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# REBUILDING AGRICULTURAL MARKETS PROGRAM RAMP COLD STORAGE IMPACT ASSESSMENT REPORT

**JUNE 2006**



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## **REBUILDING AGRICULTURAL MARKETS PROGRAM (RAMP)**

### **RAMP Impact Assessment # 8 Cold Storage**

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# Cold Storage and Value Chains of Agricultural Produce in Afghanistan: RAMP Impact Assessment

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## Summary

The shelf-life of fresh agricultural produce can be extended with cold storage and improved handling practices. Off season produce can be offered to consumers fresh at premium prices; thus, cold rooms can be used as instruments to link consumers' demand and organized supply. By the end of June 2006 the Rehabilitation of Agricultural Markets Program (RAMP) will have installed 42 cold rooms (each with 25 metric tons capacity) in 21 cold storage systems (CSS) in ten provinces to increase the value added of fresh fruits for the benefit of associations of farmers and traders, and consumers. It is projected that 21 CSS will store 3000 metric tons of produce (grapes, apples, and pomegranates, among others) annually with an estimated benefit to farmers and entrepreneurs of US\$1.37 million in a 3 year period. It is not only the projected tonnage stored and financial returns to the investments of farmers and traders what makes this a valuable intervention. The acquisition of marketing knowledge associated to this experience is triggering the analysis of value chains that contributes to problem-solving capacity of the stakeholders in the agricultural sector in Afghanistan.

## Introduction

By the end of June 2006 the Rebuilding Agricultural Markets Program (RAMP) will have installed 42 cold rooms (each with 25 metric tons capacity) in 21 cold store systems in ten provinces of Afghanistan to increase the value added of fresh fruits for the benefit of associations of farmers and traders, and consumers. This is another contribution of RAMP to the rehabilitation and sustainability of agricultural markets.

Fruits and vegetables are perishable products and it is estimated that in Afghanistan 30 percent of the fresh fruit and 20 percent of the fresh vegetables are lost because of rapid quality deterioration after harvest, mainly due to poor product handling and improper storage; further, about 40 percent of fresh fruit and 40 percent of fresh vegetables reduce their value before they are bought by the final consumers (Ken Neils, Director of Agricultural Technology and Market Development, RAMP, personal communication). Thus, only 30 and 40 percent of the fresh fruits and vegetables, respectively, are sold without price reduction. The shelf life of fresh produce can be extended with cold storage and improved handling practices.

The annual production of fruits and vegetables in Afghanistan is one and four million metric tons, respectively. The prospect for cold room development for fruits and vegetables exceeds 5000 cold rooms, each with 25 metric tons capacity (K. Neils, *ibid*). These cold rooms could store about 400,000 to 450,000 metric tons of produce year around. However, cold rooms in the country are almost non-existent. Currently, the operating cost of cold rooms is high in areas with unreliable municipal power and the majority of consumers are unwilling to pay a premium prices for fresh produce out of season.

A trade example illustrates a missing opportunity to add value to fresh vegetables in Afghanistan. Pakistani traders buy produce at low cost in Afghanistan during the harvest season and take the produce to Pakistan for processing and cold storage close to the Afghan border. Eventually, when demand for the produce is high and the supply is low in Afghanistan, the traders bring the produce back to the country of origin and sell it at premium prices (Agricultural Specialists, RAMP, personal communication). The end result: value added to processing, prolongation of the shelf life and positive price differential in Afghanistan accrues to the Pakistani merchants.

RAMP has embraced the challenge to develop value chains of agricultural products to enhance the agricultural sector and promote the consumption of high quality products by linking demand with organized production. Cold rooms strategically located in the country are part of this program that allows organized farmers, traders or entrepreneurs to buy, store and sell fresh produce. The cold room networks include retailers, dealers, processors and farmers who provide fresh produce for the consumers, extending the shelf life of the produce and taking advantage of produce price seasonality driven by supply and demand. However, it will take time and organization to fully develop these cold rooms into an integrated cold room chain. The objective of this document is to project the impact of a set of 21 cold storage systems, with two cold rooms each, these 42 cold rooms, each with a capacity of 25 metric tons are located in 10 provinces as a pilot program that allows Afghan farmers, dealers and retailers to fully realize the financial benefits of tonnage stored by linking organized production with consumers' demand for fresh produce.



## Figure 1. Storage cycles in a cold room.

The process of purchasing, processing, storing and selling produce at a particular time and in a particular market involves an organized supply chain of goods and services. Consumers benefit from the cold room units because the produce is kept fresh longer (out of season). Producers benefit because farm gate prices tend to be higher and less volatile. Managers of the cold room storage facilities sell fresh produce at premium prices when seasonal supply has declined and have the option for exporting produce if linkages are established with markets.

### *Seasonality of produce prices*

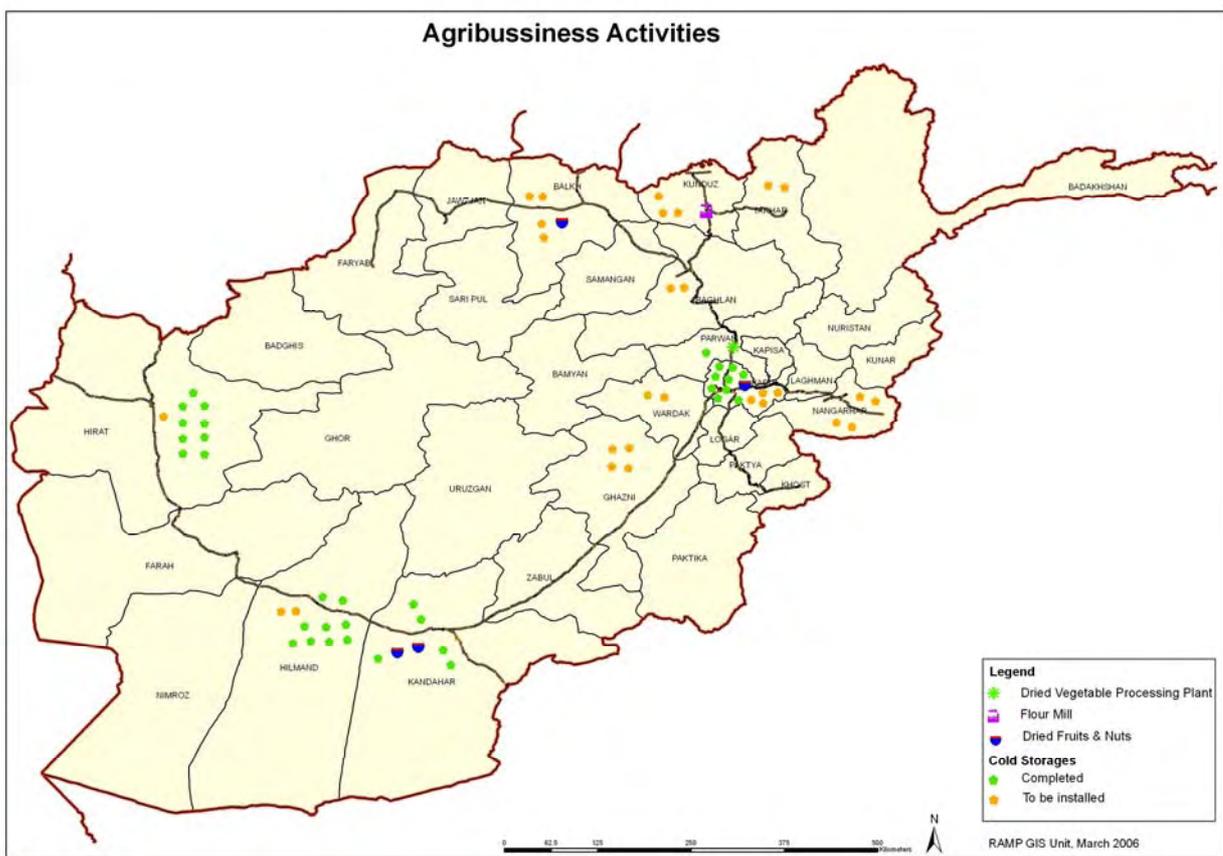
Because of the biological cycles of crops and weather conditions, produce production is seasonal and their market value is determined by supply and demand. At harvest, supply is at its peak and prices are low, as market supply weakens prices start to climb, reaching a peak when supply is lowest. The strategy for cold room storage management is to buy cheap, to process and store the produce and sell it when the difference between the selling and purchasing price is largest after subtracting the storage cost (Salunke, 2006). Implementation of this strategy requires knowledge of how the markets work. However, market price intelligence is poor. The information available since 2003 for some provinces is only indicative of price seasonality.<sup>1</sup> Rapidly changing prices constitute a challenge to organize a cold storage strategy that takes advantage of produce price seasonality.

### *Status of RAMP cold storage systems*

RAMP is still working to complete the installation of 21 cold storage systems (CSS), with 2 cold rooms each with capacity for 25 metric tons or 100 m<sup>3</sup>, in 10 provinces by the end of June 2006 (Fig. 2). The number of units, locations and type of ownership (association of producers or traders, or entrepreneur) are shown in Table 1. The ownership of these CSS determines the specific arrangements in the business plan for each of the cold room networks to secure timely produce supply and scheduled sales at the end of the storage period.

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<sup>1</sup> The Central Asia Development Group has developed a weekly data set (January 2003 to January 2005) for various fruits and vegetables in the Lashkergah market, Helmand Province, including information of origin of produce. RAMP has gathered monthly price information (March 2003 to August 2004) for fruits and vegetables from 25 provinces and the International Center for Agricultural Research in the Dry Areas has compiled daily price information for “all” Pakistan and “all” Afghanistan for 2005. The available price information needs to be screened, cleaned and systematically analyzed; and a monitoring plan needs to be implemented to eventually develop seasonal price indices for production planning and to ascertain the risk in marketing decisions. Swanberg (2004) followed a participatory approach with different stakeholders (producers, traders, processors and exporters) to ascertain representative prices and margins in the value chains of different crops.



**Figure 2. Location of the cold storage rooms in Afghanistan.**

**Table 1. Location of the Cold Storage Systems in ten provinces.**

Province	No. of Syst.	Location	Ownership
Khandahar	2	Habib City, Industrial Park	Traders Assoc./Private company
Helmand	3	Bolan, Nad-I-Ali, Lashkargha	Farmers Assoc./Traders Assoc.
Herat	2	Herat City	Traders Assoc./Seeds trader
Kabul	6	Mirba-Sha-Qut, Kabul City	Grape Producers Assoc./Central Market Traders
Parwan	1	Parwan City	Grape and Apple Juice Processing plant
Nangahar	2	Jalalabad	Fruits and vegetables traders
Balkh	1	Mazar-E-Sherif	Entrepreneur
Baghan	1	Poli-kum-ri	Entrepreneur
Ghazni	2	to be determined	Farmers Association
Takhar	1	Taluqam	Farmers Association
Total	21		

42 cold rooms are installed in 21 cold storage systems.

The Associations/Entrepreneurs contributed with the cost of the land and 50 percent of the cost of the two cold rooms. Fifty percent of the cost of the cold rooms and the full cost of a power generator were contributed by RAMP.

Seventeen cold rooms of four sizes (cold rooms of 100 m<sup>3</sup> capacity, freezing rooms of 145 m<sup>3</sup>, freezing rooms of 34 m<sup>3</sup> capacity and cold rooms of 34 m<sup>3</sup> capacity) have been allocated by RAMP for other purposes. Two cold rooms are in the Customs Office in the Kabul International airport, 6 are used to store animal vaccines and medicines, 3 are used by groups of widows and women with disable husbands for tomato and milk processing, and 6 are used for milk processing and ice cream making. These cold rooms are not included in this analysis.

## Methodology

The analysis of the tonnage stored in the CSS and the financial benefits was done at the provincial level. However, the provinces of Kabul and Parwan were merged under the assumption that share climatic and market conditions. Likewise, the Provinces of Takhar and Baghlan, and the Provinces of Helmand and Kandahar were merged under the same assumption. Annual costs and revenues (income statement) for the CSS in Kabul-Parwan, Ghazni, Takhar-Beghlan, Herat, Balkh, Nangarhar, Helmand-Kandahar were developed in consultation with agronomists and agribusiness experts. The flow of these income statements was estimated for three years for which RAMP expects to have a conservative impact (Annexes 1-7). Under the current circumstances in Afghanistan, it is considered that a three year period is a reasonable period to claim impact. A fundamental element in the CSS management is to buy produce when prices are low and sell when prices are higher (Table 2). The strategy for the management of the CSS is driven by the supply of produce in different provinces; for example, grapes in Parwan are bought by the end of November and sold between December 15 and 31; apples are bought by the end of December and sold between February 15 and 28. A cycle is defined as the process of buying, storing and selling. In the ten provinces included in Table 2 there are 2 cycles in a 12 month period with the exception of the province of Herat with only 1 cycle.

**Table 2. Buying and selling produce in different cold storage systems (CSS) in selected provinces.**

Cold room storage scheme	Buy	Buying price US\$/kg	Sell	Selling Price US\$/kg	Price Diff. US\$/kg
<b>Kabul 6 CSS, Parwan 1 CSS, 2 cycles</b>					
Grapes at wholesale price	End Nov	0.42	Dec 15-31	0.80	0.38
Apples at wholesale price	End Dec	0.40	Feb 15-28	1.40	1.00
<b>Ghazni 2 CSS, 2 cycles</b>					
Grapes at wholesale price	End Nov	0.42	Dec 15-31	0.70	0.28
Apples at wholesale price	End Dec	0.40	Feb 15-28	1.20	0.80
<b>Takhar 1 CSS and Baghlan 1 CSS, 2 cycles</b>					
Grapes at wholesale price	End Nov	0.42	Dec 15-31	0.95	0.53
Apple at wholesale price	End Dec	0.60	Feb 15-28	1.50	0.90
<b>Helmand 3 CSS and Khandahar 2 CSS, 2 cycles</b>					
Grapes at wholesale price	Mid Aug	0.23	End Sept	0.66	0.43
Pomegranates at wholesale price	Early Nov	0.27	Mid Dec	0.75	0.48
<b>Herat 2 CSS, 1 cycle</b>					
Grapes at wholesale price	End Nov	0.36	Dec 24-31	0.80	0.44
<b>Balkh 1 CSS, 2 cycles</b>					
Grapes at wholesale price	End Nov	0.50	Dec 15-31	1.00	0.50
Pomegranates at wholesale price	Dec 20-31	0.60	Feb 15-28	1.30	0.70
<b>Nangarhar 2 CSS, 2 cycles</b>					
Grapes at wholesale price	End Nov	0.55	Dec 15-31	1.00	0.45
Pomegranates at wholesale price	Dec 20-31	0.60	Feb 15-28	1.50	0.90

Source: RAMP records and consultation with production and agribusiness specialists.

Revenues are estimated as a function of the tonnage sold and sale price minus variable and fixed costs. Variable costs are a function of purchasing prices and tonnage of produce stored, costs for maintaining the operation of the cold storage (laborers, management and purchasing, security, packing material, office supplies, etc.), cost of running the power generator to cool the unit, equipment maintenance and contingencies such as cost of produce transportation from the farm to the CSS<sup>2</sup>, or

<sup>2</sup> Depending on the specific arrangement the produce can be bought by the CSS at farmer's gate and transportation cost is paid by the CSS (assumption of this analysis) or the produce can be brought by

additional fuel to run power generators under extreme high temperatures, among others. Fixed costs are those related to the rental of the building and the investment and depreciation cost of the 2 cooling rooms and the power generator. A ten year depreciation of the cold rooms is assumed and a 70 percent of its original value is the salvage value at the end of the third year.

Tonnage and three-year cash flows from the CSS located in different provinces were aggregated to determine the impact of RAMP in cold storage for fresh fruits and vegetables.

## **Results**

There are direct and indirect effects of the RAMP experience with 21 CSS. Direct effects are the volume of produce stored that increases the value of agricultural production, the financial returns to the investment of farmers and traders' associations, and acquisition of marketing knowledge and increasing organization capacity and networking within the value chains.<sup>3</sup> Indirect effects are the spillovers of the successful practices of those involved in the value chains directly supported by RAMP.

### *Volume of produce stored*

A total of 2000 metric tons of fruits are stored annually in the 21 CSS in 10 provinces<sup>4</sup>: 700 metric tons in 7 CSS in the Kabul and Parwan Provinces in 2 cycles, 200 metric tons in 2 CSS in the Ghanzi Province in 2 cycles, 200 metric tons in 2 CSS in Takhar and Baghlan Provinces in 2 cycles, 500 metric tons in 5 CSS in Helmand and Kandahar Provinces in 2 cycles, 100 metric tons in 2 CSS in Herat Province in 1 cycle, and 200 metric tons in 2 CSS in Nangarhar Province in 2 cycles. No vegetables were included because of those with a high price differential between buying and selling (i.e., okra, squash or eggplant) do not keep well in storage.

With the available information about production seasonality and prices it is not possible to suggest additional cycles in the CSS. Assuming that it could be possible to have an average of four cycles per year the potential storage capacity would increase to 4200 metric tons (4 cycles times 50 metric tons times 21 CSS).<sup>5</sup> It is likely that farmers and traders associations who have invested in the CSS will experiment and identify suitable crops and market prices to increase the number of cycles per year.

### *Financial returns*

The financial analysis of the operation of the CSS was done for 3 years for which RAMP claims an impact. Even though the CSS could last 15 years or more, if they are

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farmers directly to the CSS at farmer's cost. The transportation cost in Annexes 1-7 was averaged for US\$6.12 per ton of produce bought by the CSS.

<sup>3</sup> Other direct benefits such as the use of CSS for the veterinary services program, ice-cream making, or processing of milk and tomato are out of the scope of this document.

<sup>4</sup> The crops stored and the number of cycles in the different provinces is shown in Table 2, each CSS has a capacity of 50 metric tons per cycle.

<sup>5</sup> An alternative way to plan the use of the storage space in the CSS is to manage the two cold rooms separately, which would duplicate the number of cycles per CSS either with different produce or the same produce but with different timings. This management scheme would increase the management cost and the refrigeration costs would vary in accordance with the produce in storage. The market intelligence requirements and networking skills are much higher if this approach is followed.

properly maintained, the situation in the country is uncertain for long-term projections (dams or canals would be an exception). A summary of the cash flow for the three years of operation of the cold room units is presented in Table 3. All but two CSS have a positive cash flow. Revenues in the CSS located in Helmand, Kandahar and Herat Provinces are less than the total cost to run the CSS in years 1 and 2. The positive balance in year 3 is due to the income generated with the salvage cost of the plant at the end of that year.<sup>6</sup> Overall, the projected financial benefit of the 21 CSS is US\$ 1.37 million with an initial investment of US\$ 0.95 million from farmers, traders or entrepreneurs. The projected internal rate of return for the CSS is 17 percent.

**Table 3. Cash flow for the 10 provinces with cold storage systems (CSS) for fresh fruits<sup>1</sup> in Afghanistan.**

Province(s)	No. CSS	Cash flow (US\$)				Crops	Benefit	
		Init. Invest.	Year 1	Year 2	Year 3		per unit	All CSS
Kabul-Parwan	7	-45000	19761	19761	51261	g, a	90,783	635,482
Ghazni	2	-45000	7011	7011	38511	g, a	52,533	105,066
Takhar-Baghlan	2	-45000	22390	22390	53890	g, a	98,669	197,338
Helmand-Kandahar	5	-45000	-606	-606	30894	g, p	29,683	148,415
Herat	2	-45000	-8128	-8128	23372	g	7,117	14,233
Balkh	1	-45000	11464	11464	42964	g, p	65,892	65,892
Nangarhar	2	-45000	24036	24036	55536	g, p	103,608	207,216
<b>All provinces</b>								
<b>Total</b>	<b>21</b>	<b>-945,000</b>	<b>237,381</b>	<b>237,381</b>	<b>898,881</b>			<b>1,373,642</b>
		<b>IRR</b>	<b>17%</b>					

Each of the 21 CSS has two cold rooms. Seventeen cold rooms were excluded from this analysis: 2 cold rooms are in the Customs Office in the Kabul International Airport, 6 are used to store animal vaccines and medicines and 6 are for milk processing and ice cream manufacturing.

g=grape, p=pomegranate, a=apple.

Source: Annexes 1-7.

<sup>1</sup> Vegetables were excluded because of technical reasons, see text.

As mentioned above, it is likely that the intensity of use of the CSS will increase as farmers are more acquainted with the cold room storage management, including market intelligence. The cost for running the CSS is high (employees, utilities, repairs and maintenance, and contingencies add up to US\$25,000 annually). Thus, more cycles and lower operational costs should be considered by the associations of farmers/traders in their business plans to ensure higher returns to their investment. The three-year benefits for each CSS, excluding taxes, range from – US\$ 7,000 in Herat to US\$ 104,000 in Nangarhar. The Traders Associations and Seeds dealer in Herat, in consultation with RAMP experts should figure out an alternative to operate these two CSS. The inception of these CSS constitute a set of experiences to develop

<sup>6</sup> Higher benefits could be accrued with an independent management of the cold rooms in a CSS to capture ups and downs in the produce seasonal prices if market information suggests so. This analysis was restricted to parallel management of the cold rooms because it was felt that available market price information is not enough to elaborate a more precise scheduling of cycles. This is precisely the work that needs to be done by the associations of farmers and traders in collaboration with their partners that will provide technical support to their business plans. This is a learning process that RAMP has started and it is the ingenuity of the chain value stakeholders to take advantage of the accumulation of knowledge.

and enhance value chains that are expected to be streamlined as Afghan farmers and entrepreneurs become familiar with buying, processing, storing and selling fresh produce at a premium price.

#### *Acquisition of market knowledge*

RAMP has contributed to develop the knowledge base of markets of fresh produce through the development of a business plan in Helmand, creating a basis for market intelligence and learning by trial and error. This knowledge is another direct effect that slowly but steadily, will be acquired by those involved in the value chains. The joint venture between farmers and traders' associations and independent entrepreneurs with RAMP is a process that will continue to evolve because investors want to maximize the added value of the CSS. Niels (2006) describes the complexity to link organized farmers with demand for processed produce for exports and to induce a long-term entrepreneurial approach to farm production.

#### *Diffusion of best practices*

As the value chains begin to be understood by farmers and traders the different provinces there will be an accumulation of lessons learned that will be diffused to other players not involved in RAMP CSS. It is likely that this knowledge will contribute stream line networks of agribusiness people, including farmers, once the communities realize that the benefits earned by the emerging agribusiness create more demand for agricultural products and that there are outlets for production surplus. Local non-agricultural sectors of the economy will grow because of additional disposable income.

### **Conclusions**

The network of cold storage systems (CSS) is still in an embryonic stage but provides an excellent tool to develop value-added chains in fresh fruit and vegetables. It is projected that the set of 21 CSS will store 3000 metric tons of produce annually, increasing the shelf life of horticultural commodities, with an estimated benefit to farmers and entrepreneurs of US\$1.37 million in a three-year period. This required an investment of US\$430,000 by farmers, traders and entrepreneurs.

The network of 21 CSS could possibly be used up to 4200 metric tons per year with higher returns to farmers and traders investments if more cycles of produce are stored at a profit. It is likely that the associations of farmers and traders will experiment with different crops and market windows not considered in this assessment in conjunction with reduction in management and operational costs. After all, they have a vested interest to maximize the benefits of the installed capacity of the CSS.

It is not only the projected tonnage stored and financial returns to the investment of farmers and traders what makes this a valuable RAMP intervention. The acquisition of marketing knowledge associated with this emerging program is triggering the analysis of value chains in different provinces and at this time it is difficult to assess its impact; nonetheless, this knowledge acquisition contributes to the core of RAMP's mission—to develop the problem-solving capacity of the agricultural sector in Afghanistan and the identification of opportunities for sustainable development.

## References

Neils, K. 2006. Case Study: Vegetable Dehydration and Processing Factory in Afghanistan. Paper presented at the Regional Consultation on Linking Farmers to Markets, Lessons Learned and Successful Practices, January 29-February 2, 2006, Cairo, Egypt.

Salunke, S. 2006. Cold Storage Business Plan for the Afghanistan Farmers' Association, Bolan, Lashkar Gah, Afghanistan. Draft document.

Swanberg, K. 2004. Competitiveness Analysis for Afghanistan's Fruits, Nuts and Vegetables. Rehabilitating Agricultural Markets Program, CHEMONICS/USAID, Kabul.



**Annex 2. Income statement and projected cash flow for three-year cold storage systems (CSS) in Ghazni, Afghanistan.**

<b>COLD STORAGE - PRODUCE</b>						
Ghazni 2 CSS						
<b>INCOME STATEMENT</b>						
				Year 1	Year 2	Year 3
Revenue	Date of Sale	price/unit	total	2006	2007	2008
		\$/kg	kg	\$	\$	\$
Grapes at wholesale price (buy end Nov)	Dec 15-31	0.70	47500	33250	33250	33250
Apples at wholesale price (buy end Dec)	Feb 15-28	1.20	49000	58800	58800	58800
<b>Total Revenue</b>			96500	92050	92050	92050
<b>Costs</b>						
<b>Variable Costs</b>						
Product Costs						
Grapes		0.42	50000	21000	21000	21000
Apples		0.40	50000	20000	20000	20000
			Product Cost Subtotal	41000	41000	41000
Other Direct Costs						
Boxes - (Wooden) - capacity @20 kg product		1.02	5000	5102	5102	5102
Labor (sort, clean, pack, load, unload)		0.12	5000	612	612	612
Plastic Bags		0.05	25000	1250	1250	1250
Manager/Operator of cold storage units		500	12	6000	6000	6000
Buyer of produce		300	12	3600	3600	3600
Marketer		300	12	3600	3600	3600
Accountant		300	12	3600	3600	3600
Guards (2)		150	24	3600	3600	3600
Office Supplies		50	12	600	600	600
Transport of produce		6.12	100	612	612	612
Water				2000	2000	2000
			Other Direct Costs Subtotal	30577	30577	30577
Generator Costs						
Generator Operating Cost - Grapes storage		3.70	360	1333	1333	1333
Generator Operating Cost - Apples storage		3.70	330	1222	1222	1222
			Generator Costs Subtotal	2556	2556	2556
Repairs and Maintenance (2%)				900	900	900
Contingency Costs (5%)				3707	3707	3707
<b>Fixed Costs</b>						
Rent - building		150	12	1800	1800	1800
Cold storage units (2) and generator (10 year depreciation with 70% salvage value at the end of year 3)		45000	10	4500	4500	4500
<b>Total Cost</b>				85039	85039	85039
<b>CASH FLOW</b>				-45000	7011	38511

### Annex 3. Income statement and projected cash flow for three-year cold storage systems (CSS) in Takhar and Baghlan, Afghanistan.

<b>COLD STORAGE - PRODUCE</b>						
Takhar 1 CSS and Baghlan 1 CSS						
<b>INCOME STATEMENT</b>						
<b>Revenue</b>	<b>Date of Sale</b>	<b>price/unit</b>	<b>total</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>
				<b>2006</b>	<b>2007</b>	<b>2008</b>
		<b>\$/kg</b>	<b>kg</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
Grapes at wholesale price (buy end November)	Dec 15-31	0.95	47500	45125	45125	45125
Apple at wholesale price (buy end of December)	Feb 15-28	1.50	49000	73500	73500	73500
<b>Total Revenue</b>			<b>96500</b>	<b>118625</b>	<b>118625</b>	<b>118625</b>
<b>Costs</b>						
<b>Variable Costs</b>						
<b>Product Costs</b>						
Grapes		0.42	50000	21000	21000	21000
Apples		0.60	50000	30000	30000	30000
	<b>Product Cost Subtotal</b>		<b>100000</b>	<b>51000</b>	<b>51000</b>	<b>51000</b>
<b>Other Direct Costs</b>						
Boxes - (Wooden) - capacity @20 kg product		1.02	5000	5102	5102	5102
Labor (sort, clean, pack, load, unload)		0.12	5000	612	612	612
Plastic Bags		0.05	25000	1250	1250	1250
Manager/Operator of cold storage units		500	12	6000	6000	6000
Buyer of produce		300	12	3600	3600	3600
Marketer		300	12	3600	3600	3600
Accountant		300	12	3600	3600	3600
Guards (2)		150	24	3600	3600	3600
Office Supplies		50	12	600	600	600
Transport of produce		6.12	100	612	612	612
Water				2000	2000	2000
	<b>Other Direct Costs Subtotal</b>			<b>30577</b>	<b>30577</b>	<b>30577</b>
<b>Generator Costs</b>						
Generator Operating Cost - Grapes storage		3.70	540	1998	1998	1998
Generator Operating Cost - Apple storage		3.70	330	1221	1221	1221
	<b>Generator Costs Subtotal</b>			<b>3219</b>	<b>3219</b>	<b>3219</b>
Repairs and Maintenance (2%)				900	900	900
Contingency Costs (5%)				4240	4240	4240
<b>Fixed Costs</b>						
Rent - building		150	12	1800	1800	1800
Cold storage units (2) and generator (10 year depreciation with 70% salvage value at the end of year 3)		45000	10	4500	4500	4500
<b>Total Cost</b>				<b>96235</b>	<b>96235</b>	<b>96235</b>
<b>CASH FLOW</b>			<b>-45000</b>	<b>22390</b>	<b>22390</b>	<b>53890</b>

**Annex 4. Income statement and projected cash flow for three-year cold storage systems (CSS) in Helmand and Kandahar, Afghanistan.**

<b>COLD STORAGE - PRODUCE</b>						
Helmand 3 CSS and Kandahar 2 CSS						
<b>INCOME STATEMENT</b>						
				Year 1	Year 2	Year 3
<b>Revenue</b>	<b>Date of Sale</b>	<b>Price/unit</b>	<b>total</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>
		\$/kg	kg	\$	\$	\$
Grapes at wholesale price (buy mid Aug)	End Sept	0.66	47500	31350	31350	31350
Pomegranates at wholesale price (buy early Nov)	Mid Dec	0.75	49000	36750	36750	36750
<b>Total Revenue</b>			96500	68100	68100	68100
<b>Costs</b>						
<b>Variable Costs</b>						
<b>Product Costs</b>						
Grapes		0.23	50000	11500	11500	11500
Pomegranate		0.27	50000	13500	13500	13500
Product Cost Subtotal			100000	25000	25000	25000
<b>Other Direct Costs</b>						
Boxes - (Wooden) - capacity @20 kg product		1.02	5000	5102	5102	5102
Labor (sort, clean, pack, load, unload)		0.12	5000	612	612	612
Plastic Bags		0.05	25000	1250	1250	1250
Manager/Operator of cold storage units		500	12	6000	6000	6000
Buyer of produce		300	12	3600	3600	3600
Marketer		300	12	3600	3600	3600
Accountant		300	12	3600	3600	3600
Guards (2)		150	24	3600	3600	3600
Office Supplies		50	12	600	600	600
Transport of produce		6.12	100	612	612	612
Water				2000	2000	2000
Other Direct Costs Subtotal				30577	30577	30577
<b>Generator Costs</b>						
Generator Operating Cost - Grapes storage		3.70	540	2000	2000	2000
Generator Operating Cost - Pomegranate		3.70	270	1000	1000	1000
Generator Costs Subtotal				3000	3000	3000
Repairs and Maintenance (2%)				900	900	900
Contingency Costs (5%)				2929	2929	2929
<b>Fixed Costs</b>						
Rent - building		150	12	1800	1800	1800
Cold storage units (2) and generator (10 year depreciation with 70% salvage value at the end of year 3)		45000	10	4500	4500	4500
<b>Total Cost</b>				68706	68706	68706
<b>CASH FLOW</b>				-45000	-606	30894

**Annex 5. Income statement and projected cash flow for three-year cold storage systems (CSS) in Herat, Afghanistan.**

<b>COLD STORAGE - PRODUCE</b>						
Herat 2 CSS						
<b>INCOME STATEMENT</b>						
				Year 1	Year 2	Year 3
Revenue	Date of Sale	Price/unit	total	2006	2007	2008
		\$/kg	kg	\$	\$	\$
Grapes at wholesale price (buy end November)	Dec 24-31	0.80	47500	38000	38000	38000
<b>Total Revenue</b>			95000	47500	47500	47500
<b>Costs</b>						
<b>Variable Costs</b>						
Product Costs						
Grapes		0.36	50000	18000	18000	18000
Product Cost Subtotal			50000	18000	18000	18000
Other Direct Costs						
Boxes - (Wooden) - capacity @20 kg product		1.02	2500	2551	2551	2551
Labor (sort, clean, pack, load, unload)		0.12	2500	306	306	306
Plastic Bags		0.05	12500	625	625	625
Manager/Operator of cold storage units		500	12	6000	6000	6000
Buyer of produce		300	12	3600	3600	3600
Marketer		300	12	3600	3600	3600
Accountant		300	12	3600	3600	3600
Guards (2)		150	24	3600	3600	3600
Office Supplies		50	12	600	600	600
Transport of produce		6.12	50	306	306	306
Water				2000	2000	2000
Other Direct Costs Subtotal				26788	26788	26788
Generator Costs						
Generator Operating Cost - Grapes storage		3.70	360	1333	1333	1333
Generator Costs Subtotal				1333	1333	1333
Repairs and Maintenance (2%)				900	900	900
Contingency Costs (5%)				2306	2306	2306
<b>Fixed Costs</b>						
Rent - building		150	12	1800	1800	1800
Cold storage units (2) and generator (10 year depreciation with 70% salvage value at the end of year 3)		45000	10	4500	4500	4500
<b>Total Cost</b>				55628	55628	55628
<b>CASH FLOW</b>			-45000	-8128	-8128	23372



**Annex 7. Income statement and projected cash flow for a three-year cold storage systems (CSS) in Nangarhar, Afghanistan.**

<b>COLD STORAGE - PRODUCE</b>						
Nangarhar 2 CSS						
<b>INCOME STATEMENT</b>						
				Year 1	Year 2	Year 3
Revenue	Date of Sale	Price/unit	total	2006	2007	2008
		\$/kg	kg	\$	\$	\$
Grapes at wholesale price (buy end November)	Dec 15-31	1.00	47500	47500	47500	47500
Pomegranates at wholesale price (buy Dec 20-31)	Feb 15-28	1.50	49000	73500	73500	73500
<b>Total Revenue</b>			96500	121000	121000	121000
<b>Costs</b>						
<b>Variable Costs</b>						
Product Costs						
Grapes		0.55	50000	27500	27500	27500
Pomegranate		0.60	50000	30000	30000	30000
Product Cost Subtotal			100000	57500	57500	57500
Other Direct Costs						
Boxes - (Wooden) - capacity @20 kg product		1.02	500	510	510	510
Labor (sort, clean, pack, load, unload)		0.12	500	61	61	61
Plastic Bags		0.05	25000	1250	1250	1250
Manager/Operator of cold storage units		500	12	6000	6000	6000
Buyer of produce		300	12	3600	3600	3600
Marketer		300	12	3600	3600	3600
Accountant		300	12	3600	3600	3600
Guards (2)		150	24	3600	3600	3600
Office Supplies		50	12	600	600	600
Transport of produce		6.12	100	612	612	612
Water				2000	2000	2000
Other Direct Costs Subtotal				25434	25434	25434
Generator Costs						
Generator Operating Cost - Grapes storage		3.70	360	1333	1333	1333
Generator Operating Cost - Pomegranate storage		3.70	330	1222	1222	1222
Generator Costs Subtotal				2556	2556	2556
Repairs and Maintenance (2%)				900	900	900
Contingency Costs (5%)				4274	4274	4274
<b>Fixed Costs</b>						
Rent - building		150	12	1800	1800	1800
Cold storage units (2) and generator (10 year depreciation with 70% salvage value at the end of year 3)		45000	10	4500	4500	4500
<b>Total Cost</b>				96964	96964	96964
<b>CASH FLOW</b>			<b>-45000</b>	<b>24036</b>	<b>24036</b>	<b>55536</b>