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Cold Storage, Air Freight, and High Value Afghan Horticulture

An Overview & Concept Note

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December, 2009

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I. Overview

Last year, regional trade in fresh fruits and vegetables, and dried fruits and nuts for countries around Afghanistan totaled almost $1.2 billion dollars. Afghanistan's share of this total was approximately $51 mil, or very close to zero.[1] This trade involved shipments of nearly 4 billion metric tons of fresh and dried produce. In the past, as a war-torn landlocked country, the condition of Afghanistan's roads, lack of cold storage facilities, and absence of reliable air cargo capacity made it virtually impossible for Afghanistan to penetrate this growing regional market. Today, however, this is beginning to change.

Significant parts of Afghanistan now have access to reliable power, which means it is possible to fund Cold Storage Facilities, and related Cold Chains. Afghan also now has access to a national air cargo airline, which specializes in servicing regional markets, as well as Europe and the Middle East. And it already grows world quality grapes, melons, and pomegranates, and produces smaller quantities of other important high value horticultural products, including apples, peaches, pears, various nut crops, and a growing list of seasonal vegetables.

The time is coming for Afghanistan and the donors who are helping to develop its economy to invest in significant cold storage capacity in selected cities around the country, located near major horticultural producing regions. Primary cities include: Kabul, Kandahar, Jalalabad, Mazar-i-Sharif, and Herat. Secondary cities could include Lashkar Gah, Kunduz, Baghlan, Mir Batchakot and Charikar in Parwan, and perhaps towns like Sar-i-Pul, and Bamyan. Of course cold storage facilities by themselves are not enough. They should be linked with Producer's Associations, Packing Houses, and Marketing Associations, which can take proper responsibility for sorting, grading, packing, shipping, and storage. The balance of this paper provides more background on these important commercial and developmental opportunities.

II. Background on the Afghan Horticultural Sector.

There are three major fruit growing zones in Afghanistan. These include: (i) the Kandahar/Zabul region in the South, (ii) the Kabul/Parwan/Kapisa/Logar region in the central part of the country, and (iii) Samangan, Sari Pul, Kunduz, Balkh and Takhar Provinces in the North. Historically, grapes and raisins have been the country's most important horticultural product, followed by melons. In 1990, the total area under grape cultivation was estimated at somewhere around 75,000 hectares,[2] making this by far the country's most important cash crop at that time. A subsequent study by the FAO in 1997 estimated that active vineyards had declined to about 46,000 ha.[3] Today, statistics from the Afghan Ministry of Agriculture show a substantial increase over the past twelve years, and grapes are now estimated to cover 57,600 hectares,[4] an increase of at least 25%. Melons, almonds, apricots, pomegranates, and apples are other major cultivated

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[1] Harmon, Henry, "Regional Markets for selected Horticultural Products of Nangarhar Province and Eastern Afghanistan," an internal working document prepared for the USAID-funded Alternative Livelihoods Project (East) ALP/E, as part of a larger feasibility study. 2008, p. 8.

[2] DAI, "Cash Crops Feasibility Study," circa 1990, p. vi.

[3] This figure probably went down much further, however, because Shomali was a major battlefield, and many vineyards were badly damaged or completely destroyed during the years between 1998 and 2001.

[4] Central Statistics Office, "Afghanistan Statistical Yearbook, 2007 – 08," quoting Government of Afghanistan, Ministry of Agriculture and FAO, p 159.

crops, ranked in rough order of importance. Like grapes, the area in pomegranates has also increased. This was estimated at approximately 5,000 hectares in 1990, but is now estimated by the Ministry of Agriculture to have increased by about 60%, to nearly 8,000 hectares.[5]

Prior to the war, Afghanistan's annual exports averaged around US $580 million dollars, of which fresh fruits were 7 percent, ($41 mil) and dried fruits constituted about 30 percent, ($174 million.) By 1984, following the construction of approximately 13 raisin cleaning factories around Afghanistan, the country had captured more than 60 percent of the world market for raisins.[6] By the early 1990s, however, largely as a consequence of the war, Afghanistan had lost most of this market share. The US (primarily California) had secured more than 60 % of the world market for raisins/sultanas and almonds, while Turkey had more than 60 percent of the world market for dried figs and apricots. It seems unlikely that Afghanistan will ever recapture a major share of the world's raisin markets, but with some additional work to improve its quality control systems, it should be possible for the country to carve out a significant market share of fresh table grapes, particularly in nearby countries like India, Russia, perhaps Iraq, and maybe Dubai and the United Arab Emirates. With improved post harvest handling including cleaning, grading, packing, and shipping it might be possible to claim a significant market share for the green raisin market in South Asia, the Middle East, the Russian Federation. China might become another market for both grapes and green raisins. Afghan melons and pomegranates are also deservedly famous, particularly in India, where there is a substantial potential market.

III. Current Production Patterns: Exportable Afghan Horticultural Products

The highest potential for exporting fresh horticultural products lies with products like grapes, melons, pomegranates, and selected seasonal fresh vegetables. Figure # 1, below, provides a general overview of the hectares in horticultural crops around the country.

Figure # 1: Fruit and Vegetables, by Cultivated Land Area, 2007/08[7]

Crop	Hectares	Metric Tons
Fresh Vegetables	68,000	
Grapes/raisins	57,600	730,000
Melons	45,000	300,000[8]
Pomegranates	8,000	180,000
Apricots	8,000	
Apples	7,000	
Berries	5,600	
Plums	5,500	
Figs	2,700	
Peaches	2,000	14,000

At the present time, Pakistan represents Afghanistan's principle market for fresh and dried fruits, as well as nuts and vegetables, although this appears to be changing. (See Table # 6, below.) Recent trends in Afghan exports to Pakistan are given in Table 2, below.

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[5] Central Statistics Office, ibid, p 172.
[6] DAI, op cit, p. v.
[7] CSO. *op cit*, p. 159.
[8] This total includes both watermelons and kharboza melons, and is quoted from "Feasibility Study for Melon Subsector Plan," Dec, 2007, p. 82.

Table # 2: Afghanistan's Fresh Fruit Exports to Pakistan[9]

Produce	Afghan Fresh Fruit Exports to Pakistan (Total U.S. dollar value, 000)		
	2004	2005	2006
Grapes, fresh	3,939	8,344	8,672
Apricots, fresh	605	29	4,941
Apples, fresh	1,116	1,136	1,654
Melons, fresh,[10]	1,640	1,186	1,578
Watermelons	18	270	457
Misc fruits, fresh	730	1,102	1,156
Totals	6,932	12,067	18,458

A. Grapes.

In 2007/08, (1386) Afghanistan produced about 730,000 metric tons of grapes. Approximately 85 % of these were dried into raisins, because the soft skins of these grapes make them especially difficult to transport fresh,[11] while the balance (roughly 100,000 MT[12]) was sold as fresh grapes. Five provinces produce nearly 85% of the country's current total grape production: Kabul, Parwan, Zabul, Ghazni, and Sari Pul. Afghan grape production per hectare is not high by international standards. In 2004, a team from RAMP found that vineyards in the Shomali Plains north of Kabul on average were producing only about 9,000kg per hectare, while vineyards in California produce 4 or 5 times as much, or 40 – 50,000 hectares. This suggests substantial opportunities to increase production through better varieties, using trellising, improving pruning, increasing fertilization, better irrigation, and improving pest management.

Table # 3: Grape Production, by Major Provinces, (2007) [13]

Province	Grape/Raisin Production		
	Hectares	Metric Tons	% of Nat'l crop
Parwan	9,250	148,000	20.3
Zabul	11,700	115,000	15.8
Sar-i-Pul	9,210	129,000	17.8
Ghazni	8,120	114,000	15.6
Kabul	7,200	108,000	14.8
Herat	4,400	46,200	6.9
Faryab	1,900	13,300	1.8
Kandahar	1,190	15,500	2.1
Balkh	900	6,750	<1.0
Other, (misc)	15,000	30,572	4.2
Total	57,600	726,322	100.00

[9] Harmon, *op cit.*, p. 14.
[10] Does not include water melons
[11] Chemonics, "Case study of poultry and Grape/Raisin subsectors in Afghanistan, micro-report # 106," January, 2008, p. 25.
[12] From "ASAP India Marketing Mission Report," November, 2007, p. 14, footnote # 11.
[13] Afghanistan Statistical Yearbook, 2007 – 08, quoting Afghan Ministry of Agriculture and FAO, p 172.

The export potential for fresh grapes currently is limited because Afghanistan lacks refrigerated storage and suitable transport facilities and also has poor post harvest handling practices. This, along with the many intermediaries along the chain to the final end consumer adds incrementally to the final coast, making Afghan grapes less cost competitive. Vineyard production will also have to increase substantially, in order for grape exports to be cost competitive in regional markets, and profitable for producers.

A substantial majority of vines in the Shamali Plain currently produce grapes that are more suitable for raisins than for export as fresh table grapes. The vines that produce large table grapes with firm skins already command high prices on the local markets. Thus, because they are being consumed locally, large quantities of exportable grapes are not readily available. Of course over time, farmers can switch to growing table grapes for export, but this will require planting new grapes or grafting existing stocks with higher value varieties,[14] plus farmers developing confidence in the reliability of export marketing chains. Table grapes from Afghanistan can meet the quality demanded in markets like India, but until there is sufficient quantity, and the cold chain from harvest to end consumer is complete, exporting fresh grapes will continue to prove somewhat challenging. Technical Assistance from donors and extension agents will be needed to work with Afghan farmers in order to generate exportable quantities of high quality table grapes, as well as Afghan raisins.

Iran is Afghanistan's main competitor in the regional markets, because it produces the same varieties at the same time of year at lower cost. Uzbekistan can also produce grapes of higher quality for lower cost than Afghanistan. China and India are the world's first and second largest producers of grapes, but their harvest season ends just as Afghanistan's begins. Thus, there is unmet demand for fresh grapes in both countries that Afghanistan could potentially help to supply. And there is a long tradition of Afghan raisins being sold in the markets of India, Pakistan, Russia and other regional neighbors, and this tradition has not been forgotten.

For Afghan grapes and other fresh produce to be internationally competitive, however, Producers Associations and marketers will have to find ways to meet international requirements for higher phyto-sanitary and quality standards. Over time farmers will have to improve yields, and also improve post harvest handling, access to cold storage, and find better packaging techniques to reduce the current losses on the way to markets.

B. Raisins. To be competitive for raisins, Afghans will have to adopt improved drying techniques to produce a higher quality product. In broad terms, there are two kinds of Afghan raisins: those dried in the sun, and those dried in the shade. Shade dried raisins are worth approximately twice as much as raisins dried in the sun. In India, green shade-dried raisins are in high demand and fetch a high price. This is a niche market Afghanistan could readily exploit with some modest improvements in its traditional drying methods. ***Indian technology, for example,*** *for producing high-quality green raisins could easily be transferred to Afghanistan, and would provide the basis for transforming the Afghan raisin industry from its focus on low-value commodity raisins to higher-value niche-market green raisins.***[?]** In India, green "organically dried" raisins[15] are especially prized, so the Indian market remains a substantial potential opportunity, since Afghanistan has a long established tradition of drying raisins in this manner. China also is a net importer of green raisins, which Afghanistan could potentially supply. Currently there are 6 raisin processors in Kabul, compared to 22 before the war. Before the war there were 36 processors

[14] New stock will take approximately five years to begin to produce marketable quantities of grapes. Grafting of new varieties onto established rootstock can yield marketable produce within one year.

[15] "Organically dried" means dried in the shade without sulfates.

countrywide; now there are only 14.[16] In order for Afghanistan to continue to expand into raisin markets with higher standards, new raisin processing plants will need to be constructed. This represents another potential opportunity for donors in various regions of the country.

C. Sales of Grapes and Raisins: About 39% of farmers sell their products at the farm gate; another 30 percent sell in their district markets; 25% sell at the provincial market level; and 6 percent directly export grapes or raisins. All the risk from selling is borne by the farmers. At the present time, very little end-market information gets back to producers from client and consumers. There is not enough of a direct feedback loop, and learning is not occurring, so Afghan fruit quality control is not improving as quickly as it might, ans Afghan farmers suffer the consequences.

D. Melons. Afghanistan produces 38 varieties of melon, although more broadly it produces two major types – watermelons ("tarbooz") and the white-fleshed, sweet melon known as "Kharbooza." While there are many varietal differences, certain kinds of the two varieties can readily be transported over relatively long distances without significant damage or need for cold storage. One or two specialized varieties can actually last for several months without chilling. Recent statistics from the Ministry of Agriculture put total cultivated area in melons at 45,000 hectares. This included 25,000 ha in cantaloupe and "Kharbooz", plus another 20,000 hectares in water melons. Like most summer produce, Afghan melons come onto the market between July and September, when they sell for an average farmgate price of around 35 afs per "sehr", (seven kilos.)[17] The wholesale price typically is 3 to 5 afs per sehr higher than farmgate prices. Without cold storage, however, the melon season like the grape season is relatively short. A small percentage of the melon crop is sun dried, while some literally rots on the ground, particularly when it can't be exported, because of road blockages, custom problems, or other disturbances. About 20% of the national melon crop is exported, primarily to Pakistan, where they sometimes are put into cold storage, and then shipped back to Afghanistan in the winter season and resold to Afghans at a substantial mark up. Cold storage for melons – particularly in key provinces like Kunduz, Balkh, and Helmand – represents an important potential investment for the country. As with other Afghan produce, it will also be important to find better ways to sort, grade, and pack melons for shipment. A SWOT analysis for Afghan melons is given in Appendix I at the end of this concept note. This analysis is specifically for melons, but in broader terms, much of what it says is also representative of the challenges facing other Afghan fruit export crops. International competition for Afghan melons (including watermelons) comes from China, Turkey, Iran, Central Asia, and Pakistan.

Table # 4: Afghan Melon Production

Province	Melon Production	
	Hectares	Metric tons
Samangan Jowzjan Kunduz Balkh Takhar	7,000	90,000
Total	45,000	300,000

E. Pomegranates.

[16] Source: Ministry of Commerce's Institute of Raisins, as quoted in "Case Study of Poultry and Grape/Raisin Subsectors in Afghanistan," *op cit*, p. 27.

[17] In season, prices seem to range from 20 to 55 afs per 7 kgs, depending on grade and quality. Out of season they can sell for several times this much.

Pomegranates have recently become one of the worlds most sought after fruits for their anti-oxidant and nutritional qualities. They are being heavily promoted in Western markets. Pomegranates are native to Afghanistan and Northern Iran, are strongly drought resistant, and can grow on many different types of soil. They have a tough outer rind, and are easily transported over bad roads. Some are grown in Iran, Turkey, California, Arizona, Spain, and the Former Soviet Union. Limited quantities are grown in India and Pakistan. Both fresh fruit and pomegranate juices and cordials are popular in the Middle East, Asia, as well as becoming increasingly popular in Europe and the United States. Propagation of pomegranates is relatively easy. A fully developed tree, which takes 5 to 6 years to reach maturity, can produce up to 17 tons per hectare in parts of Afghanistan. Since 1990, Afghan production has increased by approximately 60%, from 5,000 to 8,000 hectares. This was substantially in response to growing market demand, undertaken at the initiative of local farmers. Since Afghanistan produces a high-quality product, it should be able to continue this expansion. At present, pomegranates are primarily grown in three Afghan provinces, as shown in the Table below.

Table # 5: Afghan Pomegranate Production

Province	Pomegranate Production	
	Hectares	Metric tons
Kandahar	4,700	
Balkh	2,000	
Kapisa	750	
Other	550	
Total	8,000	180,000

F. Fresh Vegetables [Find more data. Expand or delete this section]

Virtually all of Afghanistan's recorded exports of vegetables (98%) went to Pakistan.

IV. Potential Markets for Afghan Produce[18]

India is a major horticulture exporter, and is already somewhat self sufficient except (i) for the importation of nuts and dried fruits, where Afghanistan holds an important comparative advantage, and (ii) the importation of off-season Afghan grapes, that coincides with Afghanistan's production period for grapes.

Increasingly it appears that markets for Afghanistan's fresh and dried agricultural produce can be divided up between India, and all other nearby countries. Indian consumers have a notable preference for fresh and dried Afghan produce as well as nuts going back to Mogul times With the possible exception of Pakistan, other countries don't have this preference.

A Preferential Trade Agreement between India and Afghanistan already provided for a 50% reduction in import duties for Afghan grapes and other fresh fruit. In early 2008, India announced that all import duties on Afghanistan's agricultural produce would be eliminated. This now means

[18] Most of the material in this section of the concept paper comes from Brown, Tom, "ASAP India Marketing Mission Report, November, 2007,

that Indian wholesalers pay a premium price to Afghan exporters for agricultural products. Of course this premium price also makes the same products more difficult to sell in other export markets, where the advantage of a duty differential does not exist. With India now being the premium price market, coupled with its demonstrated historical preference for Afghan fruits and nuts, this presumably means that India will capture the vast bulk of Afghanistan's export market.

The USAID funded Project "Accelerating Sustainable Agricultural Production", (ASAP) recently sponsored an Afghan trade mission, which included a booth at a Trade Fair in New Delhi. Of all the Afghan products promoted at a Trade Fair in New Delhi, table grapes received the best reception from Indian consumers, wholesalers, and supermarket buyers. At a recent wholesale auction market in Delhi, Afghan grapes were fetching prices comparable to Indian grapes, and rendering a gross profit of 15% over export costs. In fact, there was a demonstrated willingness to pay good prices for fresh Afghan fruit in India, provided it was properly packed, well handled, chilled, etc.

And the Indian demand for grapes is huge. India currently consumes more than 1 million metric tons of table grapes annually,[19] and none are available domestically when Afghan grapes are being harvested. There is virtually no domestic grape production in India during the Afghan grape production season. Horticultural experts working with ASAP believe a reasonable retail price for Afghan grapes would be about $3.00 per kilo in the winter in Indian supermarkets. Informal reports suggest that grapes might be selling for as much as $7.00 per kg in Dubai at the same time.

For pomegranates, a reasonable representative retail price for properly sorted, graded, packed, and chilled Afghan pomegranates would be around $2.50 per kg in India.

At the same Trade Fair in New Delhi where Afghans grapes were well received, consumers also uniformly appreciated the taste and texture of the Afghan melons. For melons, since India's import duties are calculated on CIF costs, and since freight is such a large portion of the final cost on melons, the removal of import duties on agricultural products will have a big impact on the potential profitability of Afghan melons sold in India, as well as a positive impact on grapes and pomegranates. However it may be that Afghan melons are still too heavy to warrant shipment by air. The rule of thumb for international air freight for high value products is that freight rates need to be kept below US $1.00 per kilo in order for high value horticultural products to be profitable. This argues for shipping high value low bulk good by air, and bulkier or hevier products by truck.

In 2008, three grocery chains in India reportedly were interested in wholesale purchases of Afghan grapes at a rate of 45 metric tons per week for a period of about 16 weeks to supply their market when no domestic Indian grapes are available. Some details about one of these potential buyers are given in the Text Box, on the following page[20]:

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[19] Brown, Tom, *ibid.*, quoting USDA "2006 India Exporter guide, Annual," p. 14,

[20] *Ibid.*

Reliance Fresh, a potential market for Afghan Produce

Reliance Fresh, an Indian Supermarket chain, is a company that shows great promise to become a substantial customer of Afghan fresh and dried fruit. Here's why:

- *Reliance plans to have 1,500 retail sulpermarket stores opened in India by sometime in 2008, and plans to invest $4 bil in retailing over the next 5 years.*
- *Reliance's Head of International Business said, "We need to feed this growing operation and don't want to pay the Mandai (the traditional auction-driven terminal market system) 10% for nothing. We want to know who grew this food and we want to buy from the source that is as close to the producer as possible.*
- *Reliance wants to build direct purchasing relationships with Afghan suppliers. They appreciate the strong positive brand recognition for fresh and dried Afghan fruit in the North Indian region, and want to capitalize on this sentiment. They want as few intermediaries in the chain as possible.*

Thus, today it appears that India is moving to supplant Pakistan as Afghanistan's principle market for fresh and dried fruits, as well as nuts. India more than tripled its fruit imports from Afghanistan between 2001 and 2005, for example, and now trails Pakistan very closely as a leading destination of Afghan fruits and nuts. Table # 5, below shows the value of both fresh and dried fruits, melons, and nuts exported to India and Pakistan and begins to indicate the potential market for Afghan produce in the Sub-Continent, assuming sufficient cold storage and air freight capacity, plus other appropriate quality control mechanisms are put in place.

Table # 5: Comparison between Indian and Pakistani imports fresh and dried fruits, melons, and nuts from Afghanistan.

Country	2003	2004	2005	2006	2007
Pakistan	9,866	11,223	11,120	16,560	19,494
India	30,077	33.033	46,959	15,421	N/A

B. Notes about Other Potential Markets, beyond India[21]

- **Pakistan** is already largely a self sufficient market for fresh and dried produce, and is actively engaged in a major horticultural crop diversification and export program. Its domestic markets suggest relatively limited opportunities for much growth of imports from Afghanistan, except perhaps for vegetables, or off season specialty niche produce.

- **Iran** is also largely self sufficient, with the exception of mandarin oranges, and it produces many of the same crops at approximately the same time as Afghanistan.

- **Iraq** may represent a possible opportunity for Afghanistan in the area of fresh fruits, in part because of its ability to beat Turkey to market based on early season production. The difficulty will be in transportation, but if commodities are of a high enough quality, then air cargo can overcome this problem. The growing level of Afghan fresh fruit exported to Iraq is shown in the table, below:

Table # 6: Afghanistan's Fresh Fruit Exports to Iraq, (2004 – 2006)

Product	Value (000, US $)		
	2004	2005	2006
Grapes, (fresh)	4,279	4,239	8,345
Melons, (fresh[22])	14,722	16,164	21,537
Apples	322	1,123	1,136
Totals	19,323	21,526	31,018

- **Russian Federation**: both fruits and vegetables offer significant possibilities assuming that transportation difficulties can be overcome. Russian imports of fruits and nuts have increased by 250% over the past five years, reflecting the income elasticity of demand for fruit.

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[21] Harmon, *op cit.* Data for this section, broken down by country, comes from the Harmon report, pp 13 – 14.

[22] Does not include watermelons.

- **UAE/Dubai**: Fresh fruits and vegetables including tomatoes, onions, leeks, cauliflower, eggplant and peppers all offer good possibilities, along with grapes and melons. Among nuts, almonds and pistachios show good potential.

- **Saudi Arabia** represents another potential opportunity for Afghan exports, particularly for fruits. The vegetable trade currently is supplied from Egypt, Syria, and China.

- **China** might represent an important market for Afghanistan's fresh grapes. China's per capita consumption of fruits and vegetables is growing at 8% per year. Like India, China's own production of grapes ceases just as Afghanistan's production begins, and China is one of the two biggest consumers of grapes in the world, along with India.

V. The Importance of Cold Storage[23]

A. Characteristics of Cold Storage

"Twenty to thirty percent of the value of fresh fruits and vegetables is estimated to be lost because produce is not refrigerated. Forty percent of the products lose some value before reaching the final market. Proper refrigeration and handling can increase the shelf life of fruits and vegetables considerably, allowing sellers more flexibility to take advantage of favorable prices as the harvest season recedes."[24]

Planning cold storage requires having the buildings used for as many days of the year as possible. For this reason, several different strategies with regard to location, size, and ownership should be considered. Above all else, client needs have to be clearly determined. Important considerations include (i) items to be stored, (ii) long-term versus short-term storage, and (iii) possible ownership or management models. Some horticulturalists favor privately owned cold stores with small room-sized units linked closely to packing sheds. Keeping the units small will sometimes cause the technology to spread more rapidly, and small facilities can be developed by many different groups and organizations.

There are three considerations for cold storage, in the following priority order:

1. Location. This should be determined by proposed product mix and destination, and/or purpose for storage;
2. Temperature and humidity flexibility. (This follows from item # 1, the above.)
3. Size. (This follows from items # 1 and 2, above.)

Each kind of product has its own temperature and humidity requirements, and units can be designed to specialize or to be flexible. Cold stores can be planned for long term storage or as holding units that form part of the wholesale aggregation system.

Freezers are another important issue. The large flexible unit usually has three divisions with three different temperatures and humidities. The technology for expelling humidity and ethylene gas must be carefully assessed. Many fruits and flowers either give off or are ruined by ethylene. For this reason, it is important to assess what products will be stored together.

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[23] Most of the materials in this section come from an email communication with Allison Brown, an American horticulturalist who has worked in Afghanistan and many other countries.

[24] Chemonics, *op cit.*, "Case Study # 106," p. 49.

Further, in the near future, Afghanistan MUST make plans for large, flexible cold stores located at all the major domestic and international airports. Some may not be used immediately, but they will be used as soon as there is relative peace. Adding them later, after land around the airport has become more expensive, will represent a wasted opportunity, and may prove difficult.

The cost of a unit depends on what it does. A small holding unit with a packing shed might cost around $50,000. Larger ones can be substantially more expensive. Some indicative costs for a larger cold storage of 5,000 tons capacity can be roughly estimated as follows:

- **Preparation**: Project preparation costs: $100,000.

- **Site**: Land requirements are estimated to be about 10,000 square meters, including land needed for logistics services like parking and access roads. Land for the site for the facility itself, (one 5,000 ton unit) would require about 6,000 square meters, assuming the height of the storage facility is 8 meters. Cost for this element is not given, since land acquisition costs would fluctuate around the country.

- **Facility**: Estimated price per cold storage facility, (5000 tons capacity) is about $6,000,000. (This includes shelving, hardware, and one water chiller of 1.5 MW.)

- **Externalities**: This rough estimate does not include any additional elements of infrastructure like internal roads, water connections, delivery, or any credit (mortgage) costs.

B. Potential Location of Cold Storage

Afghans and donors who are helping to develop the country's economy need to invest in cold storage capacity in selected cities around the country, located near major horticultural producing regions, and airports. Primary cities include: Kabul, Kandahar, Jalalabad, Mazar-i-Sharif, and Herat. Secondary cities could include Lashkar Gah, Kunduz, Baghlan, Charikar and/or Mir Batchakot in Parwan, and perhaps towns like Sar-i-Pul, and Bamyan. Cold storage can take the form of relatively large facilities located in provincial capitals, or it can involve a more diversified strategy, with smaller scattered units. Or it can be some combination of the two. Decisions should be based on client demand, access to reliable power, and the need for individual crops, export potential, etc. Of course cold storage facilities by themselves are not enough, although they may serve as a catalyst to encourage Afghan farmers to aim for better quality control. Cold Storage should also be closely linked with Producers and Marketing Associations.

VI. Producer's & Marketing Associations

At the present time, farmer associations are all but nonexistent among the grape growers of the Shomali Plain, although some trader associations exist. Currently there appear to be between 7 and 10 trader-exporter associations nationwide dealing in fresh and dried fruit, vegetables and nut subsectors. Most of these were recently organized by donors. **[Source, Chemonics, p.]**

Some horticulturalists who have looked at establishing Producers Associations in Afghanistan have thrown up their hands and simply said that Afghan farmers are too independent to be organized. **[Footnote: Chemonics, find page.]** However, for centuries Afghans have routinely organized themselves to share water through community owned water corporations, (which today

are called Water Users' Associations.) Afghans also routinely organize themselves at the village level to fund mosques, and for other community activities, historically including roads and bridges. While it will take time, it seems there is growing interest – at least in the Shomali area – to begin to organize Grape Producers Associations that can begin to aggregate product, and perhaps undertake some of the initial value added processing – cleaning, sorting, grading, and packing – at the village or community level. As part of drafting this Concept Note, the author and friends have begun visiting grape growing villages around Mir Batchakot. In conversations, many of the larger growers appear to recognize that they need more reliable technical assistance, better quality inputs, more and better information about markets, and better ways to market their products. Published reports have said, "Traditional Afghan marketing linkages with India are expensive, wasteful, and unprofitable. Afghan produce exporters are convinced their own commission agents in the Indian wholesale auction markets are cheating them." **[Chemonics, find page.]**

While Grape Growers don't yet have answers to the best way to organize themselves, they certainly seem cognizant of the need for new organizational and marketing models.

Some important observations **[Footnote sources]** that will influence the establishment of Production Associations include the following:

- Buyers in other countries are skeptical of the quality of Afghan shipments and are reluctant to pay for goods even after receiving samples, because of past problems with quality control. They have been willing only to receive shipments if Afghan merchants will sell on consignment.

- Afghan merchants currently don't appreciate the quality demands of international buyers. Merchants don't pay farmers enough to get high quality grapes, and end up receiving grapes that are a mixture of both high quality and low quality.

- In general Afghan traders are not paying farmers a premium for top quality grapes, so farmers have no incentive to produce them. Farmers will only change as traders receive orders from exporters for top-quality grapes. If they are in short supply traders will pay farmers a higher price for growing them.

- Farmers currently do not pool their products for processing or selling. The lack of farmers' and traders' associations in the Shomali Plains is a constraint on exports. Every farmer and trader works individually.

- Shelf life for Afghan fresh table grapes needs to be improved by gentler handling and more attention to breaks in the cold-storage chain. Grapes should not be shipped without pre-cooling, and eventually a significant part of Afghanistan's grape production should go into cold storage, so it can be sold over a longer period of time.

On the positive side, however:

- **Exporters who arranged to properly handle, package, and chill grapes for export to India in test marketing exercises saw their grapes bring four times the profit of other Afghan grapes shipped in traditional wooden crates without refrigeration.** This suggests the potential importance of Production Associations, as well as improved marketing, and the necessary intermediate steps to address sorting, grading, packing, chilling, shipping, etc.

Appendix I. SWOT Analysis, Afghan Melon Sub-Sector

This SWOT analysis provides an overview of strengths, weaknesses, opportunities, and threats in the melon subsector, and was initially designed for Balkh Province.[26] While it is specifically directed at the melon subsector, many of the same challenges confront other Afghan produce like grapes, pomegranates, fresh vegetables, and dried fruits and nuts.

STRENGTHS	OPPORTUNITIES
Afghan product is well known in the region, particularly in India Competitive product in world market, especially the Arkani variety which can last for several months Suitable climate across several provinces of Northern Afghanistan, Large production of 38 varieties. (Balkh Province alone produces 90,000 MT/annum, with approximately 500 tons traded per day between July and November.) Existence of a domestic market and big markets in proximity, (Kunduz, Kabul, Herat) Major investments in farm-level technical assistance in melon subsector in Balkh (ASAP)	Quality control and certification Extend sales season by creating better storage facilities, (chilling, cold storage, etc) Direct air transport to export markets Improve packaging (including melon fly free labeling) Brand Afghan melons Improve market linkages Eradicate melon fly and utilizing preventive means Target other export high value markets by meeting international certification standards, and improved packaging. Afghan melons can be downsized, (selection) to fit Indian shopping bags or UAE refrigerators.
WEAKNESSES	**THREATS**
Lack of quality control Lack of cold storage facilities Lack of value-added packaging, and processing Lack of a brand General low level of technical know-how and marketing at farmer and trader level. Lack of organization by farmers and melon traders Occurrence of melon fly, and inadequate means to detect and prevent Limited experience with direct air transport to main export markets Lack of professional business conduct Seasonal market	Competition from regional markets Competition on price Melon Fly can destroy domestic as well as export markets if consumers lose faith in product No particular differentiating product features ("Nothing special") Without selection, Afghan melons may be too big for external markets. (Smaller melons may have better market appeal.)

[26] SWOT analysis adapted from "Feasibility Study for Melon Subsector Plan: Improved sorting, grading and boxing of melons for export," from "Subsector Analysis and Business Plan Development / North and NE/ Economic Viability & Technical Feasibility," December, 07, p. 83.

This system of harvesting and payment is traditional. It endures because of the inability of grape growers to find any alternatives. While it functions well enough that grapes continue to flow out to international markets. the grower would only have a serious incentive improve the quality of his grapes, (by using improved horticultural techniques) if he knows that he will be rewarded for improved quality and treated fairly by the packer/shipper. This suggests the potential need for developing Grape Producer's Associations, perhaps in conjunction with Grape or Fruit Marketing Associations.

[delete: The most useful cold stores in Afg, as in most other places, is probably for potatoes, with fruits and vegetables coming after. Flowers need storage too, as do strawberry and other planting materials that need chilling before planting. Cold store facilities can also be used to keep products from freezing in cold places.

- Further efforts need to be made to find a suitable source of packing materials in Afghanistan.

- Better packaging, transport, and storage, processing and marketing are all areas that are critical for Afghan produce to be competitive....

When they are shipped overland, Afghan fruits and vegetables are adversely affected because in Pakistan, Afghan trucks are not allowed to transit Pakistan and must stop, unload, and then reload their cargo aboard Pakistani vehicles. Such unnecessary regulations not only adds superfluous costs, but it can detract from product quality, especially for refrigerated cargo, which goes from a proper holding temperature to ambient temperatures, and then to an unknown state. Once refrigerated cargo is unloaded and exposed to higher temperatures, it is unlikely to return to proper holding temperatures.

Before the war, fresh fruits such as grapes, apricots, and pomegranates grown in the Kabul, Parwan, and Kapisa Provinces were regularly shipped by air and overland routes to India and the Soviet Union. There were up to seven weekly, cargo-carrying flights to New Delhi and three to Amritwsar. The main produce exported by air included grapes, apples, pomegranates, and occasional loads of nuts and medicinal plants.[28] In 1979/80, Afghanistan exported 35,000 tons of fresh grapes; of this 78% went to Pakistan and 22 percent to India. Much of the Afghan trade with India was handled by Indian traders based in Kabul.

- Development programs should work between the bigger players (wholesalers, exporters) at the far end of the production chain, and the producers and input suppliers at the other end of the chain in order to achieve the changes that will be necessary to facilitate sales.

See the webpage of Dr Lisa Kitinoja, an American horticulturalist, who specializes in "Training in Post Harvest Technology" as her web page explains. It's a valuable source of information, dealing with things like: (i) basic postharvest technology; (ii) storage of horticultural crops; (iii) Packing practices; and (iv) temperature and relative humidity control. It can be accessed at ***http://www.postharvest.org/storage***

[28] DAI, op cit, pp 8, and 38.