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**Improving a fresh tomato market value chain in Fergana Valley
under Subcontracting**

**between
Winrock International Institute for Agricultural Development
and
Corporate Technology Center.**

Report on Phase I

**Prepared by:
Corporate Technologies Center**

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Title of the Project

Improving a fresh tomato market value chain in Fergana Valley (Andijan Oblast)

Description of the Project

A building of Cool House for tomatoes of the Association of Vegetable Producers in Fergana Valley (AVPFV) will take the centre stage of this project. With this Cool House and its previous experience of exporting fresh tomato to Russia, the association has good opportunities to tap the full potential of this tomato value chain and make it benefit a large number of members. The major obstacle to the full development of this value chain is that the farmers losing their potential gain of tomato production, as far as the tomato being perishable good spoiling during the transportation and distribution in external markets. The problem could be solved by building the Cool House to increase the farm gate price of tomato up to retail prices as much as possible.

The project will therefore fund the research of improving value chain of tomato production in Fergana valley, processing (cooling), packing, transporting and distributing in Russian markets. These include: investigation the opportunity increase in sale of tomatoes in regional markets, increased availability of appropriate technology and agricultural equipment at affordable prices, identify of size of the Russian market, identification of major players, trends of tomatoes producers in Fergana valley, analysis of tomato processing in the Central Asia region and export to Russia as well as input supply coordination, training of for Cool House specialists and Associations of Producers of Fresh Vegetable.

The project will work with about 10,000 farmers in Fergana Valley and neighbouring areas. They all have either individual land slots or shares in privatised, ex-Kolkhoz plantings. They either join or conclude a delivery contract with the association (or another exporter) in order to qualify for participation in the extension and support program.

Farmers inside the program may also receive input loans to be able to apply the extended technology. In addition, they will be facilitated to form groups that will be linked to trained, village-based spray contractors.

The association itself will receive TA in cold storage of tomato. To lower in-store losses and extend the storage period to a moment when prices are high, all tomato entering the store have to undergo a special treatment, and this project will enable the association to do this. In addition, the association will benefit from research into the fresh tomato market of Russia.

This project centres around the establishment of a Cool House and embraces the entire value chain of tomato to consumers.

Supporting the farmer:

1. Agricultural extension for tomato growers
2. Multiplication of high quality seed

3. Development of institutionalized structures

Supporting tomato production and marketing:

4. Specific marketing research for tomato in Russia
5. TA in legal and investment analysis of building of Cool House
6. TA to help with development of business planning and management systems
7. TA in installing as well as operating new processing equipment (Cool House)
8. TA in market promotion

With respect to traditional tomato production area, the project will work in Fergana Valley Andijan oblast of Uzbekistan.

Rationale

The domestic and export market for fresh tomato has been stable and growing for the past years. However, the supply of quality tomato is very limited due to:

1. The farmer losing their income due to spoiling of their produced tomatoes negatively affecting the quality of the products
2. The value chain of tomato production, processing, transportation and distribution is not giving possible income to farmers
3. There has been much planting of tomato from soviet period, and Central Asia was traditional suppliers of fresh tomatoes to Russia

Therefore we are in a situation, where most of the quality tomato sold in the domestic market but not in large markets in Russia. That would have the opportunity to expand the business and grow the income of tomato producers in sustainable basis. Also the process of distribution is not well structured due to lack of institutionalized pattern where the interest of tomato producer would be well presented and protected.

On the others side farmers see tomato as an opportunity with great potential to improve their livelihoods. A recent studies of the agriculture sector revealed that among various alternatives improving tomato quality would have the greatest impact on village economy. Especially in the South of Kyrgyzstan there is great opportunity to export fresh tomato. In Soviet times this was one of the main supply areas for fresh tomato.

A reason for this is that tomato from Fergana valley are up to a month earlier than the produce from North Kyrgyzstan and South Kazakhstan. In addition, the climate is drier reducing some disease pressure. Besides, the Fergana area has become renowned within Kyrgyzstan and the region for being a producer of good tasting tomato. This all has led to established trading routes of tomato from this area into Russia.

The knowledge and skills to obtain quality marketable tomato is not developed. Therefore general agronomists and Grower Ahmatre weak in the area of production, pest and disease control, and farmers have no understanding of crop protection whatsoever, as most have

never been involved in wide commercial production before. This project therefore wants to establish this business planning knowledge of tomato grower, structured the process of distribution based on modern practice and empower village-based field advisors and spray contractors.

Objective of the activity

The goal of this project is to increase personal income for more than 10,000 of tomato producers in Fergana valley. The project wants to make sure that farmers take advantage of a steadily increasing demand for fresh quality tomato. The project also wants to provide incentives for farmers to further invest into tomato.

The project is linking a large number of farmers to an association that is capturing a market for their tomato. It envisages that these linkages between farmers and the association become strong and stable to guarantee a market and prices that are attractive to farmers and lead to further investments. The success of the association in terms of increase in exports as well as of farmers in terms of increase in income will constitute a model that can be replicated inside and outside the area. In Uzbekistan and Kyrgyzstan the revitalisation of the tomato industry affects as many as 30 % of all households in Fergana area.

An increase in tomato production in Central Asia – in terms of quantity and quality – will therefore have an effect on alleviating poverty in villages as well as on the international reputation of the region for investors and global trade companies as a reliable source of reasonably prices tomato. The further development of this project could attract the potential investor to produce tomato juices and pasta, ketch-ups increasing the value adding to this sub-sector.

One of the opportunities to increase the income of farmers is producing of fresh tomatoes as an alternative value added product to other grain crops. There is potential market for fresh tomatoes for in domestic and regional markets. In Fergana valley more than 10000 farmers involved in tomato production which give stable source of income for large size families and about more than 50000 people gain from this economic activity. In Fergana valley, as elsewhere in the region, both agricultural production and food processing were severely curtailed with the collapse of the Soviet system, and rural livelihoods were devastated.

The agricultural economy of this area has recovered significantly in recent years but there remain many barriers to production, imperfect marketing, antiquated production and processing equipment, and outmoded management practices. There is a limiting factor of the local market and difficulties in accessing and benefiting from other national and export markets. On the other hand, Fergana valley has areas of favorable climate for tomato production and an ecologically clean environment that contributes to a strong reputation as a source of high quality agriculture products and income generation.

Estimates of profitability in the Fergana Valley show that tomato production has the highest comparative advantage at export parity prices with an estimated economic profit and a DRC

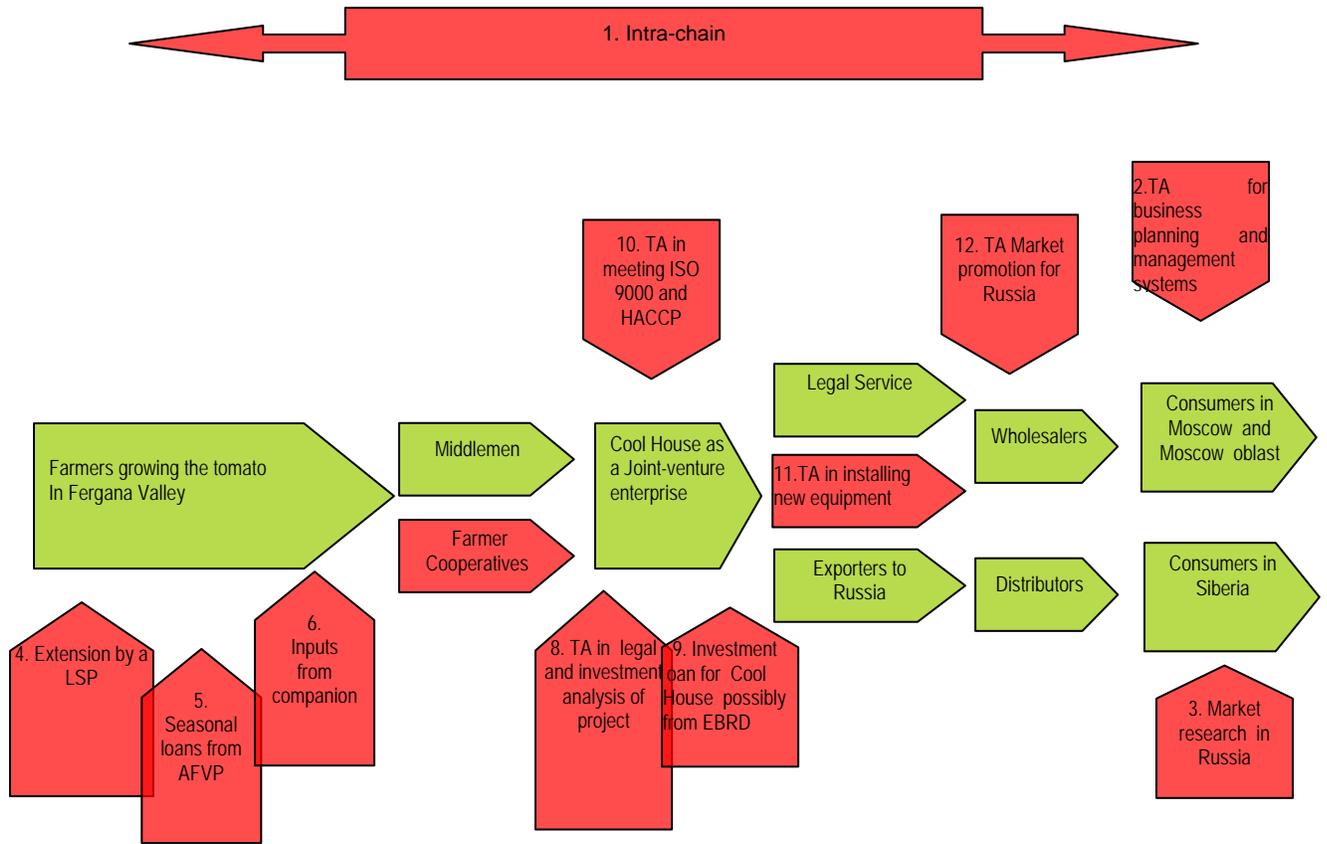
(Domestic Resource Cost) ratio of 0.05 for household small-scale farms. However, as a non-traded commodity the estimated economic profits of tomato production are only about one-fourth of the profits at export parity prices but still in quite a strong comparative advantage. The large difference in profits is explained by the problems and costs associated with the transportation, storage, and marketing of tomatoes in the domestic market including the volatility of this market and the perishable nature of this product. Moreover, estimates of the comparative advantage of tomatoes in the export market shown here should be viewed with extreme caution because some factors and costs such as those associated with the lack of information and poor experience of farmers and entrepreneurs in region in exporting vegetables have not been properly accounted for in these estimates. . Lack of knowledge, experience, and access to information and proper technology are some of the key difficult constraints that must be overcome in export-promotion development for tomato producers. Some of these constraints may be relaxed through the agro industrial approaches for instant using freezing and better marketing instruments.

Agro-industry – that is, sub-sector based on the processing of agricultural raw materials – is growing importance in the economics of Central Asian countries. Because of agro-industry's distinctive characteristics create a set of critical interdependencies a systemic approaches is needed to project analysis. The agroindustrial project analysis will be focused on following types of systemic linkages such as:

- Production chain linkages, which consist the operational stages that agroindustry material flow as they move from farm through processing and then to the consumers.
- Macro-micro policy linkages concerned the multitude of effects that macropolicies in the region have influence on an agroindustry operations. Macropolicies related to government policies in fiscal (subsidies, taxes), monetary (credit, interest rates), trade (foreign exchange, export control), and incomes (wages, prices).
- Institutional linkages which involves the relationships among the different types of organizations (individual farmers, cooperatives, association, processing plant, exporters, distributors) that operate and interact with the agro-industry production chain

The viability of an agroindustrial project requires soundness in each of the projects three basic component activities – procurement, processing, and marketing. Although this is the operational sequence of the goods flow in the production chain, the marketing factor is the logical starting point for project analysis: unless there is adequate demand for a project, it has no economic basis.

Explanation of the tasks to be undertaken by the Project



Industry and Market Analysis

Industry Background

There are nearly 10,000 growers with an average greenhouse area of 500 square meters in Andijan region. About 95% of these greenhouses businesses are engaged in vegetable production with the dominating crops of tomatoes and cucumbers. Especially, tomato production has the largest share in this sector. Majority of greenhouse businesses are concentrated in Andijan district, Asaka district, and Oltinkol districts that surround the Andijan city and owned by individual households. There is no big greenhouse business or businesses that dominate the market. Nearly all greenhouses are covered with polyethylene films (not glasshouse).

Market size for domestic and exported greenhouse vegetables is not estimated due to time constraints and lack of sufficient information. However, according to one industry expert, the industry growth rate is about 20% per year.

Greenhouse producers can be categorized into two groups by the type of their heating system and the markets served. Greenhouses are heated by natural gas, coal, and oil. However, the cost and availability of natural gas make natural gas based heating system more affordable than the other alternatives for greenhouse owners. Generally, producers with natural gas heating system, plant their seedlings either in early December or February. On the other hand, growers who do not have any heating system at all use coal and fuel only for a few days. For simplicity, I will term this type of greenhouses as "naturally heated greenhouses". They usually finish up planting the seedlings by mid-March. Majority of growers produce for export only and some of them for domestic market and export.

Following is the table for average production time for tomato:

Table 2. Average production time for tomato from planting until harvesting

Type of heating system	Planting	Start harvesting
Heated (gas)	December	March
Heated (gas)	Early February	April
Naturally heated	March	Middle of May

In recent years, productivity has increased mainly due to adoption of new hybrid varieties. Yield per plant ranges from 2 kg to 6 kg of tomato harvest per plant among the growers in Andijan. According to my and practitioners' observations, average yield per tomato plant is about 3 kilograms. It indicates that, on average, producers harvest about 5 tons from 500 square meter greenhouse.

S-1. Gas heated greenhouse in Asake district (Uzbekistan)

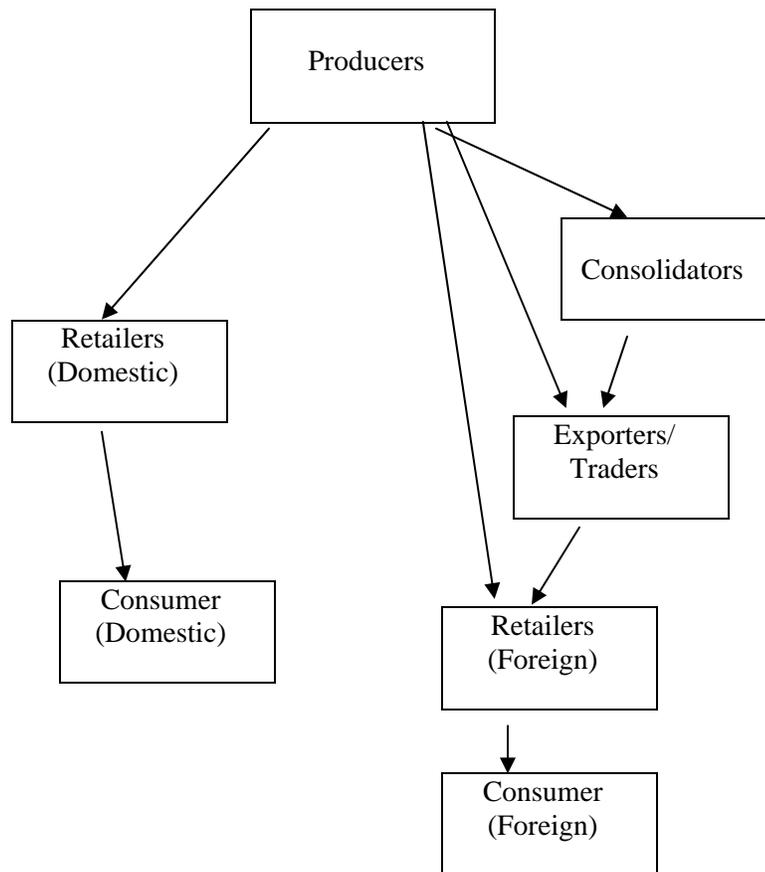


Greenhouse vegetables are exported to mainly Russia, Kazakhstan, and Kyrgyzstan. Russia is the prime market, which consumes more than 90% of this industry's output. For this reason, prices of tomato and cucumbers are very much dependent on demand for these products in the Russian market. Peak season for tomato and cucumber exports begins from April to mid June, which mirrors the seasonality patterns of consumption of these products in the Russian market. During this season, demand for imported fresh vegetables and for greens such as dill and cilantro is high. As soon as their own (Russian) vegetables start coming out, the prices of vegetables fall sharply.

Uzbek vegetable and fruit exporters are facing fierce competition in the Russian market. Major players in this market are China, Uzbekistan, Turkey, and Iran. Imported fruits and vegetables from Uzbekistan (especially, tomatoes, cucumbers, eggplants, and bell peppers) have a strong reputation in the Russian market. Despite its poor packaging relative to products from other competing countries, Uzbekistan grown vegetables are valued highly because of their better taste and minimum amount of chemicals content (ecologically clean). Generally, producers export their best quality output to the Russian market and partly to Kazakhstan because of higher wholesale price for exported vegetables in Uzbekistan.

Distribution Channels

Generally, producers market their output in the domestic market through retailers. Whereas exported products are sold to foreign retailers in the wholesale market channels out through consolidators and traders (exporters). There is some degree of vertical integration in the supply chain between producers and exporters. Some producers are also engaged in export business while others form a group (rare case) to have enough loads for a truck shipment to export their own produce.



In some cases, consolidators (who gather the produce from individual growers and prepare them for shipment) act as intermediaries between exporters and producers. This is relevant to large exporters who ship the produce frequently.

Predominantly, exported fresh produce is shipped via big trucks (trailers), which can carry from 20 to 30 tons of load. Alternatively, some exporters employ railroad services for shipping fresh produce to the Russian markets. Since market price in the Russian markets changes on daily basis (according to demand and supply schedule), exporters try to capitalize on any news about high prices in the Russian market by shipping the produce as

soon as possible. Therefore, despite the cost advantages, the longer transit period (1-3 days more) and the load size (about 45 tons) to fill up the railroad car make railroad transportation less attractive and feasible option to many exporters.

Market Attractiveness

This industry is characterized by multitude of small-scale producers and relatively few buyers. Products are not differentiated and almost all the producers offer the same varieties of tomato and cucumbers. Therefore, rivalry among the producers and bargaining power of buyers is high in this industry. Suppliers of main inputs - seeds and polyethylene films (plastics covers) - have also some degree of bargaining power over producers. For instance, this year, seed distributors raised the price of seeds up to 80% for the same varieties from the 2005 level. However, excluding initial investment in the construction of greenhouse, barriers to entry are somewhat high (especially for December and February planting). Main reasons as follow: necessary skills for greenhouse production, limited access to land and availability of natural gas for heating. On average, it takes at least 4 to 5 years to acquire necessary skills for proper cultivation technology. Not everyone has access to steady supply of natural gas. The neighborhoods with such an advantage are the ones around the city (Andijan) where the natural gas is distributed to other surrounding areas.

Industry Cost Structure and the Value Chain

The vegetable producers and exporters create most of the value in the value chain. At the same time, majority of risk is borne by the same parties. Below, producers' and exporters' cost structure and their profit margin are analyzed. This analysis will help us identify how much value is created by both parties in the value chain. First, cost of tomato production in a 500-m²-greenhouse is calculated for three planting seasons. Then, typical producer's profit margin is estimated (for all planting seasons) by using the estimated cost of tomato production and last year's observed average farm-gate price in Andijan. Lastly, typical exporter's revenues and expenses are analyzed according to each type of transportation alternatives.

Cost of producing vegetables in a typical greenhouse according to time of planting is given below:

Table 3. Cost of tomato production in 500 m² greenhouse for typical grower in Andijan in 2005

Description of Expenses	Cost December	As % of cost	Cost February	As % of cost	Cost March	As % of cost
Polyethylene films (if not glasshouse)	200 000	11%	200 000	13%	200 000	16%
Seedlings (1650 seedlings / 500 sq. m)	247 500	13%	247 500	16%	247 500	20%
Fertilizers	145 000	8%	145 000	9%	145 000	12%
Organic fertilizers	50 000	3%	50 000	3%	50 000	4%
Crop protection	50 000	3%	50 000	3%	50 000	4%
Strings (10 kg)	45000	2%	45000	3%	45 000	4%
Miscellaneous greenhouse supplies	15 000	1%	15000	1%	15 000	1%
Heating	400 000	22%	200 000	13%	100 000	8%
Labor (from preparation to final harvest)	700 000	38%	600 000	39%	400 000	32%
Total (SUM)	1 852 500	100%	1 552 500	100%	1 252 500	100%
Total (in USD)	\$ 1 544	100%	\$ 1 294	100%	\$ 1 044	100%

Table 3 shows that, the biggest costs to produce vegetables in greenhouse are labor cost, cost of seedlings, heating costs, and cost of polyethylene films to cover the greenhouse. It is estimated that, average grower spends about 100,000 sums on labor every month until the end of exporting season. Last year's average price for a seedling was 150 sums. This year's average price of one seedling was 225 - 275 uzbek sums depending on the variety. Some growers have complained that the cost of polyethylene films have gone up because of their poor quality. Poor quality films have to be replaced two times in a season or growers need to buy higher quality polyethylen films (Korean ones are popular). Due to the gas shortage problem (will be discussed later) compounded with the problems mentioned above, this year's cost of production has increased significantly.

Time of planting does not change the cost structure significantly except for heating and labor costs. In December planting, heating costs are about two times higher and the labor costs are about one and half times higher than the February planting. On the other hand, heating cost accounts for one half, if it is planted in March. However, labor is readily available with the daily average wage of 2000 – 2500 sums (about \$1.5 - \$2 a day). Labor costs are fairly stable in dollar terms.

S-2. One of the tomato producer in Andijan oblast with Chairman of Association of Vegetable Producers



Typical producer's estimated profit margin is analyzed in table 4. The calculation of harvest (5 tons per 500 m²-greenhouse) is based on the fact where an average grower harvests 3kg of tomato (all exported) per plant and plants 1650 seedlings. Estimated weighted average farmgate prices (per kg) of tomato were 700, 550, and 400 sums for December, February, and March plantings respectively in the previous year. The costs for each planting seasons are taken from the table 3. It is estimated that growers operate for 7, 6, and 5 months until the tomato season, according to chronological order of planting seasons.

Table 4. Estimated profit from tomato production in 500 m² greenhouse in Andijan

	December planting	February planting	March planting
Harvest (kg)	5 000	5 000	5 000
Weighted average price (last year)	700	550	400
Total revenue	3 500 000	2 750 000	2 000 000
Cost of production	1 852 500	1 552 500	1 252 500
Profit (in sum)	1 647 500	1 197 500	747 500
Profit (in US\$)	1 373	998	623
Months of operation	7	6	5
Profit per month of operation (sum)	235 357	199 583	149 500
Profit per month of operation (\$)	196	166	125

Some producers admitted that, last year's farm-gate price was fairly higher (when compared with the cost of production) than the prices received in the previous years. Greenhouse growers cannot pass on the cost increases to the down stream (to exporters).

Below, typical exporter's costs and the variation in his profit margin (based on last year's observed tomato prices in Andijan and Krasnoyarsk, Russia) are shown in table 5.

Table 5. Analysis of variation in average exporter's cost and revenues per kg of exported produce in 2005 - season.

Type of expenses/revenues	Via trucks			Via railroad		
	Beginning of season	End of season	Season's average	Beginning of season	End of season	Season's average
VAT (ruble)	6.5	1.5	3	6.5	1.5	3
Price received in Russia (ruble)	65	15	30	65	15	30
Unit cost of transportation (ruble)		10			6	
Price received (foreign)	2600	600	1200	2600	600	1200
VAT (converted into SUM)	260	60	120	260	60	120
Farmgate price	1400	300	550	1400	300	550
Transportation	400	400	400	240	240	240
Total cost	2060	760	1070	1900	600	910
Exporter's profit	540	-160	130	700	0	290
Profit in US\$	0.45	-0.13	0.11	0.58	0.00	0.24
Exporter's profit margin	20.8%	-26.7%	10.8%	26.9%	0.0%	24.2%
Average exchange rates		\$1 =			30rubles	
		\$1 =			1200sums	
		1 ruble =			40sums	

Prices received by the exporters in the Russian market are based on the actual price levels (wholesale) in Krasnoyarsk, Russia. Analysis indicates that the biggest expense of an exporter is the cost of merchandise (farmgate price). In addition to price paid for producers, the second largest expense is the cost of exporting, which mainly accounts for transportation costs and VAT paid in Russia. In 2001, 20% and 10% (as a % of going market price in the Russian market) VAT was imposed on imported fruit and vegetables respectively by the Russian government. This resulted in higher cost of exports.

Last year's average transportation costs (per kg) of exported vegetables to Russian market were 9 - 11 rubles and 5 - 7 rubles for truck and railroad shipments respectively. Average transportation cost (for truck shipments) of 10 rubles is fairly stable in terms of dollar amount (\$0.33 per kg). In the beginning of the season (mid April), the price paid for tomato producers was 1400 sums where exporters received 65 rubles per kg. By the end of the season (late June), this amount declined to as low as 300 sums and 15 rubles respectively.

Average, turnover of transporters is one shipment a month, whereas exporters' average turnover is two shipments a month. We can see from the table 5 that there is a big variability in the exporters' profit margin: starting from 21% and 27% in the beginning of the season and -27% and 0% in the end of the season for truck and railroad shipments respectively.

Market Trends

Shopping patterns and tastes of Russian consumers have changed significantly after 2000. Especially, attention to product packaging, fresh look and demand for varieties with longer shelf life increased. For example, average box for exported vegetables would contain 30 kg and 10 - 15 kg net weight before 2000 and during 2000 - 2005 respectively. Today, these types of boxes contain about 6 - 8 kg of produce. Various fabrics and papers are being used for packaging to keep the produce clean and make it look more attractive. However, in this regard, Uzbek exporters are still lagging behind their other foreign competitors such as China, Turkey, and Iran.

Lured by the attractiveness of the Russian market and partly due to inception of VAT on imported vegetables in 2001, some Chinese entrepreneurs built large-scale greenhouses around major Russian cities. Despite the higher fuel costs, the cost of producing tomato and cucumbers in those greenhouses is lower than the cost of imported vegetables. This is mainly due to economies of scale, cheap labor costs (mainly immigrants), and almost zero transportation costs, which compensates for nominally higher fuel costs. Therefore, as soon as they begin selling their output by mid June, the price of tomato declines to as low as 15 rubles, which is below exporters' cost of about 20 rubles per kg at that time.

Case study

Grower Ahmat is a 56 year-old farmer/greenhouse grower. He has become widely successful over the past decades through his efforts in the greenhouse business and farming. In 2001, Grower Ahmat received "Mekhnat Shukhrat Ordeni", a prestigious medal, for his services in the development of private farms in Uzbekistan. In addition, he regularly receives praise in the mass media locally and internationally. For example, "Sadovod" (horticulturalist),

"Fermer", "Gavriush", Russian magazines, acknowledged his works in the development of greenhouse sector in Uzbekistan. Regularly, articles are published and TV programs are broadcasted about Grower Ahmat's success stories (such as the Andijonnoma Newspaper, local and central television channels). He has a good reputation in the marketplace as a producer of high-quality products. The case of Grower Ahmat highlights that; success can be attained from careful attention to consumer demands and market trends.

Introduction

Grower Ahmath was born in a farmer's family in 1950. His father, who built the first naturally heated (without heating system) greenhouse in the village in 1957 to produce vegetables, was one of the most successful farmers in the district. After graduating from Andijan Pedagogical Institute with mathematics degree in 1971, Grower Ahmat started his career as a schoolteacher at school #8 in Asaka district. He worked for the same school until 1990. By the initiative of the president of Uzbekistan, "Household Farmers Union" (later became as "Farmers Association") was established in the beginning of 1991. Grower Ahmat was elected to be the first chairman of this union's branch in Asaka district. From 1997 to 2004, he worked as a regional level chairman of Farmers Association in Andijan region.

In the 1970s, as Grower Ahmat's family became larger, his salary of about 145 rubles per month (about US \$207) from teaching was not enough to support the family financially. Grower Ahmat decided to use his backyard (400 square meter open field), which was part of his property, to produce vegetables and sell them in the local market. This additional source of income was still insufficient to meet the increasing financial demands of the family. In 1976, without quitting teaching at the school, he started his fruit and vegetable trading business. During the school's summer vacation, in addition to his own produce, Grower Ahmat used to buy fruits and vegetables such as tomatoes, apples and grapes from the local farmers and sell them in the Russian markets. As a result his financial situation improved significantly and, soon, Grower Ahmat became financially strong with the annual revenues ranging from 2000 to 5000 rubles. However, during the soviet era, this type of entrepreneurship was called "speculation", which was an illegal business. Therefore, sometimes, Grower Ahmat had to incur losses if he was chased or caught by the government regulatory agencies that dealt with speculation.

Despite the high returns from that type of business, Grower Ahmat sought an alternative stable and less risky source of income for his livelihood. He decided to build a greenhouse on his open field where he used to grow vegetables. Grower Ahmat invested the funds tied up to his trading business into new greenhouse operations without borrowing any external loans. He built his first 500 square meter greenhouse in 1980 and planted tomatoes. Fortunately for the business, Grower Ahmat's skills acquired from his father and previous experience in vegetable farming were the key factors in making the new business profitable from the year of inception. In fact, Grower Ahmat's greenhouse was the first greenhouse with a heating system in the district.

Since tomato production in greenhouses was a new trend in Andijan, he often used to meet with specialists and scientists from agricultural research institutes to learn more about

proper growing techniques and technologies. Grower Ahmat recalls that in 1980, on any given day, there used to be about 10 sellers each of whom with up to 30 kg of tomatoes for sale in the local market. Market acceptance of the tomato did not take long, as a result, demand for tomatoes increased steadily. Lured by the profits, Grower Ahmat's neighbors and friends asked him to help them build greenhouse and teach them how to grow tomato. By 1985, the number of greenhouse growers increased significantly in Andijan region. Grower Ahmat, even allocated one of his business days in a week for free consultation where he shared his knowledge with other greenhouse growers.

Grower Ahmat built his 300 square meter glasshouse in 1986. Since the access to land was limited, he decided to cut costs and increase the productivity in order to increase his profits. Grower Ahmat rebuilt his greenhouses several times in the first five years to improve the greenhouse design in order to improve the productivity. In addition, he tested "Bakuras" seed company's new varieties such as "Bakhor", "Fukand", and "Tashkent". Grower Ahmat noticed that "Peremoga", "Volgograd", and "Talalakhin" varieties came out as best-selling varieties one after another. Until early 1990s, he successfully capitalized on these varieties by adopting them earlier than his other counterparts. On average, tomatoes of these varieties were sold at 2 - 5 rubles per kg and Grower Ahmat netted about 1 - 3 rubles per kg respectively depending on the season.

In 1992, he decided to diversify and upgrade his product offerings, and expand his greenhouses. During 1992 and 1994, Grower Ahmat established cooperation with "GAVRISH", Russian leading seed company, and became their representative in Uzbekistan. He began testing about 50 hybrid varieties of tomatoes from GAVRISH and other Netherlands based seed producers each year. Grower Ahmat offered the best varieties to other growers for sale that fit the local conditions. By 1995, he expanded his greenhouses up to 0.5 hectare and began growing cucumbers.

Until 1995, Grower Ahmat used to buy tomato seedlings from other nurseries. In 1995, he started producing his own seedlings and gave the extra ones to his friends. Next year, Grower Ahmat had orders from several growers for more tomato seedlings of his new offerings from GAVRISH. Soon, he became known as a successful greenhouse grower in Andijan. Grower Ahmat diversified into production of tomato seedlings in 1996 after he realized that he could double his profits from a given area then just producing tomatoes only.

Since 1995, in cooperation with GAVRISH and other leading specialists, Grower Ahmat has been organizing annual seminars and workshops for greenhouse growers (majority of participants come from the Fergana valley) in Andijan. During this period, they developed new varieties of cucumber ("Ibn Sino", "Osio", "Ulugbek") and tomato ("Amir Temur") that specifically designed for Uzbekistan's climate.

In 2003, he implemented a drip irrigation system into his greenhouse production. Grower Ahmat built another 0.5 ha of greenhouses (total of 1 hectare) in 2005. Currently, he is using products from NETAFIM and EIN-TAL companies that are available in the market. Grower Ahmat has a contract with European manufacturer - EURODRIP - for more

irrigation systems that are more affordable and easy to apply to the local greenhouse operations. He sees a big potential in the application of this technology and has been working on to commercialize this idea. Grower Ahmat said: "we can not commercialize this product until we educate our growers and show them the benefits of using this system in practice." So far, Grower Ahmat is very optimistic about this idea and has started his promotion campaign already by educating growers in the seminars and exhibiting his already installed drip irrigation system.

Last year, Grower Ahmat experimented two types of tropical fruits - banana and kiwi - whether they are suitable to Andijan climate or not. The results were positive. However, cost of producing banana exceeds its market price, therefore he opted for not to produce this fruit. On the other hand, Grower Ahmat hopes for the prospects of kiwi production and wants to further experiment by testing different varieties of this fruit. He says that, growing the kiwi tree is very much like growing a grapevine.

S-3. Light greenhouse in Andijan



Performance

Most of Grower Ahmat's revenues come from the production of tomato and cucumbers. The other sources of revenue are from the sale of seeds and seedlings. During the conversation,

Grower Ahmat did not give any information about his main business for confidentiality reasons. According to Grower Ahmat, profitability steadily increased over the years due to steady growth in the sales of vegetables and seedlings. Table 1 shows the profit growth from the sale of seedlings from 1996 to present.

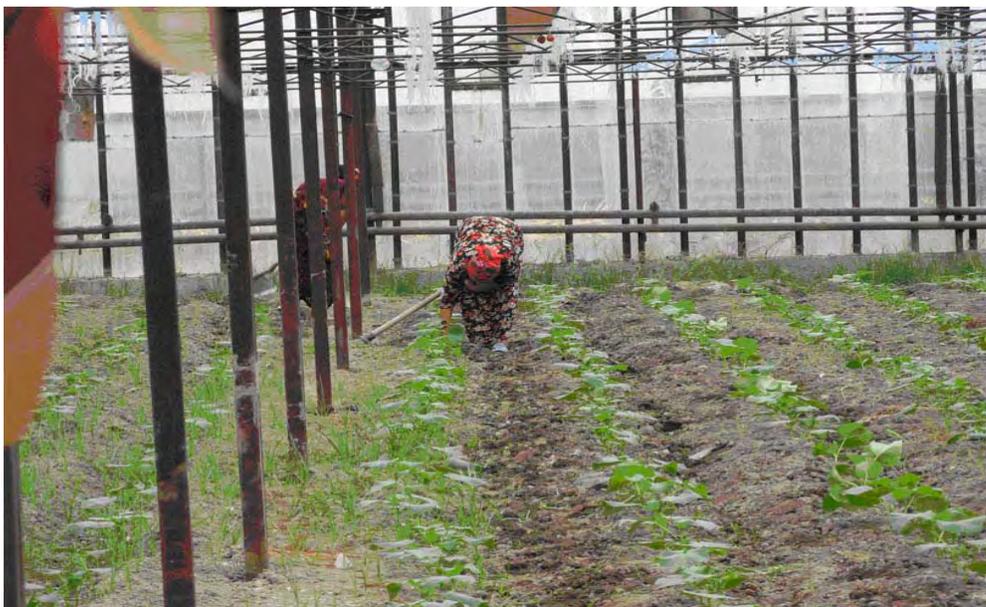
Table 1. Profit growth from the sale of seedlings during 1996 – 2005

Period	# of seedlings sold	Profit from sales (\$)
1996	15,000	488
1997	50,000	1,625
1998	150,000	4,875
1999 - 2005	300,000	9,750

Despite the increase in the price of seeds during this period, Grower Ahmat managed to maintain a profit margin of \$30 - \$35 per 1,000 seedlings. During 1980 - 1997, productivity increased threefold due to improvement in the design of greenhouse and adoption of new varieties. From 1997 to 2005, productivity did not increase as much. However, in addition to more than 30% cost reduction benefits, application of drip irrigation system has increased the productivity by 25% in 2005. Today, productivity of tomato per 1 m² has reached 20 - 25 kg level.

Production Process and Technology

Currently, Grower Ahmat is utilizing the entire production capacity of his 1-hectare of greenhouses. Production of tomatoes and cucumbers occupy about 80% of production capacity. Besides 450-m² greenhouses for lemon production, the rest of the capacity is tied up to bell peppers, eggplants, and other types of vegetables (partly for experiment purposes).



S-4. Most of the job is done by the women in greenhouse

Generally, Grower Ahmat plants the seedlings in December and February and starts harvesting them in March and April respectively. Main inputs in the production process are polyethylene films, seedlings, heating materials, and labor. The nature of the production requires upfront expenditures in the amount of about 50% of total production costs. These costs mainly account for polyethylene films, seedling, fertilizers (including organic ones), and labor that are incurred before planting. In addition, drip irrigation system requires a lump sum cost of about \$1,200 for 1000 m² greenhouse. However, once purchased, this system can be used for 5 - 10 years depending on the brand.



S-5. 1500 sq/m Greenhouse in Andijan oblast (Uzbekistan)

Product Markets and Market Promotion

Grower Ahmat produces 100% of his output for export purposes. Nevertheless, some insignificant amount of the produce is sold in the domestic market. He sells about 50% of his own output in the Russian markets (in "basa"s) and the other 50% is sold to local exporters. Grower Ahmat uses the significant amount of proceeds from the sale of vegetables (half of his output) to purchase seeds from GAVRISH.

Grower Ahmat does not promote his products directly, but he promotes his new varieties and technologies through annual seminars and workshops organized in cooperation with GAVRISH. In addition, his greenhouses are considered as one of the main experiment stations of new seeds in Andijan. Therefore, Grower Ahmat's reputation (as a leading practitioner) and his free consultations to other growers in the region serve as an indirect promotion for his products.

Fresh tomato production and exporting value chain in Uzbekistan (Fergana Valley)

Chain	The cost 25 ton of fresh tomatoes (in USD)	Share (%)	Per 1 kilo (in USD)
Farm gate price (February – March)	12500	31	0.50
Collection and consolidating of harvest	2500	6	0.10
Transportation to Russia (Moskow region)	14000	34	0.56
Formal and informal payment on the way	7000	17	0.28
Income of transporter	7000	17	0.28
Income of trader (exporter)	11950	29	0.48
Losses during the transportation	4050	10	0.16
Total cost	40950	100	1.64

AGFIN + Tomato Value Chain

Obstacles to development

Grower Ahmat related: *Grower Ahmat has a contract with EURODRIP for drip irrigation systems. He wants to sell this technology for local growers in the region. There are some farmers who want to purchase this technology on credit. Due to tedious legal procedures to import this product and lack of financial resources he is not able to commercialize this plan. However, Grower Ahmat thinks that, adoption of this technology will be much faster if growers have access to low interest rate loans.*

Inputs related: *This year, seed prices have increased by 80% mainly due to change in the measurement unit. Seed distributors had been selling the seeds by grams, but they changed their sales strategy this year. Now they are selling the seeds piecewise (number of seeds in the package). In addition, some distributors are cheating their clients by providing*

miscounted number of (less) seeds in the package and by replacing original seeds with brown-bagged ones (resulting in lower germination rate).

From December 2005 to February 2006, growers in Andijan and surrounding neighborhoods of Andijan city had experienced severe natural gas problems. Especially in the neighborhood of Komakay of Oltinkol district (one of the heavily concentrated neighborhoods of greenhouse production), growers lost their crops because of natural gas shortage. Other growers are using kerosene and diesel as a contingency fuel, which is more expensive heating alternative than natural gas.

Usually, land for building greenhouses is limited to the size of the individual's own property (available land ranges from 200 in the cities to 2000 m² in the villages). Alternatively, it is possible to obtain more land if an individual becomes legally registered farmer. However, becoming a legally registered farmer has some disadvantages. First, there will be extra organizational costs and frequent check-ups by the governmental regulatory agencies. Second, the main reason, farmer cannot use his own funds for all business transactions and cash out available money in his account anytime he wants. Therefore, people use their private property for greenhouse production to avoid this type of problems with expansion of business.

In the greenhouse vegetable production, nature of the business requires growers to incur upfront expenses (more than 50% of total cost of production) before planting to purchase polyethylene films and seedlings. Due to the size of their operations, many growers cannot save their profit for the next season to cover their upfront expenses. Therefore, they are left with two options: either to borrow necessary funds or to buy those inputs on credit at higher price. Generally, growers use latter option due to lack of external financial resources at reasonable interest rate.

Analysis of Andijan credit market showed that, there is no credit line (except for one) specifically tailored to greenhouse production. Only ACDI VOCA, an American credit union for micro financing, offers "Green" credit line for greenhouse production up to 6 months at 4% monthly interest rate. This credit line is attractive to growers with its four-month grace period provision. Borrowers begin paying off their debt in 15 days' time interval in the form of amortized loan after the grace period (interest is calculated for grace period as well). Another advantage of this loan is there is no collateral requirement on the loan. However, it has two disadvantages: high annual interest rate of 60% (effective rate) and borrower's responsibility for other group members' debt. Since there is no collateral, the credit union requires borrowers form a group of four and pay off other members' debt in case they default on their payment.

Other types of loans are available for growers from various commercial banks such as HAMKORBANK, TADBIRKORBANK, and others. Offered (accessible) loans start from nominal annual interest rate of 26% to 60% with monthly compounding. Most of them are amortized loans with no grace period feature and require collateral. Alternatively, HAMKORBANK offers dollar denominated loans (EBRD credit line) at 36% annual interest

rate, compounded monthly, with the same features stated above. However, the real effective interest rate (in sums) is about 50% after inflation rates taken into account.

Export related: On the marketing side, growers face some market risks other than price fluctuations. Generally, during the harvest time, growers spend their time waiting or looking for a customer (consolidator/exporter) to sell their produce. Since the majority of growers are small-scale producers, **they do not have cooling and storage rooms**. There are no centralized cooling and storage facilities for producers as well. The nature of the product requires the growers to sell the produce as soon as they are ready for sale. Therefore, often times, producers sell their output at bargain or on credit to exporters. Sometimes, producers cannot get their money for their produce in case traders default on their debt payment. This type of problem sometimes happens with traders also when they sell their exports on credit to retailers in the Russian market.

Transportation costs are extremely high (especially in transiting Kazakhstan), mainly due to unofficial payments for customs and police at some checkpoints. The reason is, trucks contain more load than allowed level (the actual weight is more than the one on the document) and expensive items are not shown on the document to pay less VAT. On the other hand, VAT is charged regardless of the condition of produce. Even if some portion of the produce is rotten or the exporter is losing money on that shipment (because of lower market price than the unit cost), the VAT must be paid.

Supply chain related: In general, there is a minimum degree of cooperation between producers and traders in the supply chain. In some cases, growers intentionally mix small sized tomatoes, which are not acceptable size by traders, during packaging in order to sell more produce. Buy and sell relationships between input suppliers, growers, and traders are based on only handshakes or oral promises.



S-6. Small collector of vegetables in Andijan district (Uzbekistan)

Growth Strategies and Future Plans

Grower Ahmat: *Grower Ahmat has several business plans for the near future. He is planning to build another greenhouse (one hectare) on his farmland (private farm) in 2007. Grower Ahmat has been thinking about building a modern greenhouse, which is comparable with western standards, including Cool House. However, this major capital investment requires a large cash outflows. Therefore, he thinks, it might take some time to reach this goal.*

After Grower Ahmat identifies the right kiwi variety, which is best suitable to the local conditions, he wants to diversify into kiwi production as well. There are no local producers of kiwi and consumers are already familiar with this given fruit. Therefore, it might give "Grower Ahmat" a first mover advantage in the market.

Grower Ahmat is working on solving the problems associated with importing the drip irrigation systems from EURDRIP. Meanwhile, he is committed to continue his promotion campaign through various educational seminars.

While Grower Ahmat's business doing quite well, there is a concern in the areas of vegetable production and his seed business (including the sales of seeds and seedlings). At present, Grower Ahmat's all offerings of new varieties are from GAVRISH. "Vladimir" of GAVRISH was one of the best selling tomato varieties during 2002 - 2004. Since last year, GAVRISH did not introduce another such a popular variety (from the consumers' view). Therefore, Grower Ahmat's seed business is very much dependent on his partner's success in continuously developing best selling varieties. On the other hand, Grower Ahmat may not be able to maintain the same profit margin from tomato and cucumber production as the other growers increase their productivity and efficiency by adopting new technologies and acquiring better skills.

Grower Ahmat thinks, growers eventually adopt new technologies such as drip irrigation systems and other greenhouse supplies. He will concentrate on the supply of such technologies, because, there is no supplier of these technologies and he believes that the demand for these products will be high in the near future.

Grower Ahmat's quest for continuous learning and improvement along with his proactive attitude were the key components of success in his business. He always seeks advice from experts and scientists who can help him how to improve the productivity of vegetables and efficiency of his operations. For example, Grower Ahmat's partnership with GAVRISH is the milestone of his business success. At the same time, he successfully capitalized on the new irrigation technology, which gave him an edge over his competitors.

The case of Grower Ahmat provides several lessons for greenhouse growers in Uzbekistan. He constantly updated his product offerings by testing and selecting the best ones from as many as 50 varieties every year. However, Grower Ahmat was not content with that. He continuously adopted the best available technology and knowledge. For example, Grower Ahmat rebuilt his greenhouses several times and used latest growing techniques and technologies in his operations in order to improve productivity and quality of products, and production efficiency. Grower Ahmat correctly identified market opportunities and was able to capitalize on those opportunities by correctly timing trends in the market.

Analysis of barriers to transit trade pertaining to Uzbek and Kyrgyz transit transport

Based on Cases

The first group of questions discussed during the meeting in with truck drivers and managers of transport companies concerned differences in technical standards on vehicles (dimensions of vehicles, axle load, problems of reweighing, etc.) used on territory which considered as transit for Uzbek and Kyrgyz transporters (major service provider to vegetable producers in Uzbekistan).

Raised issues:

*On summer of 2005 on the “Petuhovo” post (Russian Federation) Uzbek vehicle has been detained for excess of a total weight on the basis of the RCI order on application of the Minsk agreement on weights and dimensions of vehicles which Kazakhstan has signed in 1999 with the clause (item *-1.3.1.2 Appendix 2 maximal total weight of a vehicle - 36 t.) in spite of the fact that the governmental order #32 of the Republic of Kazakhstan dd. January 17, 2003 has abolished mentioned clauses and the order has approved norms of the Minsk agreement on territory of Kazakhstan.*

On July of 2005 on the “Chudovo”(central transport corridor) transport control post (Russian Federation) Kyrgyz vehicles loaded with fresh-vegetables have been detained for ostensibly excess of axle load in connection with flood restrictions in spite of the fact that according to the order of the Ministry of Transport and Communication of the Russian Federation such restrictions do not extend on the vehicles carrying out the international shipment on federal roads. Despite the fact that the rights of Russian Transport Inspection officer are determined by the Law of the Russian Federation #127 dd. July 24, 1998, the order on charge of penalties is defined by the Code on administrative offences, and weight loads and dimensions of vehicles are determined in the Agreement on weights and the dimensions signed by the CIS countries adopted in 1999by Minsk Agreement.

Concerning the first question analysis of this situation show that is result of bureaucratic delays the Russian party has received the notice on abolishment of clauses to the Minsk agreement on loads and dimensions of vehicles from Central Asian Republics. Also active cooperation between Transport Inspection Bodies of Russia and CARs in resolving this problem would be helpful.

Next group of questions concerned introduction of the *Unified Weight Certificate* (UWC) on the territory of the CIS countries going to Kyrgyz Republic.

On the Shymkent-Pavlodar(Republic of Kazakhstan) route main transport corridor for Kyrgyz Republic up to 8 posts for carrying out weighing of cars (transport inspection) can be counted. Weighing results of various weight stations differ from each other.

More attention should be paid to the elimination of barriers for vehicles in these countries, and with this purpose there is a need an establishing intergovernmental group which will be engaged in elimination of administrative barriers on the border of CIS countries.

Unified Weight Certificate is so important, that the many association of the international carriers was ready to introduce UWC as a pilot project on the territory of CIS, but this proposal has not been supported by the officials of some countries. Interviewers have also discussed an issue on adoption of the *Unified Technical Requirements* (UTR) to vehicles based on its technical characteristics on the territory of the CIS countries.

Also carriers concerned about simplification of obtaining special permissions for shipment of large-sized cargos, notably regarding possibility to simplify procedures on obtaining special permissions for shipment of large-sized cargos at least in cases of insignificant excess of weight and to hold this procedure on the border posts.

Bribes on the roads.

Problem:

Traffic policemen openly ask for bribes from drivers. In case of refusal, Kazakh and Russian traffic policemen take drivers' documents away and detain for uncertain time without any explanations.

Apparently from actions of the Ministry of Internal Affairs of the Republic Kazakhstan, the officials of Ministry of Internal Affairs are worried about these cases and undertake decisive measures to change situation. High officials of the Department of the Traffic police of Kazakhstan have held a press conference, where they informed that the new Minister of Internal Affairs has toughened requirements to the traffic police and has signed an order on regulation of traffic control. According to this order it is strictly prohibited to stop and check cars carrying out international shipment on republican roads except for cases when there is concrete instruction to detain concrete vehicles and persons. Besides, the order stipulates reduction of traffic police stationary posts. It is decided to leave only 30 posts out of 69 on main transport corridor for Uzbek and Kyrgyz transporters. Thus, all 12 posts on the Shymkent-Astana highway will be liquidated. Only 1 stationary post close to the capital of the Kazakhstan Astana from Karaganda side will be left.

It remains only to add that besides the Ministry of Internal Affairs, control over international auto-shipment of agriculture products in the Kyrgyz Republic and Republic of Kazakhstan is carried out by Transport Inspection, Border Service, Committee of National Security, Custom Committee, Immigration Service, Veterinary Service.

Time duration for carrying out different types of checking both on border check points and on numerous control posts of different services within for instance in Kazakhstan is unreasonably delayed. At the same time psychological pressure is committed on drivers (rude treatment, threats, search, including personal inspection, etc.) who have to "guess" possible ways to speed up and simplify control actions. There are steady rates of illegal collection of money from different control services on concrete posts which testifies existing system "squeezing" for illegal payments.

Also Kyrgyz carriers affirm that traffic policemen and Transport Control Committee officers in Shymkent and Jambyl oblasts unreasonably and for a long time detain cars in Chiganak, Karaganda, Pavlodar, Cherkent demanding the significant amounts of penalty without receipt. If needed they are ready to organize a control trip with the representatives from Transport Control Committee over the Tashkent – Petuhovo route.

COMPULSORY ESCORT OF VEHICLES

Russian custom bodies impose to the Central Asian Republic carriers expensive services of the private JSC-CBTC for implementation of escort of transit goods, the price of which is 1200 - 1500 US dollars. Russian carriers according to the instruction of the SCC of the Russian Federation dd. July 11, 2002 are escorted by officers of custom bodies that is three times cheaper and corresponds to the custom legislation of the Russian Federation (clause 87 of the Custom Code of the Russian Federation). The instruction #01-06/46087 of the SCC of the Russian Federation dd. November 24, 2003 introduced custom escort of the trucks carrying cars through custom border of the Russian Federation to the republics of Kazakhstan, Uzbekistan, and Kyrgyzstan. It contradicts the clause 23 of the TIR Convention supposing escort of the goods and vehicles only in exceptional cases. It is clear that custom bodies of the Russian Federation simply lobby interests of the same and State Unitary Enterprise “ROSTEK” that issues guarantee certificates (obligation) to physical persons transporting cars on a private base from EU.

Fees in the JSC CBTC differ from the fees of custom services by 18 %. Thus, 1 km of escort according to custom tariffs costs 0,33 \$ and according to the JSC CBTC - 0,40 \$.

Institutional Organization of the Trade

In contrast to other sectors of the Uzbek economy, there is a marked poor of representative institutions for exporters of fresh vegetables. The contrast with the cotton industry is, for example, quite sharp. Reasons cited include the small scale and number of operators in the trade, their meager financial means, and the tendency to regard each other as competitors.

As a result there is no effectively operating association of fresh produce exporters, and this is reflected in a fragmentation and inability to undertake advocacy on behalf of the sector in getting remedial actions from government on the important bureaucratic obstacles to trade.

There are, however a number of marketing cooperative bodies, typically consisting of groups of farmers, often from one region, who are cooperating to some degree to gain access to export markets. From the point of view of the Government, it would appear that the fresh produce export sector is not regarded as a priority and there are few or no official programmes of support.

Sovereign Risk and Investment

It is a notable feature of the current Uzbek vegetable export market that a majority of

the exporters which are managing to make some progress in penetrating export markets with higher quality products have benefited from strong specific and personal contacts with companies based in Russian largest cities. Much of the investment and know how to effectively access these markets can only realistically be achieved in the short term with inflows of FDI.

The problem is that there have been very few of these initiatives and they have led to investment only on a modest scale. It is important that Uzbekistan should make a correct assessment of the reasons for this disappointing flow of investment into a sector in which the country should by most accounts, have comparative advantage in certain sub-sectors. A part of the explanation lies, no doubt, in the fact that Uzbek investment climate is not appropriate for potential capital inflow.

It is clear that other aspects of the investment environment, which are within the control of the Uzbek government, also play a very important role, and these can be summarized as issues of sovereign risk. The poor governance framework in the economy, the frequent changes in the regulatory environment and the lack of a properly functioning court system to provide commercial guarantees of contract enforcement have all be cited by the respondents in the private sector during this study as factors explaining the low levels of interest and investment.

In the agribusiness sector this is particularly unfortunate, as the sector clearly needs a greatly increased inflow of external private sector expertise if it is to upgrade its products to the point where it can enter and expand in other markets. In most emerging markets or economies, commercial banks can be expected to have initial concerns relating to country risk. This risk might embrace, among other things, risks such as debt rescheduling, nationalization of assets, currency convertibility and hard currency transfer as it concern Uzbekistan in past experience.

Export Market Information and FDI Promotion

While Uzbek fresh vegetable traders have a reasonable level of knowledge about the Russian and CIS markets, the same cannot be said for European markets. Potential exporters have poor knowledge of western markets and the potential for profitable investment for export, or even of how to set about becoming better informed. It is striking how many of the few existing enterprises which are currently exporting on a small scale to western Europe started from chance contacts stemming from visits by European investors seeking potential partners, as opposed to resulting from active search by Uzbek investors.

In other words the process in this sector has been passive rather than pro-active, waiting for chance encounters with visiting investors. There would appear to be some scope for

increasing investment through projects aimed at facilitating Uzbek enterprises to undertake partner-search activities in Russia or Europe (and elsewhere), but this would only make sense in the context of a marked improvement in the overall environment for inward investment which remains strongly hostile as outlined above.

Russian market trends and consumer preferences

The Russian vegetables market is continuing to grow rapidly at an average of 16 percent annually, and the fresh tomato market is increasing annually by 12 percent. In 2005, the value of the fruit and vegetable sector in Russia was USD 1.2 billion, from which fresh tomato took 112 mln USD. According to experts, the share of imported tomato in the Russian market is about 70 percent; however, official statistics report only 55 percent. According to the State Statistics Committee of Russia, the Uzbekistan was second largest fresh tomato exporters into Russian market after the Turkey in 2005.

The largest food product groups in the Russian market are as follows: squash and eggplant pastes, followed by marinated cucumbers in second place, and green peas together with sweet corn in third. Next in line are canned pineapples, peaches, field mushrooms, and olives. The peak of demand for Uzbek tomatoes is observed in March - May. Summer sales only amount to 50-60 percent of this sales level. Future trends in the processed fruit and vegetables market will be directed toward broadening product assortments in the expensive and medium-priced segments.

The Russian retail food sector is beginning to see significant change, particularly in the retailing of fresh vegetables, where there is an increasing movement away from kiosks and traditional outdoor wholesale markets to well equipped modern food stores. This is particularly the case in the larger cities of Moscow, St. Petersburg, Nizhniy Novgorod, and Yekaterinburg, where consumers are spending more on better quality food products.

Uzbek fresh tomatoes are not currently sold through retail chains due to bad packaging. Tomatoes are often sold unbranded in the market, and frequently in bulk form for subsequent re-packaging by wholesalers into retail packs. Their reputation earned during the time of the USSR has seen significant erosion, as Uzbek produce's appearance, calibration, and packaging are well below the standards of competing product from other countries such as Spain, Romania and Turkey. In addition, many of the fresh tomato varieties offered in the market, remain essentially unchanged from product produced in the mid to late 1980s, with few early or late varieties being developed. Thus Uzbek fresh tomato produce are often brought to the main Moscow wholesale market where they are purchased by re-sellers that retail the products in bazaar and kiosks.

Labeling requirements for fresh vegetables in Russia

- Name of product, variety and type
- Weight
- Quality Category
- Year of Production

- Number of fruits per row or layer
- Gauge
- GOST Standard (R51810 Fresh tomato specifications)
- Producer Name and Address
- Country of Origin

Main fresh tomato exporters to Russia (2005)

Position	Country exporter	Volume of export (mln USD)	Share of market %
1	Turkey	20.8	18.7
2	Uzbekistan	14.5	12.9
3	China	13.6	12.2
4	Spain	10.0	9.0
5	Morocco	6.9	6.2
6	Holland	6.3	5.6
7	Ukraine	4.7	4.2
8	Romania	3.1	2.8
9	Syria	2.6	2.4
10	Jordan	2.2	1.8

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Additional information regarding the Moscow market

Moscow's vegetables market is perhaps the largest in Russia. According to some estimates, it is 4 times larger than the St. Petersburg market due to a larger number of consumers and higher income levels. For producers and suppliers who plan to enter Moscow's fresh vegetable market, the following issues are particularly important:

- A high number of large, medium-sized, and small trading and production companies in the Moscow area (many of which are involved in wholesale distribution of their own products).
- Established retail chains where many producers and brands are represented, such as Seventh Continent, Ashan, Ramstore, Perekryostok, Paterson, etc. According to an ACNielsen survey conducted in 2005 in Moscow and St. Petersburg, more than 50 percent of consumers in these two cities purchase food exclusively from modern supermarket-style stores or spend the largest share of their family food budgets there. Also, the results of this survey confirmed that Russians are very loyal to brands.
- An efficient distribution system for retail chains active in the regions.
- The presence of representative offices of many tomato processing plants (based in Russia, Ukraine, Belarus, and Uzbekistan) in Moscow.

- Moscow's large consumer population (according to various sources, there are from 8 to 11 million people living in Moscow, including migrants from the regions and illegal immigrants), and the total population of Moscow and the Moscow Oblast is about 15.2 million people. About 6.1 million people live in St. Petersburg and the Leningrad Oblast.
- The official per capita income in Moscow is double the Russian average (annual per capita income in Russia is USD 2,900, compared to USD 4,700 in Moscow and the Moscow Oblast and USD 3,150 in St. Petersburg).

Due to the number large storage facilities and financial resources, Moscow operates as the main distribution center in Russia for all consumer goods. For this reason, most Russian wholesalers and distribution facilities operate in Moscow and Saint Petersburg and are able to service retail markets from a centralized location.

The popularity of supermarket chain stores is growing in urban areas of Russia in response to improved economic conditions. In response to increasing demand, Russian supermarket chains such as Pyaterochka, Ramstor, Sedmoi Kontinent, and Metro Cash & Carry are enlarging their network of stores each year with new stores in new locations to better serve their clientele. Supermarkets and Hypermarkets target consumers with monthly incomes of over Rb12,000, (\$500) and those that own private cars. Such retail formats have a great potential in Moscow and St Petersburg, where the general income levels of consumers are higher than elsewhere in the country. According to estimates made by trade experts (Colliers International Russia, 2004), the saturation threshold for hypermarkets in Moscow will be reached when 60-80 outlets of this type are open with an estimated total sales area of 2 million sq m. At present there are 27 hypermarkets in Moscow in total.

When supermarkets first began serving Russian consumers, shoppers were slow to purchase fresh fruits and vegetables, and other items traditionally purchased on a daily basis at open markets. As a convenient shopping experience gains importance in a busy schedule, that wariness fades in favor of time saving shortcuts. According to an "Adwinter" survey conducted in March 2004 among middle income consumers in Moscow, 42% of them buy food that has a rapid turnover in supermarkets, 32% in open markets and 26% in small food stores.

Comparative Analysis of Uzbek Tomato Attributes in Russian Market

Introduction. Uzbekistan has some natural advantages in the greenhouse production of tomatoes in the simple fact that its latitude is more southern creates a window of opportunity in the early season. Additional advantages consist of excellent soils, available water, low labor costs, climate and a good reputation for flavourful produce within the Russian and CIS markets. However, Uzbek producers need to diversify the varieties and types of tomatoes being sold to meet specific customer and market demands. The major varieties of tomatoes produced in Uzbekistan are traditional varieties, which limit market opportunities when

competing with countries with broad access to new and improved varieties. There is a growing demand for cherry tomatoes, grape tomatoes, green house specialty tomatoes, and on-the-vine varieties that should all be considered for production in Uzbekistan. A general improvement in the overall quality, condition, appearance, uniformity, and packaging of tomato export products is also needed to compete effectively in the Russian market.

Low quality product attributes. Traditional Uzbek markets are being rapidly lost to higher quality producers and this trend will continue unless significant changes are made. There are markets for Uzbek products if they can meet the quality expectations of those markets; however these markets have defined windows of opportunity. The reputation of Uzbek products has taken a beating in recent years and it will require performance on the part of the suppliers to change this attitude.

Uzbek tomato producers are expected to meet the same quality standards as any other supplier from any other nation. In Russia the “high degree of quality” standards varies between Siberian markets and Moscow markets. However, most buyers accept only vegetables of high and first quality. Tomatoes of “second class of quality” are sold mainly in discount stores like “Piatiorotchka” or “Kopeika”, but even in these shops sales are not satisfactory, as consumers with low incomes often can’t afford to buy fruits and vegetables.

Packaging trends. Packaging is also seen as a key problem in the export markets. In general, Uzbek products still appear to have a reputation as flavourful and nutritious, according to recent market studies. Much of this is due to Uzbek tomatoes being shipped in low packing standards. This level of maturity ensures tomatoes with high sugar content and good flavour, but it reduces the shelf life if not transported and stored at the proper temperature. When tomatoes are not handled and packed properly it results in poor appearance, limiting their value in the export markets.

Unfortunately for Uzbek growers, in last years Russian wholesalers refuse to purchase Uzbek tomatoes, claiming Uzbek tomatoes have unsatisfactory traits and spoil too quickly when compared to Turkish tomatoes which can be stored almost 1 week, and the Spanish tomatoes which last 2 weeks in storage. Also, deliveries from Uzbekistan are not as frequent as needed. Improved shelf life is vitally important to wholesalers and distributors because it lessens their risk.

The general request for tomato packaging improvement is to assure protection during transit, cold storage and distribution of product. Also, priority is given to smaller packages that minimize handling and reduce distribution difficulties. Small packages allow for direct delivery or distribution to stores, and product can be directly displayed on store shelves in small packages.

Specific quality standards for tomatoes. Tomatoes are divided into three categories: Extra Class, 1st Class and 2nd Class. The Extra Class Tomatoes contain the highest quality standards and capture the highest price. According to answers obtained in focus groups, tomatoes of First Class are priced 10-30% more than those of Second Class. The difference of tomato prices of Second Class and Extra Class is of 20-60%.

To be classified in the high class of quality, tomatoes have to be bright red, smooth, firm, without stains. They should not start spoiling before 1 week of storage. Tomatoes of the first class have basically the same characteristics; but allow for smaller and softer tomatoes.

Extra Class Appearance: Tomatoes should appear fresh, whole, firm flesh, clean, sound, thick, free from damage caused by pests, not overripe, free of technical damages and sunburns, and free of abnormal external moisture. Minor external defects are allowed, if they don't affect the appearance, quality or marketability.

Content of tomatoes with corky formations (grown receptacle not more than 2cm², not more than 3 healed cracks – max 1.5 cm each) are also not allowed. Also, tomatoes have to be ripe, not green, but red or pink. Operators accept only tomatoes with a smooth surface, not wrinkled. Overripe and soft tomatoes are excluded.

Extra Class Taste and Smell: The taste and smell should be appropriate for each specific variety, and should be free of any unnaturally occurring smells or flavors.

Extra Class Maturity and Color: In one package, all tomatoes must be mature, red and rosy in color, with no green or brown colored tomatoes allowed. Specific color profiles vary by variety. Variation of maturity within one package is not acceptable.

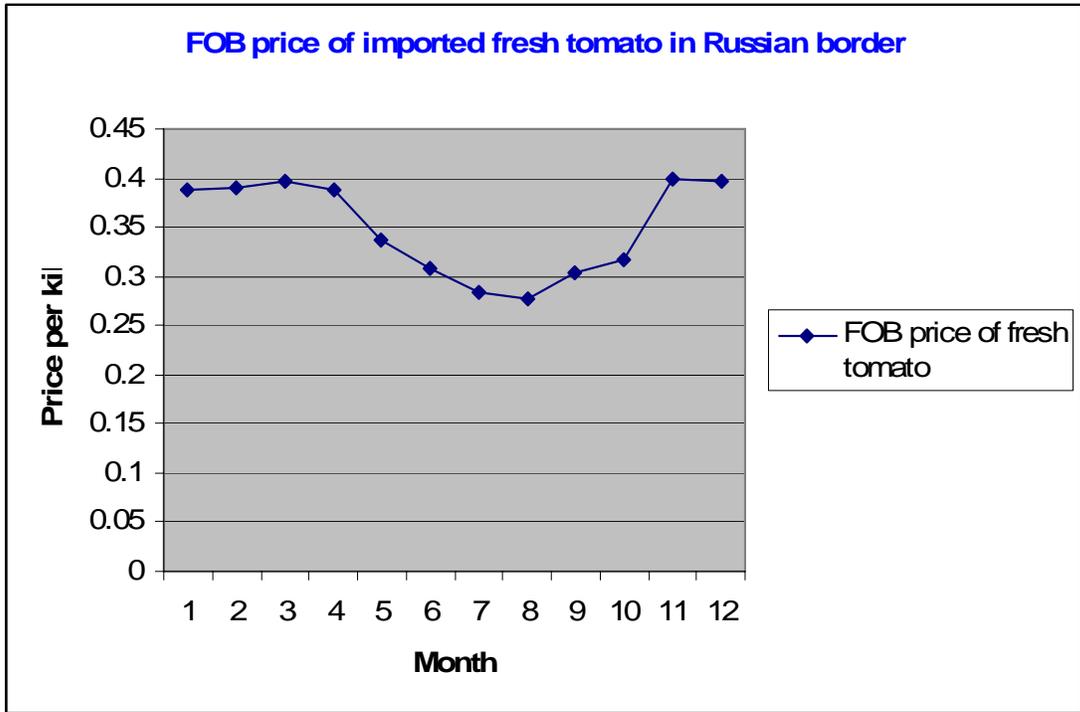
Extra Class Size: (in cm) In one package, the difference of tomatoes depending on size of the most cross diameter shall not exceed 0.5 cm- this means that all tomatoes must measure larger than 4.5 cm in diameter. Careful grading standards are necessary to receive a higher price.

Extra Class Tolerance: Major importers require a ratio of spoiled/defect products not to exceed 3-5%. If an extra class batch exceeds the 5% ceiling of tomatoes that do not meet quality standards, that batch will be downgraded to first class product.

Tomato distribution. Tomatoes are accepted in batches. A batch is considered a number of tomatoes of certain class, variety, and type, packed in the same way, transported in the same truck and registered with the same documentation. Tomatoes are transported by all means corresponding to requirements of perishable cargo. Tomatoes should be transported in refrigerated truck at between 8°C - 10°C for firm-ripe tomatoes and between 13°C - 21°C for mature-green tomatoes. The estimated shelf-life for firm-ripe tomatoes is 4 – 7 days and for mature green is 1 – 3 weeks.

Naturalness was not mentioned as an important criterion, as natural products have short shelf life, are risky, and require a much more efficient distribution chain.

The price of fresh imported tomato fluctuating with inward production and supply from southern region of Russia. Highest price is observed in the beginning and at the end of the year. For Uzbek producers good niche for expanding the tomato export in this market would be increasing supply of the product not only in the beginning of the year (February, March, April), but in November, December and January.



According to a market review by AGRIConsult, it is still possible for companies to enter the Moscow market with a proper distribution system, appropriate positioning, strong branding, and good product quality.

S-7. Vegetables from Belgium and Italy in Kyzminskaia Warehouse in Moscow (Russia)



S-8. Repacking process for retail sales



Meeting with manager of wholesale company



S-9. Kuzminskaja warehouse one of the largest in Moskow region



S- 10. Proper packing is basic requirement in Russian large city markets



Existing infrastructure of production and distribution of greenhouse tomatoes at the farms of the Andijan area of Uzbekistan

Currently the agriculture remains one of the leading branches of economy of Uzbekistan, providing more than 30 % of gross output production, 90 % of the foodstuffs, 55 % of currency receipts in the budget and about 70 % of commodity turnover. (1)

In a countryside of Uzbekistan lives more than 60 % of the population.

The soil potential of the country, suitable for cultivation of agricultural products, makes 22614 million hectares. 10201 million more hectares are considered reserve, from which, according to Ministry of Agriculture and Water Management, 3,3 million are irrigated.

At all soil abundance only 4,1 million hectares of the irrigated soil is used in an agricultural production . Development of other areas is restrained because of deficiency of water, of the financial resources necessary for creation of new farms, introduction of high technologies in cultivation and processing of production.

According to the first deputy Minister of Agriculture and Water Management of Uzbekistan Mr. Abduvahid Djuraev in 1999-2005 1107 shirkats (*cooperative societies*) have been liquidated and instead of them about 60 thousand farms were created.

For the first quarter of 2006 there were plans to transform to the private farms 210 specialized shirkats in fruit-and-vegetable growing and grape growing (2).

By opinion of local farmers about 10000 farms with the average area of a greenhouse about 400 sq.m are engaged in production of greenhouse tomatoes in the Andizhan area. By estimations of AgFin + more than 50000 farms work in the same sphere in Fergana valley. According to the Russian experts (Gavrish S.F.) besides Fergana valley there are two larger agglomerations of greenhouse farms in Uzbekistan : in Tashkent and Samarkand areas.

Harvest of tomatoes takes place from the beginning of April till the end of June.

It is necessary to note that all greenhouse farms are multicultural, growing up greenhouse cucumbers in September-November . Besides the same farms grow up a sweet cherry (June), apricots (May), persimmons (October), peaches (July), quinces (October), grapes (August) for export.

With average productivity in greenhouses of tomatoes of 10 kg on 1 sq.m (1 ton on 100 sq.m) production of tomatoes in the Andizhan area can be estimated in: 10000 farms x 4 tons = 40000 tons for a season.

Overwhelming majority of the greenhouses are arch type on the basis of metal skeleton of local production with a film covering with stability for one year.

Heating of greenhouses is based on gas.

Seeds are delivered through dealers of the several foreign companies: Gavrish (Russian Federation), about 10-15 % of the market, Singenta (Holland), etc. at the price of 20-70 dollars for 1000 seeds.

There are some farms with the areas of greenhouses up to 1,5 hectares, specializing on cultivation of sprouts of tomatoes which represents special business.

Training the agricultural technique of cultivation of tomatoes is transferred as a rule from farmer to farmer. However, for example, the Andizhan Association of Farmers on their own initiative annually in 1-st decade of May holds educational seminars for 700-800 farmers aiming at the choice of sorts and the agricultural technique.

Thus, the situation arose when the majority of small farmers has an opportunity to grow up tomatoes, but has no opportunity to deliver them independently to Russia (the basic export direction) and to sell them there.

Therefore in the area so-called "exporters" appeared - relatively big dealers possessing necessary turnaround means, buying up small batches from the farmers and accumulating batches of the goods necessary for loading lorries (10-20 tons).

The main part of tomatoes is transported by usual lorries. Big exporters (about 30 persons in the Andizhan area), sending 2-3 trucks a week during a season (that is about: 3 months x 4 weeks x 3 trucks x 20 tons = 720 tons each), began to use refrigerators recently (20 tons).

For minimization of customs problems which the Uzbek cars face during transit through Kazakhstan and Russia, basically the trucks registered in other states (Kyrgyzstan, Russia, Kazakhstan, but also from Ukraine, Lithuania, Germany and so forth) are used

Each exporter is assisted by a team of so-called "brokers" (20-30 persons), who reap a crop in greenhouses of farmers, grade, sort and pack tomatoes into wooden one-time boxes of 7-10 kg (boxes are made in Andizhan), deliver them up to a place of loading and load into lorries.

Brokers work at 10 % of a procurement price of tomatoes.

The existing experience of harvesting assumes that harvest of tomatoes is made in the second half of the day and not less than in 6 hours after irrigation. Washing and waxing of tomatoes after harvest is not made.

Packing of boxes in the pallets is not made.

Because of absence of cooling storehouses, storehouses for ripening and special devices for preliminary cooling of tomatoes before transportation at the place of loading pre-cooling of tomatoes is not made. However during hot time drivers of lorries during crossing mountain passes in Kyrgyzstan make a stop, open lorry and use a natural cool for cooling transported tomatoes.

For the same above-stated reason farmers work only with mature red and brown tomatoes. No actions are planned to harvest green mature tomatoes and ripen and store them.

Further the lorries transit through Kyrgyzstan and Kazakhstan to the Russian Federation. Custom clearance of cargo takes place on the border of the Russian Federation.

Term of delivery of tomatoes makes 6-7 days to Moscow, Krasnoyarsk, Novosibirsk, Omsk, Perm, Yekaterinburg, etc.

Sale of tomatoes in the Russian Federation is made basically in the city markets at retail by the representative of the exporter. In some cases the cargo goes in whole to the wholesale buyers, but also for the subsequent retail resale in the markets. Cases of constant wholesale delivery to the large Russian networks of shops in conversations with exporters has not been noted.

Losses during transportation to the cities of the Russian Federation (damage, dehydration) make about 10-15 % in refrigerators and up to 50 % in usual trucks.

The procurement price of tomatoes at farmers makes about 1,0 dollar per 1 kg in the middle of April, and then decreases down to 0,5 dollar in the middle of May. The price of wholesale in the Russian markets is 2-3 dollars per 1 kg. The price of some grades of tomatoes (Simulator) at retail reaches up to 5 dollars for 1 kg.

2. Expediency of precooling of tomatoes before transportation.

Preliminary cooling (precooling) and accumulation and storage in refrigerating storehouses (cooling, cold storage) of vegetables and fruits (including tomatoes till 12-14 C) after harvesting and before transportation in refrigerators is widely used practice in the world.

Immediate and thorough postharvest cooling to remove excessive field heat aids greatly in maintaining quality and substantially lengthens the shelf life of the tomatoes.

Tomatoes destined for distant markets or tomatoes in the pink or light red stage should be cooled immediately after harvest to avoid becoming overripe before reaching the consumer. Placing containers of warm tomatoes in a refrigerated space, known as room cooling, is recommended. To aid room cooling and prevent the buildup of heat of respiration, containers of tomatoes should be loosely stacked with space between the containers to allow for sufficient air circulation.

Tomatoes are very sensitive to chill injury. The recommended storage temperature varies with the maturity of the fruit (for mature green, 58 degrees F; for pink, 50 degrees F). Proper temperature control is critical to quality and shelf life. Mature green tomatoes cannot be held at temperatures that delay ripening any appreciable time. When they are stored for several weeks at 55 degrees F, they often develop decay and fail to ripen properly. The optimum temperature for ripening mature green tomatoes is from 65 to 70 degrees F. At temperatures above 80 degrees F, mature green tomatoes will appear to ripen but may not have the best eating qualities. A temperature of 58 degrees to 60 degrees F is best for slowing the ripening of mature green tomatoes and preventing existing decay.

Mature green tomatoes stored at temperatures below 50 degrees F are susceptible to decay by *Alternaria* that may occur during subsequent ripening. Chill injury is cumulative and is a function of both temperature and exposure time. For example, comparable decay may be expected in mature green tomatoes held at 0 degrees F for six days or 5 degrees F for nine days. Mature green tomatoes may also be exposed to nighttime temperatures below 50 degrees F for a week or more. Some studies indicate that storage of tomatoes in humidities above 90 percent can increase the incidence of decay.

Light red tomatoes can be stored for two weeks or longer at 50 degrees F. Longer storage may result in reduced retail shelf life. Ripe tomatoes may be stored at lower temperatures than mature green tomatoes. Several days at 40 degrees F may be acceptable, but longer storage at this temperature will result in loss of color, firmness, shelf life, and especially taste. Under extreme circumstances, firm yet well-ripened tomatoes may be stored for as long as three weeks at 33 degrees to 35 degrees F. Such tomatoes will have almost no shelf life and very poor flavor and color.

Pink to firm-red greenhouse grown tomatoes may be stored at temperatures of 50 degrees to 55 degrees F. Less mature tomatoes should be ripened at 70 degrees F before being stored at 50 degrees to 55 degrees F. (3)

Temperature

Temperature is the single most important factor in maintaining quality after harvest. Refrigerated storage retards the following elements of deterioration in perishable crops:

aging due to ripening, softening, and textural and color changes;

undesirable metabolic changes and respiratory heat production;
moisture loss and the wilting that results;
spoilage due to invasion by bacteria, fungi, and yeasts;
undesirable growth, such as sprouting of potatoes (5) <<http://www.attra.org/attra-pub/postharvest.html>>.

One of the most important functions of refrigeration is to control the crop's respiration rate. Respiration generates heat as sugars, fats, and proteins in the cells of the crop are oxidized. The loss of these stored food reserves through respiration means decreased food value, loss of flavor, loss of salable weight, and more rapid deterioration. The respiration rate of a product strongly determines its transit and postharvest life. The higher the storage temperature, the higher the respiration rate will be (4) <<http://www.attra.org/attra-pub/postharvest.html>>.

For refrigeration to be effective in postponing deterioration, it is important that the temperature in cold storage rooms be kept as constant as possible. Appendix I charts the optimum temperature ranges for various crops. Exposure to alternating cold and warm temperatures may result in moisture accumulation on the surface of produce (sweating), which may hasten decay. Storage rooms should be well insulated and adequately refrigerated, and should allow for air circulation to prevent temperature variation. Be sure that thermometers, thermostats, and manual temperature controls are of high quality, and check them periodically for accuracy (5) <<http://www.attra.org/attra-pub/postharvest.html>>.

On-farm cooling facilities are a valuable asset for any produce operation. A grower who can cool and store produce has greater market flexibility because the need to market immediately after harvest is eliminated. The challenge, especially for small-scale producers, is the set-up cost. Innovative farmers and researchers have created a number of designs for low-cost structures.

Pre-cooling is the first step in good temperature management. The *field heat* of a freshly harvested crop-heat the product holds from the sun and ambient temperature-is usually high, and should be removed as quickly as possible before shipping, processing, or storage. Refrigerated trucks are not designed to cool fresh commodities but only maintain the temperature of pre-cooled produce. Likewise, most refrigerated storage rooms have neither the refrigeration capacity nor the air movement needed for rapid cooling. Therefore, pre-cooling is generally a separate operation requiring special equipment and/or rooms (4, 5) <<http://www.attra.org/attra-pub/postharvest.html>>.

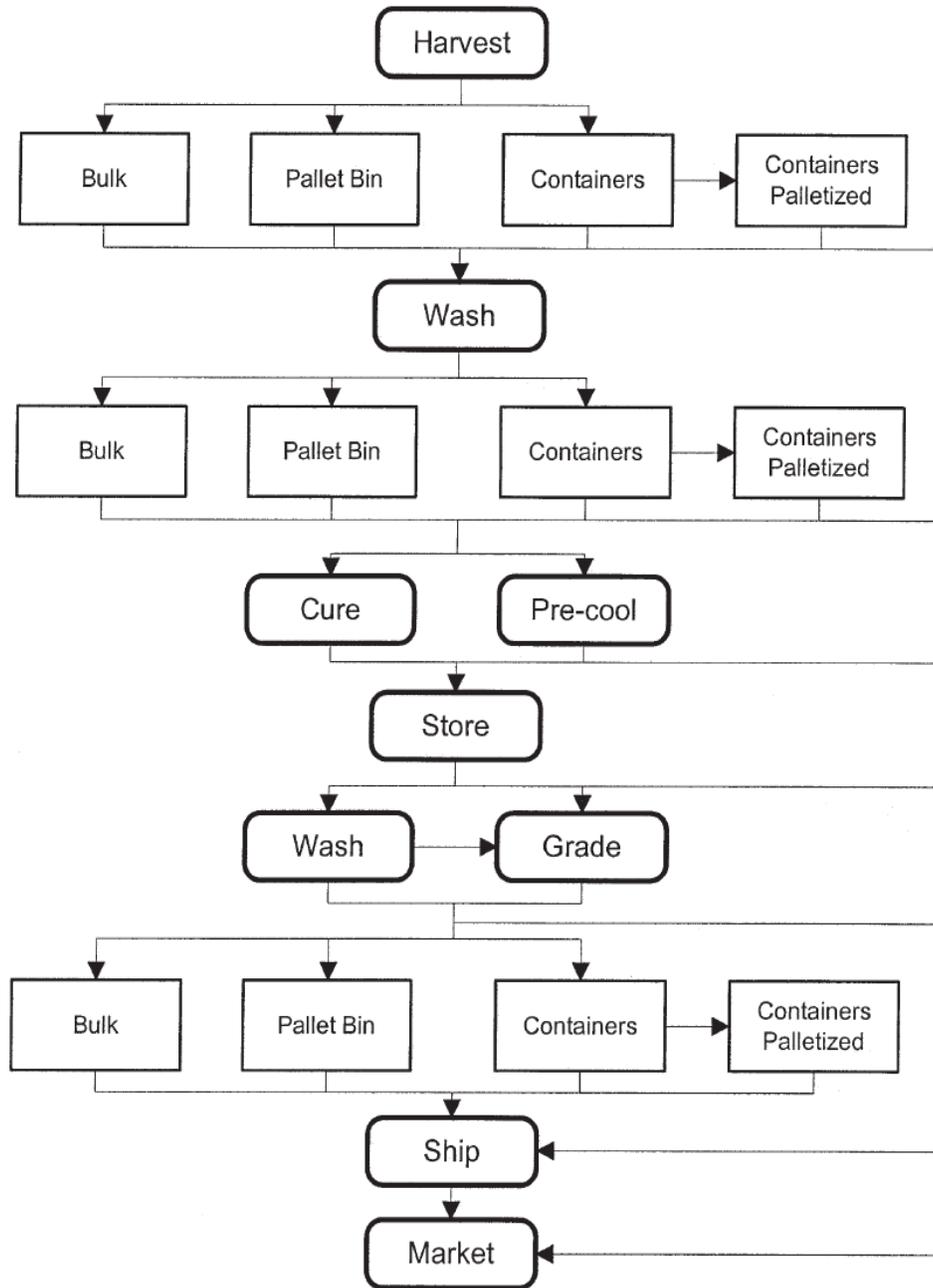
Room cooling: Produce is placed in an insulated room equipped with refrigeration units. This method can be used with most commodities, but is slow compared with other options. A room used only to store previously cooled produce requires a relatively small refrigeration unit. However, if it is used to cool produce, a larger unit is needed. Containers should be stacked so that cold air can move around them, and constructed so that it can move through them. Used refrigerated truck bodies make excellent small cooling rooms (4) <<http://www.attra.org/attra-pub/postharvest.html>>.

Forced-air cooling: Fans are used in conjunction with a cooling room to pull cool air through packages of produce. Although the cooling rate depends on the air temperature and the rate of air flow, this method is usually 75-90 % faster than room cooling. Fans should be

equipped with a thermostat that automatically shuts them off as soon as the desired product temperature is reached.

Thus, as shown in fig. 2.1, chain of harvest and processings of tomatoes by Uzbek farmers is essentially reduced in comparison with global practice. Gradually farmers come to understanding of necessity of introduction of new technologies of preliminary cooling.

Fig. 2.1 Comparative circuits of preshipping processing of tomatoes in the world practice



3. Financial estimation of use of alternative variants of system of preshipping preparation of tomatoes.

Exact estimation of financial flows and, in particular, of expences of three basic players in the sphere of production and sales of tomatoes: the farmer, the broker and the exporter is rather difficult for the following reasons:

- All processes of construction of greenhouses, cultivation, harvest, sale and purchase and transportation of tomatoes goes in "shadow", outside of the control of the Uzbek fiscal authorities;
- During current practised agricultural technique of cultivation farmers minimize their expenses by primary use of their family labour, by rare application of modern complex fertilizers and herbicides, by not registered use of gas for heating of greenhouses.
- There is no official statistics on development of farms.

Nevertheless, by a rule of thumb we shall make a rough estimate, giving picture of mutual financial relations of the specified players.

The farmer:

The farmer has expences on:

- Construction of a greenhouse;
- Annual repair and replacement of a film covering;
- Purchase of seeds or sprouts;
- Fertilizers;
- Heating based on natural gas;
- Cultivation;
- Service of irrigation system.

With an average area of a greenhouse of 400 sq.m the farmer produces during the season about 4 tons of tomatoes, for which at the average price of 0,75 dollars per 1 kg can gain up to 3000 dollars. Assuming profitability of 40 %, it is possible to estimate net profit of a farm in 1200 dollars, that is 300 dollars per 1 ton of tomatoes and per 100 sq.m of greenhouses. 5 farms as a group will have profit of 6000 dollars per 20 tons of production (1 lorry).

The broker:

The team of the broker collects tomatoes in a greenhouse of the farmer, sorts them, packs in wooden expendable boxes, delivers to a place of loading and loads into the lorry. It works from 10 % of cost of purchase, so it receives up to 75 dollars per one ton of tomatoes or 1500 dollars per 1 lorry.

Expenses:

- The salary of collectors;
- Working costs of personal cars.

The exporter:

Expenses:

- Rent of the refrigerator (20 tons) - 10-12 thousand dollars (including expenses on fuel and the salary of drivers);

- Purchase of tomatoes from brokers - 16,5 thousand dollars

- Custom clearance - 4 thousand dollars

Total: 30,5 - 32,5 thousand dollars

Incomes:

- Sale of tomatoes by the gross - 40 thousand dollars

- Sale of tomatoes at retail - 60 thousand dollars

Net profit: 9.5-27,5 thousand dollars or 475-1350 dollars per 1 ton of tomatoes. The given estimation is rather optimistic as it does not take into account risks of accidents of trucks, losses during transportation and change of a demand in the retail markets.

And nevertheless, at all approximations of calculation at the existing scheme of deliveries only exporters or large farmers or marketing cooperatives of farms, aspiring to become exporters themselves, possess investment opportunities for introduction of additional post harvest operations. Individual small farmers will not have financial resources for introduction of innovations.

These innovations include introduction of precooling and of packing into standard carton boxes with palletizing (which is the standard requirement of large trading networks). Reimbursement of expenses for innovations could be made from the reduction of losses during transportation (in the first case) and from compensatory increase of a wholesale price (in the second case).

In process of accumulation of the information and transition of farms to more transparent business the ratio of financial flows can be specified as in the table 3.1., however it will hardly essentially change the above-stated conclusions.

Tab. 3.1. The scheme of calculation of expences and incomes of a farm in the USA.

Fresh Market Tomato Budget

Summary of estimated costs and returns per acre.

Item	Quantity or number of operations	Unit	Price	Total	Your Estimate
Variable costs					
Custom					
Applying calcium lime	0.5	ton	\$20.00	\$10.00	_____
Pest scouting	8	acre	\$10.00	\$80.00	_____
Pesticide spraying	4	acre	\$7.20	\$28.80	_____
Fertilizer (postapplication)					
Nitrogen	40	pound	\$0.22	\$8.80	_____
Phosphorus	40	pound	\$0.28	\$11.20	_____
Potassium	80	pound	\$0.15	\$12.00	_____
Herbicide					
Devimol	3	pound	\$9.30	\$27.80	_____
Poast	0.5	gallon	\$75.00	\$37.50	_____
Sencor/Lexone	0.66	pound	\$18.50	\$12.21	_____
Fungicide					
Bravo weather stik	6	gallon	\$53.50	\$321.00	_____
Kocide	8	pound	\$3.15	\$25.20	_____
Manzate 200DF	48	pound	\$2.75	\$132.00	_____
Quadris 2F	6	oz	\$2.15	\$12.89	_____
Insecticide					
Asana XL	0.08	gallon	\$111.00	\$8.88	_____
Vydate L	0.5	gallon	\$59.00	\$29.50	_____
Baythroid	0.17	pound	\$465.00	\$79.10	_____
Admire	0.18	pound	\$561.00	\$100.98	_____
Other variable costs					
Disk plowing	1	acre	\$9.40	\$9.40	_____
Cultivation	3	acre	\$8.30	\$24.90	_____
Preapplied fertilizer (10-10-10)	0.225	tons	\$180.00	\$40.50	_____
Black, embossed, or red mulch	1	acre	\$300.00	\$300.00	_____
Drip irrigation (tape and labor)	1	acre	\$150.00	\$150.00	_____
Tomato transplants	6	thsd	\$90.00	\$540.00	_____
Labor	48	hour	\$10.00	\$480.00	_____
Marketing and advertising	1	acre	\$50.00	\$50.00	_____
Hand harvesting	1	acre	\$800.00	\$800.00	_____
Packing and grading	1	acre	\$180.00	\$180.00	_____
Cartons	1,000	cartons	\$0.90	\$900.00	_____
Fuel	10	gallon	\$0.93	\$9.30	_____
Pesticide spraying	1	acre	\$150.00	\$150.00	_____
Repair and maintenance					
Tractors and implements	1	acre	\$15.00	\$15.00	_____
Interest charge	1	acre	9.5%	\$108.94	_____
<i>Total variable cost</i>				\$4,695.80	_____
Fixed costs					
Tractors	1	acre	\$15.86	\$15.86	_____
Implements	1	acre	\$12.32	\$12.32	_____
Drip irrigation	1	acre	\$500.00	\$500.00	_____
<i>Total fixed cost</i>				\$528.18	_____
Total cost				\$5,223.98	_____

Cooling and storage value chain of tomato

4. The review of the markets of the equipment and modules for preshipping preparation of vegetable production. An estimation of an opportunity of use of the new equipment within existing infrastructure. Preparation of offers on use of comprehensible modules and the equipment for cooling and storage of tomatoes.

The analysis of plans of farmers of Andizhan on development of export supply of tomatoes, study of experience of exporters and requirements of wholesale networks in Russian Federation allows to offer the following recommendations on introduction of operations of precooling, accumulation, packing and palletising into production process.

They can be introduced in the following steps:

1. Arrangement of refrigerating accumulating storehouse for gradual cooling (room cooling) of a crop and for accumulation of sufficient quantity of tomatoes for loading one lorry (20 - 30 tons). During other seasons the storehouse can be used for the same purpose for other vegetables and fruits.
2. Expansion of opportunities of refrigerating accumulating storehouse with stationary or mobile separate modular or built-in devices of forced-air cooling (pre-cooling) to increase shelf life of tomatoes, or to fulfill fast cooling at urgent loading.
3. Introduction of standardized carton containers (boxes). Packing of tomatoes in the boxes will be made at a stage of harvesting and sorting of tomatoes.

Introduction of palletising which can be made both after harvesting of tomatoes before compulsory or gradual cooling, and already in refrigerating storehouse.

Presence in the Andizhan area of the developed infrastructure of automobile roads and networks of power supplies allows to use any kinds of vegetable storage constructions and the equipment applied in the world.

Construction of standard stationary modular vegetable storehouses with gradual cooling and with forced-air cooling can be executed by a number of the Russian companies which have been presented at an exhibition «Agroprod mash-2006» on October 9-13th in Moscow, and by Chinese (ALLFRESH MANUFACTURING (KUNSHAN) CO., LTD. Unit C-D, 31/F, T1, Jia Hui Plaza 2601 Xie Tu Road, Shanghai CHINA, ph. 86 21 64261740 info@allfreshtech.com) and Uzbek manufacturers (AC&R company, e-mail: office@holod.uz, ph. (998 71) 132-21-61).

Stationary refrigerating storehouses from the very beginning or subsequently when necessary can be equipped by systems of forced-air cooling along the schemes presented on fig. 4.2.

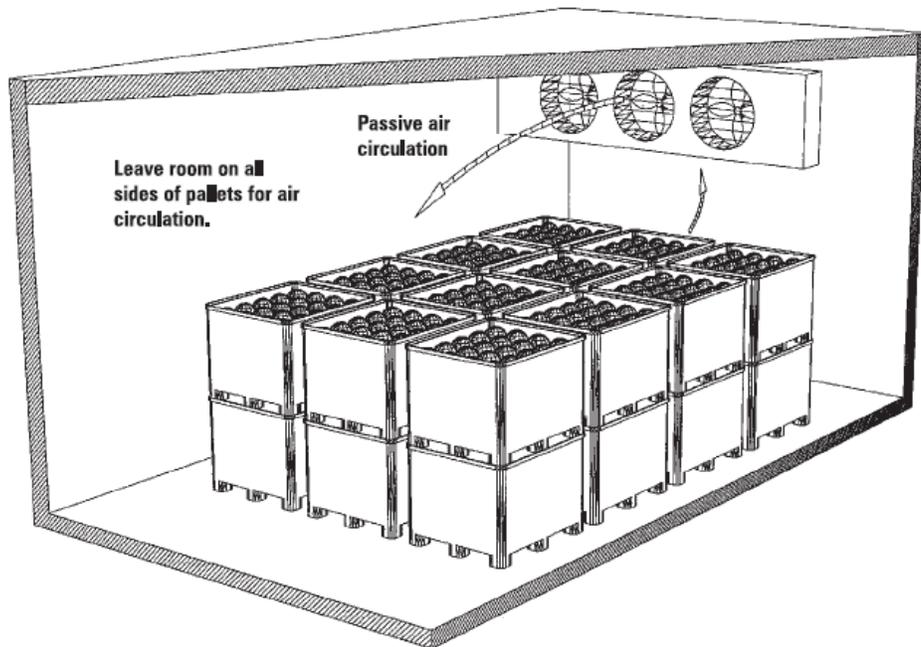
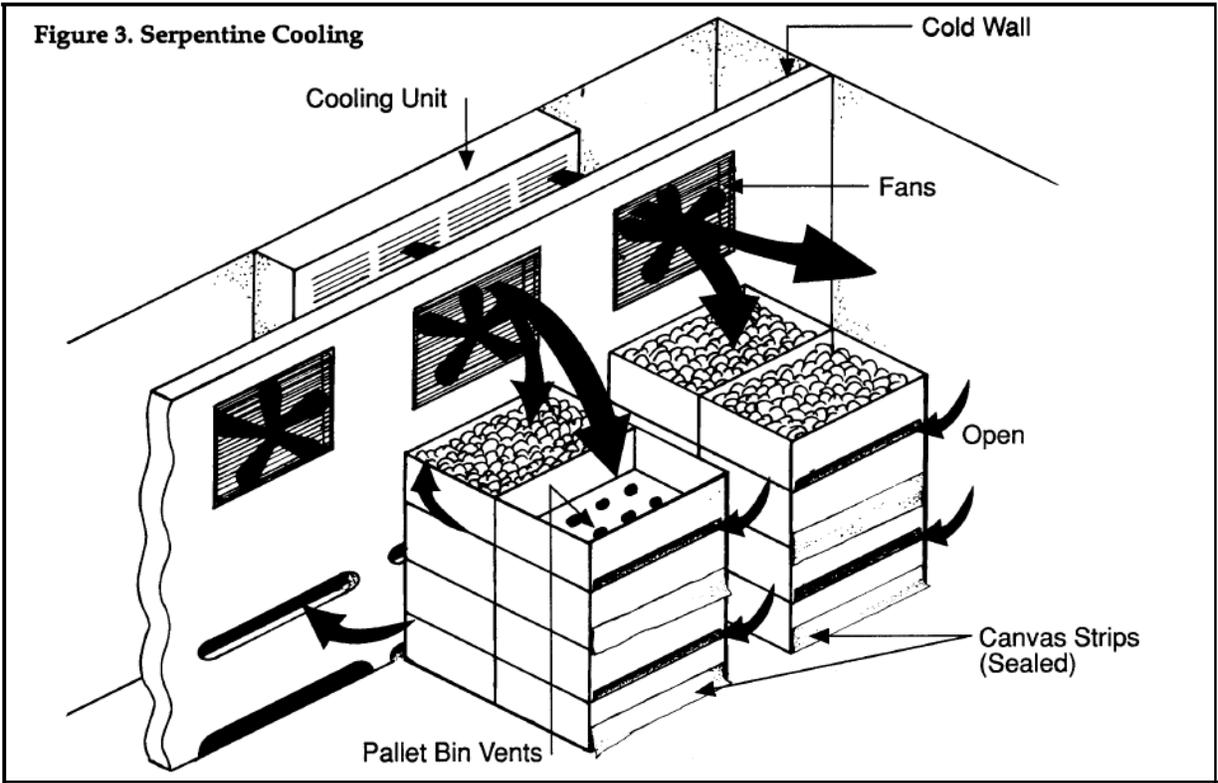


Fig. 4.2. Schemes of stationary storehouses with forced- air cooling

In the world there are a lot of offers on mobile systems of precooling immediately after harvesting of vegetables and of subsequent transportation to a place of sorting, storage and

loading. They represent small vehicles (1,5 - 4 tons) or trailers with installation of the forced-air cooling, arriving on a place of harvesting and delivering vegetables either for loading in the refrigerator, or for storage in refrigerating storehouse,

On fig. 4.3. and 4.4 schemes of such mobile coolers are given.

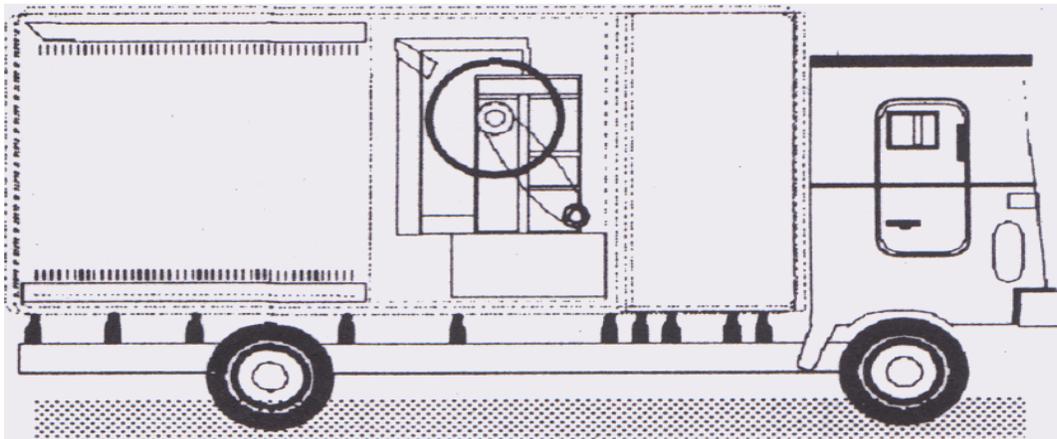


Fig. 4.3. Mobile Precooler of Rinac company (India)





Fig.4.4. Homemade mobile trailer for precooling (USA).

Company SmartAir (Fig.4.5.) offers for large-scale enterprises the up-to-date expensive refrigerator block with special system of support of humidity for harvest, cooling and transportation of tomatoes.

There are local decisions in the given area at the vegetable farms of Turkey, Thailand, Jordan etc.

It is necessary to notice, however, that such small mobile units are used in the situations when fruit and vegetables farms are located on sufficiently far distances from points of sorting and loading (100-150 km), not allowing duly delivery of a perishable crop. In conditions of the Andizhan area the distance to a place of loading in the lorry and time of delivery of tomatoes is not critical because of small distances, therefore application of such means is to be considered excessive even if to take into account consider their small cost.

5 **A distribution optimization tool.** With the ability to ship further without sacrificing quality, the SmartAir System enables distribution center consolidation — extending distribution range for substantial physical plant and labor savings. Every product you ship, whether cuts of meat or ripened fruit, will arrive fresher and last longer due to the SmartAir System.

Fig. 4.5. The refrigerator block of increased capacity with opportunities of precooling and short-term storage.

Of greater interest, especially for exporters, are the mobile cooling devices working outside of stationary structures, I delivered to a place of loading to the lorry, and providing cooling of tomatoes directly before the loading, or right after the loading in the refrigerator.

On fig. 4.6.и 4.7 examples of such devices are given.

Figure 2. Forced-air Tunnel

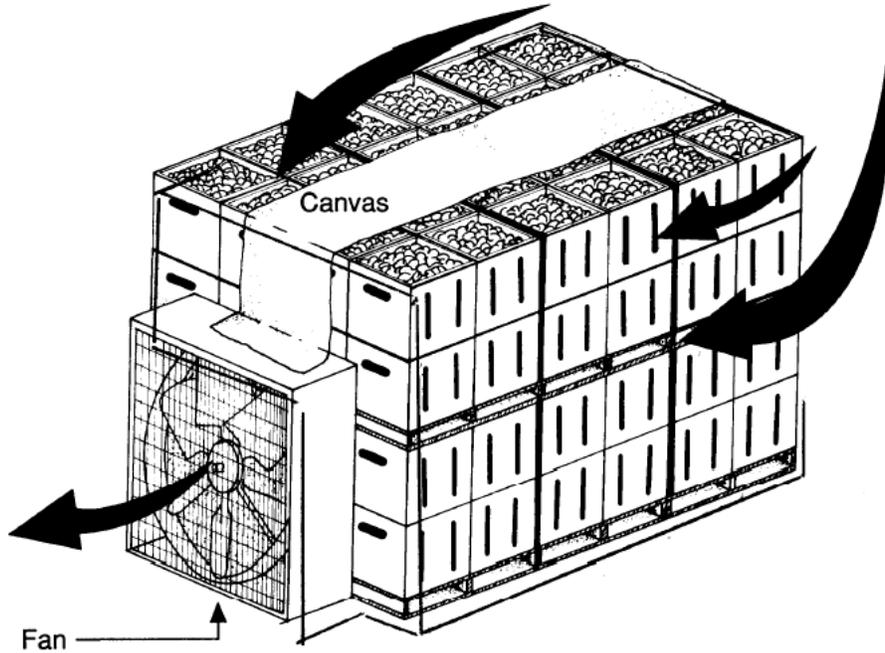
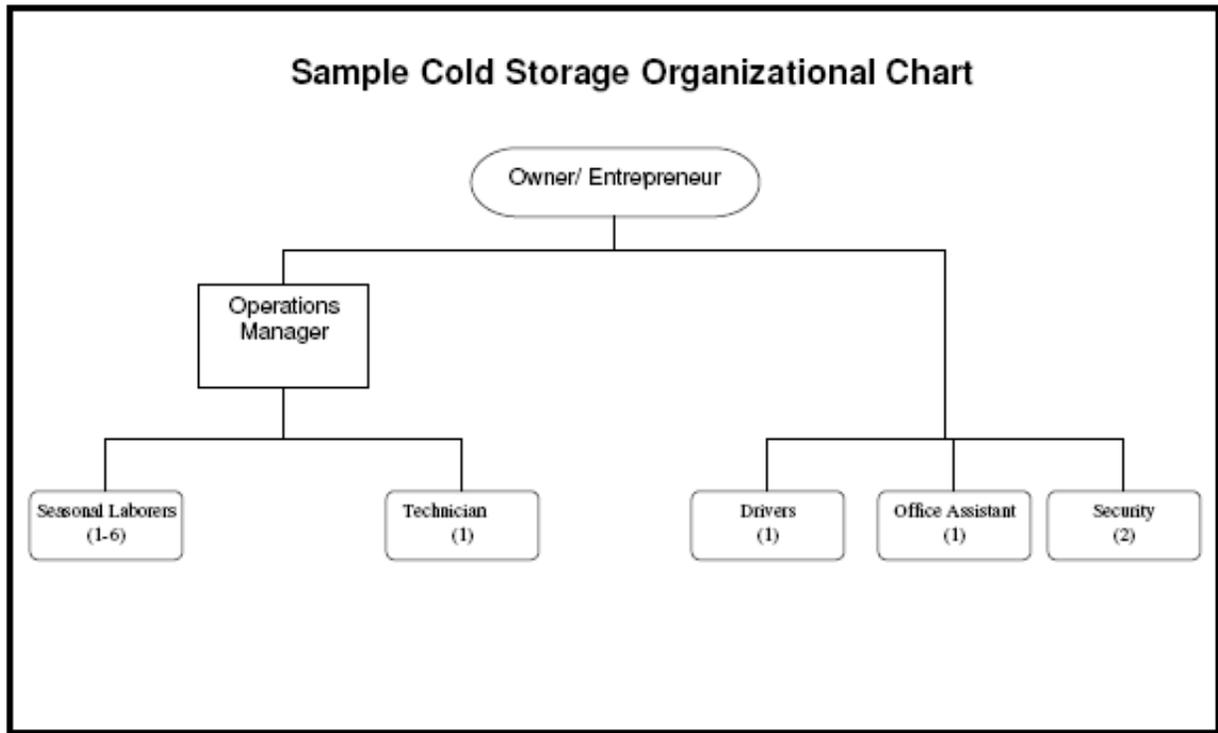


Fig. 4.6. Mobile device for cooling pallets of tomatoes outside of premises.



Fig. 4.7. Mobile device for simultaneous forced-air cooling of two loaded lorries.



5. The investment analysis of an opportunity of use of the cooling equipment

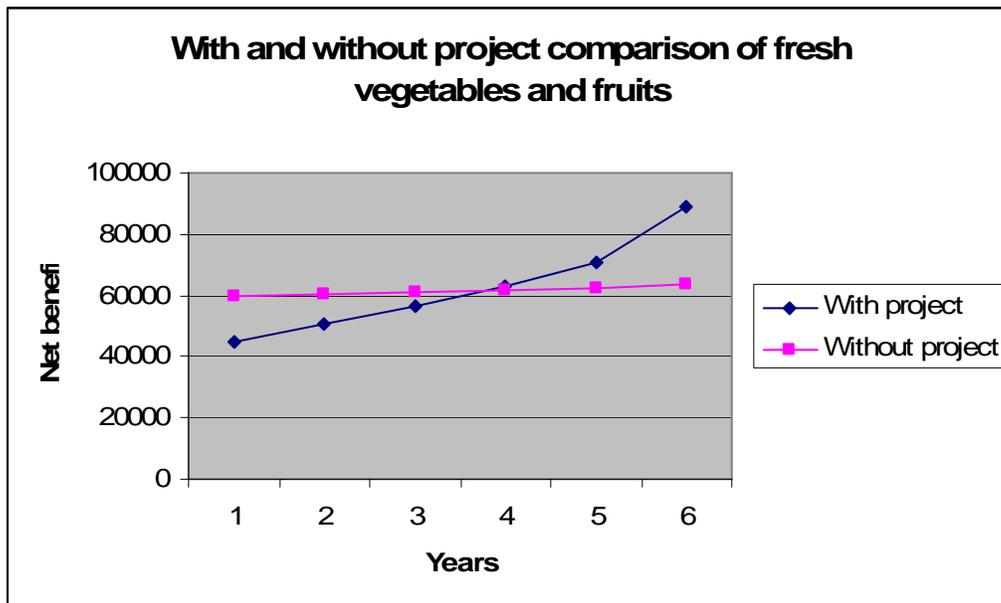
Benefit-Cost analysis of investment on cool house for tomato value chain

Year	Capital item	Incremental cost		Gross	Discount factor	Present worth	Value of incremental production	Discount factor	Present worth
		Operation and maintenance	Production						
					12%	12%		12%	12%
1	50000	2000	10000	62000	0.893	55366	20000	0.893	17860
2		2000	10000	12000	0.797	9564	22000	0.797	17534
3		2000	10000	12000	0.712	8544	24200	0.712	17230
4		2000	10000	12000	0.636	7632	26620	0.636	16930
5		2000	10000	12000	0.576	6912	29282	0.576	16866
6		2000	10000	12000	0.507	6084	32210	0.507	16331
Total	50000	12000	60000	122000	4.12	94102	154312	4.12	102752
			Benefit-Cost ratio at 12%		=	102752/94102	=	1.09	

Benefit-Cost analysis of investment on cool house for fresh fruits and vegetable value chain

Year	Capital item	Incremental cost		Gross	Discount factor	Present worth	Value of		Present worth
		Operation and maintenance	Production				incremental production	Discount factor	
					12%	12%		12%	12%
1	50000	2000	20000	72000	0.893	64296	45000	0.893	40185
2		2000	20000	22000	0.797	17534	49500	0.797	39452
3		2000	20000	22000	0.712	15664	54450	0.712	38768
4		2000	20000	22000	0.636	13992	59895	0.636	38093
5		2000	20000	22000	0.576	12672	65885	0.576	37949
6		2000	20000	22000	0.507	11154	72473	0.507	36744
Total	50000	12000	120000	182000	4.12	135312	347202	4.12	231191
		Benefit-Cost ratio at 12%			=	102752/94102		=	1.71

In table of benefit – cost analysis on cool house investment for tomato value chain the b/c ratio is equal to 1.09 which is not significant figure but taking into account that cool house will be used for other fresh vegetables and fruits in it can give significant positive incremental net benefit later on.



Also the graphs show that the positive incremental net benefit will overcome the negative incremental net benefit in 3 years after the project investment.

Proper postharvest cooling can:

- Reduce respiratory activity and degradation by enzymes;
- Reduce internal water loss and wilting;
- Slow or inhibit the growth of decay-producing microorganisms;
- Reduce the production of the natural ripening agent, ethylene.

In addition to helping maintain quality, postharvest cooling also provides marketing flexibility by allowing the grower to sell produce at the most appropriate time. Having cooling and storage facilities makes it unnecessary to market the produce immediately after harvest. This can be an advantage to growers who supply restaurants and grocery stores or to small growers who want to assemble truckload lots for shipment. Postharvest cooling is essential to delivering produce of the highest possible quality to the consumer.

Green tomatoes, if received in good condition, can be stored for 10 to 15 days at 40 degrees Fahrenheit without any apparent deterioration. During this period, ripening will be delayed but will be completed when again the tomatoes are exposed to warm temperatures. However, if storage at 40 F or below is carried on for protracted periods beyond the 10 to 15 days interval and they are then exposed to elevated temperatures; rapid breakdown of the tomatoes will take place before the ripening.

Fruits or vegetables that are allowed to continue ripening for more than 24 to 48 hours after harvesting will not keep as long in storage as they would if they were refrigerated immediately after harvesting. Cooling fruits and vegetables immediately after harvesting can extend the shelf-life up to one month. .

Discussions with Greenhouse Owners

After meeting extensively with the head of the farm - Mr. Rasuljon Ibragimov – and the - Mr. Hairullo Ibragimov, Chairman of Vegetable Producers Association in Fergana Valley – a fresh Tomato and other vegetables Cool House was designed that would cool 20 tons of ripe tomatoes from 83 F to 40 F in eight hours and store 40 tons of tomatoes above 40 F in a square foot facility as an pilot project.

For the successful operation of the fast cooling of fruits and vegetables to control the ripening, the following conditions should be met:

1. Harvesting of the produce by hand
2. Produce should be place in shipper boxes at the harvesting time
3. For Tomatoes a separator should be placed in the bottom of the box, to separate the produce
4. Sizing, only one size per box

5. Only one layer per box
6. Boxes should be the type as the sample that were selected
7. Boxes should be palletized in a standard pallet to the weight of 2200 lbs each
8. Palletized boxes should be transferred as soon as possible to the fast cooling facility
9. 12 pallets will be cooled in an 8 hour period
10. After cooling is completed cooled produce can either be loaded in the refrigerated truck or stored in the cold storage area for later shipping.

Specifications of the equipment and modules for cooling and storage of early vegetables

Dual Fan Pressure Cooler

(1) Dual Fan Pressure Cooler with (2) 25 HP VFD Fan Motors. These Fans and Motors will develop 2.5" WC External Static. This unit will produce 75 TR at +40 Degree F having a 15 Degree Delta T. This unit will be approximately 26'- 0" long x 6'- 0" wide and 11' - 0" High and will have removable hood section, Tarps and Bumpers. This unit will have a 36" Diameter Surge Drum, Control Valve Station, Insulation, Control Panel and VFD Motor Starters mounted and wired.

Refrigeration Skid Package

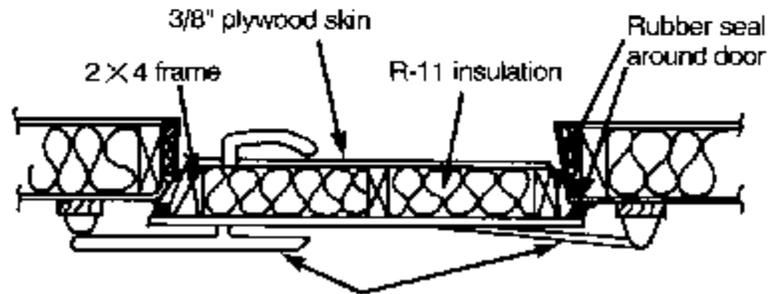
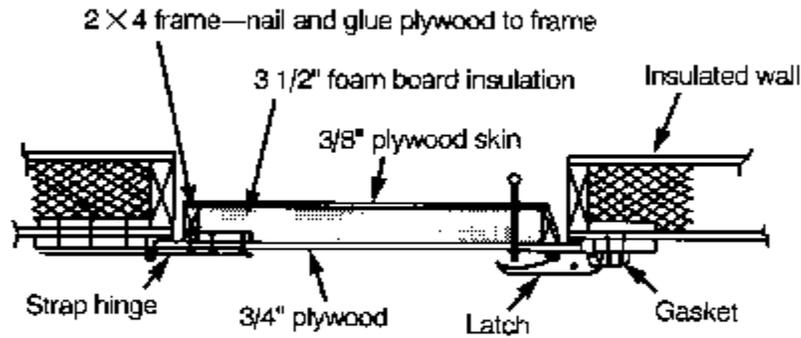
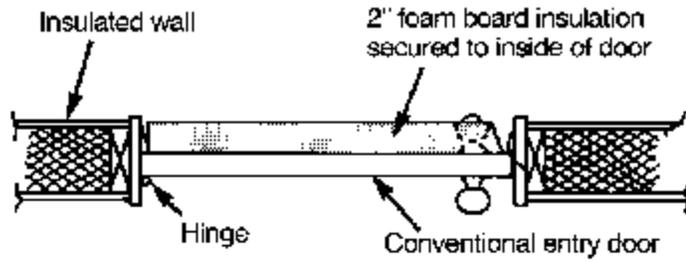
(1) Refrigeration Skid FES Model 75GS Screw Compressor. Package with a 100 HP Motor. (1) BAC Model CXV-95KMEvaporative Condenser. (1) RAM MCC Center having a main breaker, all required Motor Starters, Feeder Breakers, and Lighting and Electrical Distribution Panels. All of the above will be mounted on an I Beam Steel Skid. All components will be piped, wired, tested, insulated and painted aluminum diamond. Flat floor will be provided by user.

Cooler Building above 35 F

(1) - 100'-0" x 120'- 0" x 19'- 0" High Metal Steel Building supplied With Insulated Panels (Expanded Polystyrene Core) and Stucco. Embossed White Acrylic Baked Paint Finish including the Trim. The building will be a fabricated Red Iron Steel Structure with 6" thick wall panels. This building will have (2) Dock Doors, (1) Roll Up Door, (2) Man Doors and (24) 400 Watt Lighting Fixtures.

Not included: Any Civil Work, Wiring, and Floor.

Delivery: 16 weeks after receipt of approval



(NOT TO SCALE)

Check with local supplier for available handle and hinge.

Provide inside latch release to assure safe operation.

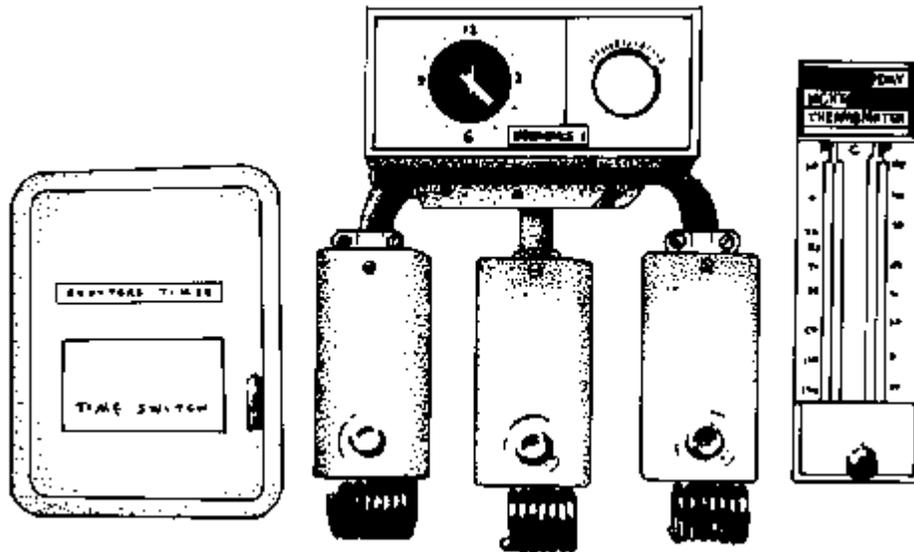
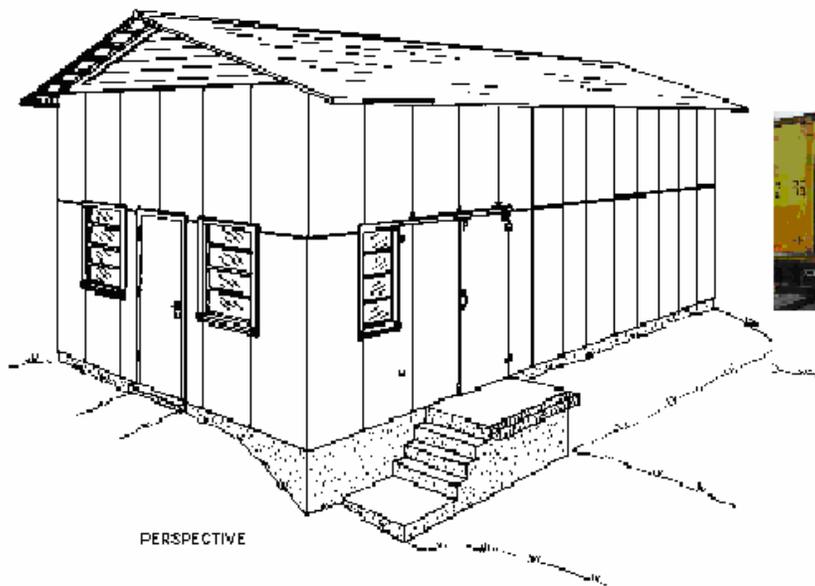


Figure 5.1 Temperature controllers.

The produce temperature and the humidity must be monitored frequently during cooling and storage to prevent undercooling and chill injury. Also, maintaining the proper temperature and humidity becomes more important with increasing time in storage.

Plan : Refrigerated Storage Building



ANNEXES

Types of Produce.

Different types of produce have different cooling requirements. For example, strawberries, apples, and broccoli all require near-freezing temperatures, whereas summer squash or tomatoes can be injured by low temperatures (Table 1). If small quantities of produce with different cooling requirements must be cooled or stored together, the temperature will have to be set high enough to prevent chill injury of susceptible produce. This temperature, however, will not provide optimum quality and storage life for other types of produce.

Table 1. Products That Sustain Cold Injury

Chill sensitive (below 40-45 F)	Freeze Sensitive (below 32 F)
Beans (all types)	Apples
Eggplant	Asparagus
Okra	Brambles
Peppers	Cabbage
Potatoes	Peaches
Pumpkins	Sweet corn
Squash (summer)	Strawberries
Sweetpotatoes	Squash (winter)
Tomatoes	
Watermelons	

Some fruits and vegetables produce ethylene gas as a natural product of ripening and respond to this gas by accelerating their ripening. Others do not produce ethylene but are very sensitive to it (Table 2). For sensitive produce, minute quantities of ethylene gas will greatly accelerate the ripening process even at low storage temperatures. It is *very important* not to store items sensitive to ethylene with those that produce this gas.

Table 2. Products That Produce Ethylene or Are Ethylene Sensitive.

Ethylene Producers	Ethylene Sensitive
Apples	Broccoli
Cantaloupes	Cabbage
Honeydew melons	Carrots
Peaches	Cucumbers
Pears	Cut flowers
Plums	Eggplant
Tomatoes	Green beans
	Leaf greens
	Okra
	Peas
	Peppers
	Squash
	Sweetpotatoes
	Watermelons

Table 3. Specific Heat and Heat of Respiration for Horticultural Crops Grown

Commodity	Specific Heat (Btu/lb/F)	Respiration -----	
		Cool (Btu/lb/hour)	Warm (Btu/lb/hour)
Apples, summer	0.87	0.018	0.340
Apples, fall	0.87	0.012	0.240
Blueberries	0.86	0.028	0.748
Cabbage	0.94	0.023	0.257
Cucumbers	0.97	0.119	0.170
Grapes	0.86	0.014	0.179
Green onions	0.91	0.096	0.704
Leafy greens	0.90	0.100	1.034
Peaches	0.91	0.023	0.466
Peas, garden	0.79	0.177	1.651
Peas, field	0.73	0.160	1.554
Peppers	0.94	0.046	0.252
Strawberries	0.92	0.069	0.872
Tomatoes,			
mature green	0.94	0.030	0.197
Tomatoes, ripening	0.95	0.067	0.188
Turnips	0.93	0.034	0.130
Watermelons	0.94	0.034	0.110

The main transport corridor for tomato exporters from Uzbekistan

Commonwealth of Independent States - Central Asian States

