	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost of running generator	0.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Indirect costs</b>																						
Cost of uniforms	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Telephone and Postage	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Printing and Stationery	0.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nitric Acid	0.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Flosc Ponicol	0.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lacto Meter	0.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PH meter portable	0.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Centrifuge	0.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Overhead costs</b>																						
Certifications and Licenses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Health Insurance for Employees	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Site insurance	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other office expenses	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Advertising expense	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Traveling expense	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Medical Expense	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Total Labor Cost (Wages and Social Insurance)</b>																						
Total direct labor cost	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Managerial Staff	0.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Administrative staff	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other personnel	0.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Working Capital</b>																						
Changes in accounts payable	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Changes in cash balance	1.00	0.00	4.98	-0.58	-1.19	-1.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.19
<b>Net VAT Payment</b>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Loan Debt Service</b>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>TOTAL RESOURCE OUTFLOW</b>		5.40	31.82	17.24	7.05	-4.19	0.00	0.00	0.00	0.00	0.00	3.52	-0.88	-0.88	-1.76	0.00	0.00	0.00	0.00	0.00	0.00	50.17
<b>NET RESOURCE FLOW (BEFORE TAX AND FINANCING)</b>		-5.40	14.96	19.88	12.31	5.52	0.01	0.00	0.00	0.00	0.00	-3.52	0.88	0.88	1.76	0.00	0.00	0.00	0.00	0.00	-0.70	35.74
(-) Corporate income tax	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>NET RESOURCE FLOW (AFTER TAX, BEFORE CONTRIBUTION TO THE COMMUNITY)</b>		-5.40	14.96	19.88	12.31	5.52	0.01	0.00	0.00	0.00	0.00	-3.52	0.88	0.88	1.76	0.00	0.00	0.00	0.00	0.00	-0.70	35.74
(-) Contribution to the community	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>NET RESOURCE FLOW (AFTER TAX AFTER CONTRIBUTION TO THE COMMUNITY)</b>		-5.40	14.96	19.88	12.31	5.52	0.01	0.00	0.00	0.00	0.00	-3.52	0.88	0.88	1.76	0.00	0.00	0.00	0.00	0.00	-0.70	35.74
<b>NET RESOURCE FLOW (AFTER TAX, AFTER FINANCING) US\$</b>		-0.30	0.83	1.10	0.68	0.31	0.00	0.00	0.00	0.00	0.00	-0.20	0.05	0.05	0.10	0.00	0.00	0.00	0.00	0.00	-0.04	1.99

NPV @12% discount rate (million ETB)	35.74
NPV @12% discount rate (million \$US)	1.99

Table 19. Economic resource-flow statement, aggressive enhancement (economy point of view, real ETB mill)

	CF	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	PV	
<b>RESOURCE INFLOW</b>																							
Pasteurized cow's milk (500 ml)	0.87	0.00	11.73	10.66	10.66	8.89	8.89	8.89	8.89	8.89	8.89	8.89	8.89	8.89	8.89	8.89	8.89	8.89	8.89	8.89	8.89		
Pasteurized camel's milk sold domestically (500 ml)	0.87	0.00	21.60	19.64	19.64	16.37	16.37	16.37	16.37	16.37	16.37	16.37	16.37	16.37	16.37	16.37	16.37	16.37	16.37	16.37	16.37		
Yoghurt (500ml)	0.71	0.00	0.75	0.70	0.70	0.59	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58		
Yoghurt (250ml)	0.71	0.00	0.56	0.52	0.52	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43		
Cheese (250 mg)	0.71	0.00	0.84	0.80	0.80	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67		
Butter (250mg)	0.71	0.00	1.06	1.02	1.01	0.85	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84		
Pasteurized camel's milk sold for exports (500ml)	1.07	0.00	23.69	21.54	21.54	17.95	17.95	17.95	17.95	17.95	17.95	17.95	17.95	17.95	17.95	17.95	17.95	17.95	17.95	17.95	17.95		
<b>Gross sales</b>		<b>0.00</b>	<b>60.24</b>	<b>54.89</b>	<b>54.88</b>	<b>45.75</b>	<b>45.73</b>	<b>45.73</b>	<b>45.73</b>	<b>45.73</b>	<b>45.73</b>	<b>45.73</b>	<b>45.73</b>	<b>45.73</b>	<b>45.73</b>	<b>45.73</b>	<b>45.73</b>	<b>45.73</b>	<b>45.73</b>	<b>45.73</b>	<b>45.83</b>	<b>358.31</b>	
Changes in accounts receivable	0.87	0.00	-5.10	-0.40	-0.77	0.00	-0.64	-0.65	-0.65	-0.65	-0.65	-0.65	-0.65	-0.65	-0.65	-0.65	-0.65	-0.65	-0.65	-0.65	-0.66	3.24	-7.77
<b>Liquidation values</b>																							
Land	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Buildings	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Machinery and equipment	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.04
Vehicles	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.88	0.22
Generator	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Borehole	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan inflow	0.00	0.00																					
USAID Subsidy	0.00	0.00																					0.00
<b>TOTAL CASH INFLOW</b>		<b>0.00</b>	<b>55.14</b>	<b>54.49</b>	<b>54.10</b>	<b>45.75</b>	<b>45.09</b>	<b>45.08</b>	<b>45.08</b>	<b>45.08</b>	<b>45.08</b>	<b>45.08</b>	<b>45.08</b>	<b>45.08</b>	<b>45.08</b>	<b>45.08</b>	<b>45.08</b>	<b>45.08</b>	<b>45.08</b>	<b>45.08</b>	<b>45.17</b>	<b>5.50</b>	<b>350.80</b>
<b>RESOURCE OUTFLOW</b>																							
<i>Investment Cost</i>																							
Land	1.00	0.00																					0.00
Electricity connection	1.00	0.00																					0.00
Buildings	1.00	0.00																					0.00
CIF cost of Machinery and Equipment	1.06	3.83																					3.83
Vehicles	1.06	10.81	0.00	-1.35	-1.35	-2.70	0.00	0.00	0.00	0.00	0.00	7.04	-0.88	-0.88	-1.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.44
Borehole construction	1.00	0.00																					0.00
Generator	1.06	0.00																					0.00
Office furniture	1.04	0.00																					0.00
Local transportation of the machinery to the project site	0.85	0.03																					0.03
<i>Operating Cost</i>																							
<i>Milk Cost</i>																							
Cow's milk	0.75	0.00	7.80	7.09	7.09	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	0.00	46.29
Camel's milk	0.75	0.00	14.48	13.16	13.16	10.97	10.97	10.97	10.97	10.97	10.97	10.97	10.97	10.97	10.97	10.97	10.97	10.97	10.97	10.97	10.97	0.00	85.96
<i>Transportation costs</i>																							
Cost of milk collection	0.85	0.00	1.06	0.96	0.96	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.00	6.27
Cost for domestic market delivery	0.85	0.00	2.93	2.67	2.67	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	0.00	17.42
Cost for export market delivery	0.85	0.00	1.09	0.99	0.99	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.00	6.45
<i>Packaging Cost</i>																							
Yogurt cup	0.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Liquid milk container 500ml	0.84	0.00	4.27	3.88	3.88	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	0.00	25.36
Butter	0.87	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.05
Cheese	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03



<b>Utilities</b>																					
Fixed Electricity Cost	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Variable electricity Cost	0.90	0.00	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.00
Cost of running generator	0.79	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.00
<b>Indirect costs</b>																					
Cost of uniforms	0.87	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.00
Telephone and Postage	0.87	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Printing and Stationery	0.71	0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.00
Nitric Acid	0.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Flosc Ponicol	0.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lacto Meter	0.93	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
PH meter portable	0.93	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Centrifuge	0.93	0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.00
<b>Overhead costs</b>																					
Certifications and Licenses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Health Insurance for Employees	0.87	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.00
Site insurance	0.87	0.00	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.00
Other office expenses	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Advertising expense	0.87	0.00	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.00
Traveling expense	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Medical Expense	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Total Labor Cost (Wages and Social Insurance)</b>																					
Total direct labor cost	0.67	0.00	1.42	1.45	1.47	1.50	1.53	1.56	1.60	1.63	1.66	1.69	1.73	1.76	1.80	1.83	1.87	1.91	1.95	1.98	0.00
Managerial Staff	0.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Administrative staff	0.83	0.00	0.23	0.24	0.24	0.25	0.25	0.26	0.26	0.27	0.27	0.28	0.28	0.29	0.29	0.30	0.31	0.31	0.32	0.32	0.00
Other personnel	0.86	0.00	0.85	0.87	0.88	0.90	0.92	0.94	0.96	0.98	1.00	1.02	1.04	1.06	1.08	1.10	1.12	1.14	1.17	1.19	0.00
<b>Working Capital</b>																					
Changes in accounts payable	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Changes in cash balance	1.00	0.00	5.87	0.46	0.89	0.00	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.75	-3.72
<b>Net VAT Payment</b>	<b>0.00</b>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Loan Debt Service</b>	<b>0.00</b>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>TOTAL RESOURCE OUTFLOW</b>	<b>14.67</b>	<b>40.52</b>	<b>30.94</b>	<b>31.42</b>	<b>24.44</b>	<b>27.93</b>	<b>27.99</b>	<b>28.04</b>	<b>28.10</b>	<b>28.16</b>	<b>35.26</b>	<b>27.40</b>	<b>27.46</b>	<b>26.64</b>	<b>28.46</b>	<b>28.53</b>	<b>28.59</b>	<b>28.66</b>	<b>28.74</b>	<b>-3.72</b>	<b>233.18</b>
<b>NET RESOURCE FLOW (BEFORE TAX AND FINANCING)</b>	<b>-14.67</b>	<b>14.61</b>	<b>23.55</b>	<b>22.68</b>	<b>21.31</b>	<b>17.15</b>	<b>17.09</b>	<b>17.04</b>	<b>16.98</b>	<b>16.93</b>	<b>9.83</b>	<b>17.69</b>	<b>17.63</b>	<b>18.44</b>	<b>16.62</b>	<b>16.56</b>	<b>16.49</b>	<b>16.42</b>	<b>16.43</b>	<b>9.22</b>	<b>117.62</b>
(-) Corporate income tax	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>NET RESOURCE FLOW (AFTER TAX,</b>	<b>-14.67</b>	<b>14.61</b>	<b>23.55</b>	<b>22.68</b>	<b>21.31</b>	<b>17.15</b>	<b>17.09</b>	<b>17.04</b>	<b>16.98</b>	<b>16.93</b>	<b>9.83</b>	<b>17.69</b>	<b>17.63</b>	<b>18.44</b>	<b>16.62</b>	<b>16.56</b>	<b>16.49</b>	<b>16.42</b>	<b>16.43</b>	<b>9.22</b>	<b>117.62</b>
<b>BEFORE CONTRIBUTION TO THE COMMUNITY)</b>																					
(-) Contribution to the community	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>NET RESOURCE FLOW (AFTER TAX,</b>	<b>-14.67</b>	<b>14.61</b>	<b>23.55</b>	<b>22.68</b>	<b>21.31</b>	<b>17.15</b>	<b>17.09</b>	<b>17.04</b>	<b>16.98</b>	<b>16.93</b>	<b>9.83</b>	<b>17.69</b>	<b>17.63</b>	<b>18.44</b>	<b>16.62</b>	<b>16.56</b>	<b>16.49</b>	<b>16.42</b>	<b>16.43</b>	<b>9.22</b>	<b>117.62</b>
<b>AFTER CONTRIBUTION TO THE COMMUNITY)</b>																					
<b>NET RESOURCE FLOW (AFTER TAX, AFTER FINACING) US\$</b>	<b>-0.81</b>	<b>0.81</b>	<b>1.31</b>	<b>1.26</b>	<b>1.18</b>	<b>0.95</b>	<b>0.95</b>	<b>0.95</b>	<b>0.94</b>	<b>0.94</b>	<b>0.55</b>	<b>0.98</b>	<b>0.98</b>	<b>1.02</b>	<b>0.92</b>	<b>0.92</b>	<b>0.92</b>	<b>0.91</b>	<b>0.91</b>	<b>0.51</b>	<b>6.53</b>

NPV @12% discount rate (million ETB)	117.62
NPV @12% discount rate (million \$US)	6.53

## 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. Pastoralists Resilience Improvement and Market Development (PRIME) interventions in the dairy value chain would affect seven main stakeholders: the households supplying milk to the milk-processing plant, the Jijiga City community, the milk traders, the labor employed by the project, the private entrepreneur, the government of Ethiopia, and USAID.

1. The government of Ethiopia would benefit due to the following factors:
  - a. The additional inflow of taxes would come from the tradable inputs used in the production. For instance, Ethiopia assesses a high tariff rate and other taxes on the imports of fuel that increase its financial cost. Taxes, in turn, are just a transfer of resources from consumers to the government. At the same time, fuel is internationally traded and requires foreign exchange that has an economic cost to the economy that is 6.5 percent greater than its financial cost. Overall, the economic cost of fuel is less than its financial cost. Every incremental dollar spent on fuel required to transport milk has an economic cost of 79 percent of its financial cost. These figures have also been added to the difference between the financial and economic outcomes of the intervention. In addition, the milk-processing plant will pay 30 percent income tax after the 5-year tax holiday period ends.
  - b. The field visits revealed that there is imported ultra-high temperature processed (UHT) milk in the Jijiga City, Somali region. The intervention would increase the supply of pasteurized milk, hence replacing part of the dairy imports. The foreign exchange premium (FEP) for Ethiopia is reported to be 6.5 percent (Kuo, 2011), so every incremental dollar spent on imports would have an economic cost of 1.065 times the market exchange rate.
  - c. The milk-processing plant would be the first plant to process camel's milk in Ethiopia. Camel's milk is in high demand in Somalia. The project would export pasteurized camel's milk into Hargessa City, Somalia, resulting in increased foreign currency earnings. The FEP for Ethiopia is reported to be 6.5 percent, so every incremental dollar earned on exports would have an economic benefit of 1.065 times the market exchange rate.
  - d. The project would also employ a significant number of laborers. The government levies personal income tax, so the newly employed laborers would generate additional tax inflows for the government.
2. The pastoralist households currently produce milk in excess of demand in the region. Milk that cannot be sold is used in a less-efficient manner, such as being fed to calves or converted to cheese or butter. In addition, the project would attempt to purchase raw milk from dedicated suppliers. The entrepreneur during the interview mentioned that he would distribute aluminum cans to the households in an attempt to increase the quality of raw milk supplied. The total net benefit to the milk-supplying households has been assumed to be 20 percent of the value of raw milk sold.
3. The project would need to pay a wage rate higher than the market's current rate to attract the labor force. In addition, the project would also make a social insurance contribution of 8 percent, resulting in net benefits accruing to the laborers involved with the production process.
4. The traders are currently selling raw milk at Ethiopian Birr (ETB) 65.00/5 liters. During the interview, they mentioned that they would be able to reduce the price of milk to ETB 55.00/5 liters. Although it is very difficult to obtain their exact operational costs, some of the traders mentioned that the net margin (after deduction of the opportunity cost of labor) would be about 5 to 10 percent of the milk's value. The analysis assumes that the net benefit to the traders would be equal to 5 percent of the value of raw milk.

5. The project would also make a contribution of 5 percent of sales to the Jijiga City community. In addition to religious reasons (the Somali region is Muslim), this contribution would also reflect some business logic. It would be important for the business to establish relationships with reliable suppliers of raw materials, and this contribution would allow the facility to develop a culture of trust within the community.
6. The private entrepreneur would benefit due to the financial subsidy from USAID. The subsidy would increase the return on investment as well as help overcome a financing problem.
7. USAID would bear the cost of the intervention.

Table 20, below, presents the value of the stakeholders' gains. The net benefits to the stakeholders have been derived on an incremental basis directly from USAID's support.

**Table 20. Stakeholder and beneficiary impacts of the project (present value in US\$ mill)**

	<b>Moderate enhancement</b>	<b>Aggressive enhancement</b>
<b>Economic NPV (FNPV + externalities)</b>	1.99	6.53
• <b>Financial NPV (entrepreneur)</b>	1.42	3.04
• <b>Externalities</b>	0.56	-0.33
○ <b>Government</b>	0.17	1.46
○ <b>Labor</b>	0.00	0.20
○ <b>Community</b>	0.08	0.16
○ <b>USAID</b>	-0.28	-0.77
○ <b>Households</b>	0.48	1.96
○ <b>Traders</b>	0.12	0.49

USAID's contribution is the amount of the financial subsidy that it would provide. This figure represents a transfer of resources between the entrepreneur and USAID.

The analysis assumes that the total benefits arising to the government of Ethiopia would be distributed among the Ethiopian population. The World Bank reports that the Ethiopian government's spending is US\$33.79 per capita; the present value of US\$33.79 over a 20-year period is equal to US\$283.00.

Tables 21 and 22, below, show the present value of the total amount of net benefits, the total number of beneficiaries, and the present value of the net benefits per beneficiary for the moderate enhancement and the aggressive enhancement scenarios, respectively.

**Table 21. The present value of the net benefits, the total number of beneficiaries, and the present value of benefits per beneficiary for the moderate enhancement scenario**

	<b>Present value of the net benefits (US\$)</b>	<b>Number of households benefiting</b>	<b>Present value of the benefits per household (US\$)</b>
<b>Households supplying cow's milk</b>	168,215.88	490	343.30
<b>Households supplying camel's milk</b>	312,400.92	569	549.28
<b>Traders selling cow's milk</b>	42,053.97	30	1,381.08
<b>Traders selling camel's milk</b>	78,100.23	28	2,762.17
<b>Recipients of government support</b>	169,932.74	600	283
<b>Labor</b>	0	0	0

**Table 22. The present value of the net benefits, the total number of beneficiaries, and the present value of benefits per beneficiary for the aggressive enhancement scenario**

	<b>Present value of the net benefits (US\$)</b>	<b>Number of households benefiting</b>	<b>Present value of the benefits per household (US\$)</b>
<b>Households supplying cow's milk</b>	685,753.18	578	1,187.45
<b>Households supplying camel's milk</b>	1,273,541.62	670	1,899.92
<b>Traders selling cow's milk</b>	171,438.29	41	4,186.53
<b>Traders selling camel's milk</b>	318,385.40	46	6,977.55
<b>Recipients of the government support</b>	1,455,428.99	5,143	283.00
<b>Labor</b>	195,417.96	83	2,354.43

Note that the present value of the labor benefits under the moderate enhancement scenario would be zero. This is because the analysis has been done on an incremental basis to determine the benefits arising due to USAID's support. Under the moderate enhancement scenario, the production capacity would be the same under the "without intervention" and "with intervention" scenarios, so no additional labor would be employed by the project due to USAID's support.

## SENSITIVITY ANALYSIS

A sensitivity analysis for the Pastoralists Resilience Improvement and Market Development (PRIME) interventions has been performed using the key variables that would be prone to change and likely to influence the project's performance. These variables include the purchase price of raw camel's and cow's milk, the domestic sale price of cow's milk, the export sale price of camel's milk, the impact of the domestic sale prices of cow's milk by products (cheese, yogurt, butter), the impact of milk losses, and the impact of an increase in transportation costs. Details related to the sensitivity analysis are outlined in the following tables.

1. The milk-processing plant would process camel's milk as well as cow's milk. Currently, the selling price of both types of milk is the same (ETB 12.00/liter). The sensitivity analysis of this study assumes that the same correlation between the prices would hold in the future. Table 23 presents the impact of the raw materials' price change on the project's financial net present value (FNPV).

**Table 23. Impact of the purchase price of raw milk on the FNPV (US\$ mill)**

Price (ETB, real)	NPV (US\$ mill)	NPV (US\$ mill)
	moderate enhancement	aggressive enhancement
10.00	1.86	4.39
11.00	1.61	3.71
12.00	1.42	3.04
13.00	1.23	2.39
13.50	1.14	2.05
14.00	0.95	1.63
14.50	0.86	1.30
15.00	0.76	0.97

The baseline scenario assumes that the milk would be purchased at Ethiopian Birr (ETB) 12.00/liter. The traders during the field visits stated that they would be able to reduce the price to ETB 11.00/liter due to the big quantities demanded by the project. If this were the case, the FNPV of the project would increase from US\$1.42 million to US\$1.61 million under the moderate enhancement scenario. The FNPV under the aggressive enhancement scenario would increase from US\$3.04 million to US\$3.71 million. However, if the purchase price of milk were increased to ETB 15.00/liter, the FNPV would still be positive. The break-even point of the purchase price of milk has been estimated at ETB 17.52 and ETB 19.47 for the moderate enhancement and aggressive enhancement scenarios, respectively.

However, at the current price of raw materials, the milk-processing plant would not be compatible with the milk-processing plants located around Addis Ababa, where processors are able to purchase raw milk in the range of ETB 5.00 to ETB 9.00/liter. In addition, the long distance to Addis Ababa may also prevent the project from penetrating the market. The private entrepreneur stated during his interview that the project would not target the Addis Ababa market, although about 5 percent of the pasteurized camel's milk may be transported to this city in an attempt to test the market.

2. The project would sell pasteurized milk in 500 milliliter plastic containers. The milk would be sold in both the domestic and the export markets. The export market (Hargessa City, Somalia), however, demands only camel's milk. Therefore, cow's milk and by-products of cow's milk

would only be sold domestically. Forty percent of the pasteurized camel’s milk would be exported, with the remaining 60 percent sold domestically. The domestic share of milk would be sold at ETB 11.00 and ETB 13.00/500 milliliters of cow’s and camel’s milk, respectively. The sensitivity analysis of the impact of the change in the domestic pasteurized milk price assumes that the same relationship (pasteurized camel’s milk would fetch a premium of 18 percent) between pasteurized cow’s and camel’s milk would exist in the future. The impact of the domestic sale price of the pasteurized milk is presented in table 24, below.

**Table 24. Impact of the domestic price of pasteurized milk on the FNPV (US\$ mill)**

<b>Price (ETB, real)</b>	<b>NPV (US\$ mill) moderate enhancement</b>	<b>NPV (US\$ mill) aggressive enhancement</b>
8.00	0.75	0.94
8.50	0.85	1.28
9.00	0.95	1.62
9.50	1.13	2.04
10.00	1.23	2.38
10.50	1.32	2.70
11.00	1.42	3.04
11.50	1.52	3.38
12.00	1.62	3.72

The baseline scenario assumes that the pasteurized cow’s milk would be sold at ETB 11.00/500 milliliters and that the camel’s milk would be sold for an 18.18 percent premium at all price levels. At the baseline-scenario price level, the FNPV under the moderate enhancement scenario would be US\$1.42 million, and it would be US\$3.04 million under the aggressive enhancement scenario. If the price of pasteurized cow’s milk were to increase to ETB 12.00/500 milliliters, the FNPV of the moderate enhancement scenario, for instance, would increase from US\$1.42 million to US\$1.62 million. The break-even point has been estimated at ETB 5.67 and ETB 4.34 for the moderate enhancement and aggressive enhancement scenarios, respectively.

It is important to note that the FNPV would also be affected by the price of pasteurized camel’s milk sold in the export market. For instance, the break-even point of ETB 4.34/500 milliliters under the aggressive enhancement scenario is less than the cost of raw milk at ETB 5.50/500 milliliters. This is because in this case, the analysis assumes that the export price has been fixed. The changes in the export price and in the domestic prices are described below.

3. The impact of the cow’s milk by-products on the project’s FNPV would be quite insignificant. For details, please refer to the cost-benefit analysis (CBA) model spreadsheet that accompanies this report.
4. The baseline scenario assumes that about 1 percent of the raw milk purchased by the milk-processing plant would be lost during transportation and processing. Although the 1 percent in this case perhaps represents the upper boundary of the milk losses, the sensitivity analysis has been conducted to determine the impact of increased milk losses on the FNPV. The results are presented in table 25, below.

**Table 25. Impact of milk losses on the FNPV (US\$ mill)**

Losses (%)	NPV (US\$ mill)	
	moderate enhancement	aggressive enhancement
1.0%	1.42	3.04
2.0%	1.38	2.91
3.0%	1.35	2.79
4.0%	1.31	2.66
5.0%	1.27	2.55
6.0%	1.24	2.42
7.0%	1.20	2.29

The sensitivity analysis reveals that even if the milk losses were to increase to 7 percent of the quantity of milk purchased, the FNPV of the project would still be positive. For instance, an increase in the losses from 1 to 2 percent would reduce the FNPV of the project by 2.9 percent.

- The private entrepreneur stated that his market analysis revealed that the pasteurized camel's milk could be sold in Hargessa City, Somalia, at US\$1.50/500 milliliters. This seems to be an unrealistically high price for pasteurized camel's milk. The entrepreneur's estimates were based on the assumed strong cultural preferences of Somali people toward camel's milk and zero availability of milk in the city. The CBA team could not obtain the exact information about the price of pasteurized camel's milk in Hargessa. However, the analysis reveals that 10 percent sales tax, 10 percent value-added tax (VAT), and US\$1,000 import tax would be assessed on trucks passing the border of Somalia with imports. The refrigerator truck's maximum load is 3,000 liters of milk. The net price of milk in Somalia after taking into consideration the relevant tax rates applied on imports has therefore been estimated at US\$0.97/500 milliliters. Table 26, below, presents the impact of the export-price change on the project's FNPV.

**Table 26. Impact of the export price of the pasteurized camel's milk on the FNPV (US\$ mill)**

Price (US\$, real)	NPV (US\$ mill)	
	moderate enhancement	aggressive enhancement
0.67	0.83	1.22
0.70	0.88	1.40
0.75	0.97	1.69
0.80	1.14	2.07
0.85	1.22	2.36
0.90	1.30	2.63
0.97	1.42	3.04
1.00	1.47	3.21
1.10	1.64	3.80

The export price of the pasteurized camel's milk would have a strong impact on the project's FNPV. For instance, if the export price were to drop to US\$0.67/500 milliliters, which would be the same as the domestic price, the FNPV of the moderate enhancement scenario would decrease by 58.45 percent, from US\$1.42 million to US\$0.83 million. However, in the tested range of the export prices, the FNPV would always be positive.

6. The project would also incur significant transportation costs, including the cost of the collection and delivery of the raw milk as well as the cost of milk delivery to the different market points. The export market (Hargessa City, Somalia) is located relatively close to the processing plant. The total average transportation cost of the baseline scenario has been estimated at ETB 2.10/liter of milk. The impact of the change in transportation costs is presented in table 27, below.

**Table 27. Impact of the change in transportation costs on the FNPV (US\$ mill)**

Cost (ETB, real)	NPV (US\$ mill)	
	moderate enhancement	aggressive enhancement
1.80	1.51	3.37
2.00	1.45	3.15
2.10	1.42	3.04
2.30	1.36	2.82
2.50	1.30	2.61
3.00	1.14	2.06
3.20	0.99	1.75
3.50	0.90	1.42
3.70	0.84	1.20
4.00	0.74	0.87

The sensitivity test reveals that the project's FNPV for both scenarios would still be positive, even if the transportation cost were to nearly double.

7. The sensitivity test has also been conducted to determine the impact of the simultaneous change in pasteurized milk prices in the domestic and export markets. However, to properly understand the impact of the price changes, it would be more practical to compare the “with intervention” scenario to the “without intervention” scenario. Although the incremental FNPV may be positive, the “with intervention” scenario FNPV may be negative, so the investment would not be feasible. Table 28, below, presents the results of the sensitivity test for the moderate enhancement scenario.

**Table 28. Joint impact of domestic and export pasteurized milk prices on FNPV (US\$ mill)**

		Export price (US\$/500 milliliters)									
		0.61	0.70	0.75	0.80	0.85	0.90	0.97	1.00	1.10	1.20
Domestic price (ETB/500 milliliters)	8.00	-1.89	1.13	0.71	-0.28	0.14	0.57	1.16	1.42	2.26	3.11
	8.50	-1.40	0.64	0.21	0.21	0.64	1.06	1.65	1.91	2.76	3.61
	9.00	-0.91	0.14	0.28	0.70	1.13	1.55	2.15	2.40	3.25	4.10
	9.50	-0.41	0.35	0.77	1.20	1.62	2.05	2.64	2.90	3.74	4.59
	10.00	0.08	0.84	1.27	1.69	2.12	2.54	3.13	3.39	4.24	5.09
	10.50	0.57	1.34	1.76	2.19	2.61	3.03	3.63	3.88	4.73	5.58
	11.00	1.07	1.83	2.25	2.68	3.10	3.53	4.12	4.38	5.23	6.07
	11.50	1.56	2.32	2.75	3.17	3.60	4.02	4.62	4.87	5.72	6.57
	12.00	2.05	2.82	3.24	3.67	4.09	4.51	5.11	5.36	6.21	7.06



The baseline scenario assumes that the exported camel’s milk would be sold at US\$0.97 (ETB 17.46)/500 milliliters. The domestic price of the baseline scenario is ETB 11.00, and the FNPV of the baseline scenario would be US\$1.42 million. The sensitivity analysis reveals that if the export price were to drop to the level of the domestic price, from US\$0.97 to US\$0.61 (ETB 11.00), the FNPV would still be positive. However, if the export price were to drop to US\$0.61/500 milliliters and the domestic price were to drop below ETB 10.00/500 milliliters, the FNPV would become negative.

Table 29, below, presents the same sensitivity test for the “without intervention” scenario.

**Table 29. Joint impact of domestic and export pasteurized milk prices on FNPV (US\$ mill)**

		Export Price (US\$/500 milliliters)									
		0.61	0.70	0.75	0.80	0.85	0.90	0.97	1.00	1.10	1.20
Domestic price (ETB/500 milliliters)	8.00	-1.96	-1.35	-1.04	-0.70	-0.36	-0.04	0.41	0.61	1.30	1.89
	8.50	-1.57	-0.98	-0.64	-0.30	0.02	0.33	0.81	1.01	1.61	2.29
	9.00	-1.18	-0.59	-0.25	0.07	0.38	0.73	1.20	1.41	2.00	2.68
	9.50	-0.80	-0.19	0.13	0.44	0.78	1.12	1.51	1.72	2.40	3.08
	10.00	-0.41	0.18	0.50	0.84	1.18	1.43	1.91	2.11	2.79	3.48
	10.50	-0.03	0.55	0.89	1.23	1.49	1.83	2.30	2.51	3.19	3.87
	11.00	<b>0.33</b>	0.95	1.29	1.54	1.88	2.22	<b>2.70</b>	2.91	3.59	4.27
	11.50	0.73	1.34	1.60	1.94	2.28	2.62	3.10	3.30	3.98	4.60
	12.00	1.13	1.65	1.99	2.33	2.68	3.02	3.49	3.70	4.38	<b>5.00</b>

In the “without intervention” scenario, if the export price were to drop to the level of the baseline domestic price of ETB 11.00/500 milliliters and the domestic price were to drop below ETB 11.00/500 milliliters, the FNPV would become negative. Under the “with intervention” scenario, the FNPV would become negative if the domestic price were to drop below ETB 10.00/500 milliliters. This result again suggests that USAID’s support would reduce the entrepreneur’s risk.

- The aggressive enhancement scenario would increase the plant’s production capacity to 25,000 liters/day. The sensitivity analysis attempts to determine to what extent the project would need to reduce the sale price of pasteurized milk to be able to sell quantities above 10,000 liters/day. Table 30, below, presents the results of the sensitivity test.

**Table 30. Impact of the domestic pasteurized milk price decrease to overcome excess supply on FNPV (US\$ mill)**

		Sale price (ETB/500 milliliters)					
		11.00	10.50	10.00	9.50	9.00	8.50
Capacity utilization	40.0%	3.42	2.87	2.34	1.79	1.24	0.70
	50.0%	4.35	<b>3.72</b>	3.12	2.50	1.87	1.25
	60.0%	5.28	4.58	<b>3.90</b>	3.20	2.50	1.81
	70.0%	6.21	5.43	4.68	<b>3.91</b>	3.13	2.36
	80.0%	7.13	6.29	5.46	4.61	<b>3.76</b>	2.92
	90.0%	8.06	7.14	6.24	5.31	4.39	<b>3.47</b>
	100.0%	8.99	8.00	7.02	6.02	5.02	4.03

The baseline scenario assumes that the project’s maximum capacity of 25,000 liters would be utilized at 65 percent. At this level, the FNPV of the “with intervention” scenario would be

US\$5.74 million. However, if the project were only able to operate at the capacity of 10,000 liters at the baseline level of prices, the FNPV would drop to US\$3.42 million.<sup>5</sup>

The elasticity of the demand for pasteurized milk is assumed to be  $-2$ .<sup>6</sup> At the price of ETB 10.50/500 milliliters and an operating capacity of 50 percent, the FNPV would increase from US\$3.42 million to US\$3.72 million. The same positive trend exists unless the prices were to drop to ETB 9.00 at an operating capacity of 80 percent. At this point and after, the milk-processing plant would have no financial incentive to increase utilization of its potential production capacity.

9. The supply of raw milk also has some seasonal fluctuations. During the dry period of the year, the milk supply decreases. The milk traders during the field visits stated that they would be able to supply the required milk quantity to the milk-processing plant without increasing the price. However, if the plant were to increase its capacity to 25,000 liters/day, it may need to compete for the stable milk supply. The increase in the raw-milk price would not necessarily take the form of an increase in the price of the raw material but, for example, would increase the transportation cost to collect raw milk from the raw-milk selling points located relatively far away.

The sensitivity test has been conducted to determine the joint impact of the change in the plant's capacity utilization and an increase in the price of raw milk. The results are presented in table 31, below.

**Table 31. Joint impact of the increase in the price of raw milk to overcome a shortage of raw milk on FNPV (US\$ mill)**

		Purchase price (ETB/liter)					
		12.00	12.50	13.00	13.50	14.00	14.50
Capacity utilization	40.0%	3.42	2.88	2.35	1.81	1.27	0.73
	50.0%	4.35	<b>3.73</b>	3.13	2.52	1.90	1.29
	60.0%	5.28	4.59	<b>3.91</b>	3.22	2.54	1.85
	70.0%	6.21	5.44	4.69	<b>3.93</b>	3.17	2.40
	80.0%	7.13	6.30	5.47	4.64	<b>3.80</b>	2.96
	90.0%	8.06	7.15	6.26	5.34	4.43	<b>3.52</b>
	100.0%	8.99	8.01	7.04	6.05	5.06	4.08

Again, the assumption has been made that the project would need to increase the purchase price of raw milk by ETB 0.50/liter to be able to increase the capacity utilization by 10 percent. At 40 percent capacity utilization, which is also the full production capacity of the “without intervention” scenario, and the baseline purchase price of ETB 12.00/liter, the FNPV would be US\$3.42. At the price of ETB 12.50/liter and an operating capacity of 50 percent, the FNPV would increase from US\$3.42 million to US\$3.73 million. The same positive trend exists unless the price was to increase to ETB 14.00 at an operating capacity of 80 percent. At this point and after, the milk-processing plant would have no financial incentive to increase utilization of its potential production capacity.

<sup>5</sup> Assuming that some of the costs are fixed—for instance, labor cost.

<sup>6</sup> The formula used to calculate the elasticity of the demand is  $\eta_{Project}^D = \eta^T \frac{Q^T}{Q_{Project}} - \varepsilon_{Other}^S \frac{Q^S}{Q_{Project}}$

## CONCLUSIONS AND RECOMMENDATIONS

The cost-benefit analysis (CBA) analysis of the Pastoralists Resilience Improvement and Market Development (PRIME) milk-processing plant enhancement interventions shows a positive financial net present value (FNPV), suggesting that the benefits of implementing such an intervention would outweigh the costs. The pastoralist households would increase their annual income, and the private investor's risk would be reduced due to the intervention.

The CBA team could not obtain data regarding the willingness of people in Hargessa City, Somalia, to pay for pasteurized camel's milk. The export price of milk used in the analysis was obtained during the interview with the private entrepreneur. However, even after the adjustment for taxes levied on the goods imported to Somalia, the price of US\$0.97 seems a little bit high. The local implementer of the PRIME project should attempt to obtain a more solid price figure.

The milk-processing plant would also need to compete with the raw milk sold in the regions where pasteurized milk would be supplied. The significant quantity of raw milk purchased for pasteurization by the milk-processing plant would definitely reduce the quantity of raw milk available for local consumers. This would have a strong positive effect on the health of local communities, because the quality of the raw milk currently sold is highly questionable. In addition, raw milk is only available early in the morning and in the late evening. Local cafeterias may frequently serve powdered milk during the day when raw milk is not available. The quality of water used to mix powdered milk may also cause some health problems to the pastoralists. The availability of pasteurized cow's milk would also help overcome this issue. However, the actual quantity of the pasteurized milk that could be sold at Ethiopian Birr (ETB) 11.00/500 milliliters, which is ETB 4.50 higher than the price of 500 milliliters of raw milk, is still questionable.

The CBA analysis reveals that USAID's support would not only increase the project's financial returns but also help overcome the issue of insufficient cash flow for the debt-repayment obligation in year 1 of the plant operations.

The sensitivity analysis shows that the project would also be able to cope with the shortage of raw materials during the dry period of the year and an excess supply of pasteurized milk (if it exists) by adjusting the purchase and selling prices.

The positive incremental economic net present value (ENPV) of the interventions suggests that in addition to the entrepreneur's risk reduction, other stakeholders, including the pastoralist households, would benefit from the intervention.

The facility cannot currently penetrate the huge market for pasteurized milk in Addis Ababa due to the high cost of the raw materials. The raw milk would be supplied to the facility at the price of ETB 11.00/liter. In comparison, the milk-processing companies that supply pasteurized milk to the Addis Ababa market purchase raw milk in the range of ETB 5.00 to ETB 8.50/liter, depending on the supply area (CIA World Factbook, July, 2012).

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## APPENDIX

**Table F. Summary of conversion factors used for the economic analysis of the intervention in the PRIME dairy value chain**

<i>Summary of conversion factors</i>	
Pasteurized cow's milk (domestic sales)	0.87
Pasteurized camel's milk (domestic sales)	0.87
Pasteurized camel's milk (export)	1.07
Raw milk	0.75
Yogurt (500 mL)	0.71
Yogurt (250 mL)	0.71
Cheese (250 mg)	0.71
Butter (250 mg)	0.71
Changes in accounts receivable	0.87
Land	1.00
Buildings	1.00
Machinery and equipment	1.06
Office furniture	1.04
Vehicles	1.06
Generator	1.06
Borehole	1.00
Loan inflow	0.00
USAID subsidy	0.00
Transportation	0.85
Utilities	0.90
Yogurt cup	0.77
Liquid milk container	0.84
Butter (package)	0.87
Cheese (package)	0.87
Cost of uniforms	0.87
Telephone and postage	0.87
Printing and stationery	0.71
Nitric acid	0.71
Flosc ponicol	0.71
Lactometer	0.93
Portable pH meter	0.93
Centrifuge	0.93
Certifications and licenses	0.00
Health insurance for employees	0.87
Site insurance	0.87
Other office expenses	0.87
Advertising	0.87
Traveling	0.87
Medical	0.87

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Total direct labor	0.67
Managerial staff	0.79
Administrative staff	0.83
Other personnel	0.86
Changes in accounts payable	0.75
Changes in cash balance	1.00
Fuel for generator	0.79
Value-added tax (VAT) payment	0.00
Loan debt service	0.00
Corporate income tax	0.00
Contribution to community	0.00

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