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FRUIT PACKING AND QUALITY CONTROL

KOSOVO CLUSTER AND BUSINESS SUPORT PROJECT



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FRUIT PACKING AND QUALITY CONTROL

REPORT ADDRESSES POSTHARVEST HANDLING METHODS AND IMPROVED STORAGE CONDITIONS IN ORDER TO PROVIDE THE ADDITIONAL STORAGE LIFE NECESSARY TO LENGTHEN THE MARKETING SEASON FOR APPLES.

Kosovo Cluster and Business Support project "Fruit Packing and Quality Control"
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PURPOSE OF ASSIGNMENT

This assignment is designed to assist three targeted Fruit Associations to initiate post harvest handling methods and improved storage conditions in order to provide the additional storage life necessary to lengthen the marketing season for apples.

The rationale behind this activity is to provide the training necessary to improve fruit quality and shelf life, and to do so in such a way that meets market demands and increases the monetary returns to producers.

The consultant will have to help design a basic apple packing line including a dump table, washing brushes, water eliminator, and fan dryer or dry cleaning brushes, grading conveyor, sizer and pack table. Additionally he will train Association members in apple packing and storage procedures.

BACKGROUND

Before the conflict, the farm structure in Kosovo, as in other parts of the former Yugoslavia, was characterized by two very distinct farming systems. State-owned enterprises (SOEs) operated large-scale agricultural holdings along side small privately owned farms. Historically, there were a large number of small private farmers. It is estimated that over 100,000 rural farm households are now engaged in farming activities. The average farm size is thought to be less than 3.5 ha.

On land where farmers produce mainly fruit for market, they also maintain other activities like vegetable, cereal crop and animal production to spread the workload over the year and to ensure the subsistence needs of the family. This system provides a relatively stable farm income under adverse conditions. The fruit crops being grown here in Kosovo are traditional for a location with climatic conditions similar to Kosovo's. Apples are the major fruit crop accounting for hundreds of hectares of orchards run by both the state cooperatives and private farms. Other fruit crops are peaches, pears, apricots, sour cherries, plums and berries.

Most fruits produced are sold directly to consumers with little, if any, thought given to post harvest handling, packing and storage. Because of this, much of the annual apple production is sold as soon after harvest as possible, resulting in an oversupply on the market and low grower returns. With respect to post harvest handling, better quality control, packing and storage, minimal inputs would result in additional storage life thereby spreading the marketing period for up to three additional months.

EXECUTIVE SUMMARY

The purpose of this STTA was to “assist three targeted Fruit Associations to initiate post harvest handling methods and improved storage conditions in order to provide the additional storage life necessary to lengthen the marketing season for apples”. Post harvest handling starts the moment the fruit is harvested and is the most critical factor in ensuring that the high quality fruit that is harvested arrives to the consumer in the same high quality, good condition and long shelf life. Post harvest handling, especially in third world or developing nations, is generally either misunderstood or not understood at all. The level of knowledge of the growers worked with during this assignment in regards to post harvest handling ranged from zero to very little. This assignment started with an assessment of the current level of post harvest handling knowledge and implementation. Based on these findings three primary activities were conducted: first making recommendations to the farmers on how they can improve their post harvest systems simply and economically for the short term; second implementing these recommendations at the farm level with hands on work directly with the growers; and third providing systems so that the farmers can continue the work started during this STTA throughout the winter months. Finally, research in the market was conducted at the end of the assignment and will continue throughout the marketing period to evaluate the impact of the new post harvest systems had on the farmer’s reputation for quality in and their net income.

Upon inspection of the apples being stored in the grower’s warehouses it was determined that the condition and quality of the apples were not appropriate to sustain long term storage of the apples. The old adage “garbage in, garbage out” holds especially true when it comes to the storing of produce. The condition of the fruit when put into the stores is one of the main factors that will determine how long the fruit can be stored for and what the quality and condition of the fruit will be when taken out of storage. To ensure that the proper quality and condition of apples were packed for storage a system for sorting, grading and packing apples was developed and implemented at the farm level. Using a very simple, inexpensive and locally built packing line the growers were able to more efficiently and with less strain on the labor sort and pack the quality and condition of fruit necessary for long term storage. This system was well received by some growers and received with skepticism by others, which is to be expected when introducing a new system to established farmers.

The storage facilities used by the different growers ranged from rooms in the basement of the family home to purpose built structures for warehousing but not storage. None of the storage rooms being used were properly insulated nor did any have proper ventilation. The system used by the growers to stack their fruit in the storage areas showed their lack of understanding of basic rules of fruit storage and air flows. No storage management systems in regards to inventory, temperature or humidity management were being used. New management systems were designed and implemented for each association or grower worked with. Insulation systems were discussed with the growers with one facility receiving assistance from the KCBS project in purchasing half of the necessary materials to install basic insulation for one storage room. New ventilation fans were purchased by KCBS for all the farms worked with and training was conducted on their installation and use.

The packaging used by the growers and associations worked with ranged from old used wooden boxes to used cardboard cartons. The packaging is not adequate for long term storage of the apples and is not received well in the local market. Imported apples from Montenegro and Macedonia arrive in new, 30 cm x 50 cm, cardboard boxes. This packaging is considered “premium” by the market. A field visit to a local wooden box

manufacturer to discuss the possibilities of supplying cardboard packaging was conducted. Agreements with the wooden box manufacturer were reached to assist him in working with an Albanian carton manufacturer to supply cardboard cartons to the local Kosovo growers and for him to join the KCBS apple associations to increase the “cluster” of businesses found within the associations.

Meetings were held with the Swiss group Inter Cooperation to see how the KCBS project and Inter Cooperation could compliment each other. Inter Cooperation is working heavily in introducing new apple varieties to the Kosovo industry which will be beneficial to the KCBS growers. KCBS is working more in post harvest handling, packaging and marketing of apples, which will benefit the Inter Cooperation growers. Inter Cooperation works primarily with individual growers but many of these growers are members of associations established by KCBS. The cooperation between KCBS and Inter Cooperation consists of excellent synergies with the growers gaining increased benefits from the cooperation versus the two projects working separately.

Data was taken during the course of the assignment to be able show the impact of the assignment of the growers and associations. The impact of the new post harvest systems implemented on the volume of saleable fruit showed that if all the systems are used the growers should realize a net gain in volume of 20%. Overall net increase in income due to the increase of saleable fruit and increased quality of the fruit shows an increase of net revenue of 36%. Considering all the associations working with the KCBS project the net increase of 36% is worth an additional 142,000 Euros to the apple industry per year at current volumes.

Introducing and implementing new technologies to established farmers is never easy and always takes time. In general, farmers are risk adverse and have attitudes that “my daddy and my granddaddy did it this way, why should I change now?” The challenge in establishing and implanting any new agriculture systems is to first find the risk takers and leaders in the community and focus the initial efforts on them. Once a community leader implements the new systems and gains benefit from it then the “jealousy” factor takes over. Farmers are inherently jealous of their neighbors and will copy systems that are successful. This system of spreading new technology has been proven effective in other USAID agriculture projects and has already started to be successful in the KCBS project. By the end of the assignment the number of growers interested in implanting the new systems had increased from three to nine. This was realized in only one month of work.

Making changes in agriculture takes time but the change is exponential year to year and results in increased incomes, increased labor opportunities for the entire community, especially women and minorities and brings the entire community improved prosperity that is sustainable based on the implementation, at the farm level, of the proper technology and management systems.

FIELD ACTIVITIES TO ACHIEVE PURPOSE

The first step in establishing new post harvest handling systems is to determine the level of competency and understanding the targeted market has in these systems. Interviews were conducted with three associations in three different areas, Peja, Ishtok and Gjilan. The initial interviews indicated that the understanding the growers have of post harvest handling in general is poor. In relation to specific systems within post harvest handling the association members understood their need for improved storage facilities and management the best and had the least amount of knowledge or concern regarding sorting, grading and packing systems. The findings were not a surprise as in most developing or third world countries the concept of post harvest handling is not fully integrated into the agricultural industry.

A.	Association:	UVB
	Location:	Peja
	Crop:	Fresh Apples
	Area:	15 Hectares
	Tons:	200
	Members:	13 total, 10 active
	Varieties:	Golden Delicious, Red Delicious, Granny Smith, Ida Red, Melrose and some pear trees

The UVB association is made up of mostly members of an extended family with some neighbors in the immediate vicinity. Cooperation between members is very good with association members sharing the use of implements during production and the use of storage facilities for long term storage. The grower members welcomed the assistance of the KCBS project in post harvest handling systems and were open to listen and implement new ideas especially in regards to updating their storage facilities. The UVB association is made up entirely of a minority group.

The storage facilities being used were generally in good shape and well constructed. Of the three primary storage facilities two had no insulation and now ventilation while one, previously used as a mushroom production area, had some basic insulation and a ventilation system. Use of pallets to store fruit on was minimal. No management systems for temperature, humidity or inventory were found and no organized quality control system was in place.

B.	Association Name:	PEMA
	Location:	Ishtok
	Crop:	Fresh Apples
	Area:	20 Hectares
	Tons:	200
	Members:	12
	Varieties:	Golden Delicious, Red Delicious, Granny Smith, Ida Red, Melrose

The PEMA association consists of member farms that are all within one to three kilometers of each other. Cooperation between members is good with the sharing of farm implements between growers and some sharing of storage facilities. The grower members met with did not show much interest in implementing new post harvest concepts. Comments were made regarding a neighboring farm, Dout farms that are a

relative but not a member of the association, who has implemented some updated storage systems but that they were not necessary for the PEMA association. Due to the overall attitude of the association little work was done with them as the time of the assignment was short and the need to make immediate changes dictates growers willing to make the changes as not to waste valuable time.

C. Farm Name: Dout Farms
Location: Ishtok
Crop: Fresh Apples
Area: 6 Hectares
Tons: 200
Varieties: Golden Delicious, Red Delicious, Granny Smith, Ida Red, Melrose

Dout farm is the largest privately owned apple farm in Kosovo. Dout farm is a neighbor and relative of most of the members of the PEMA association. Based on the meetings with the members of the PEMA association it was determined that Mr. Dout was a leader in his community as was already implementing certain post harvest systems that were not being implemented at other farms in Kosovo. Dout farms has the most updated storage facility of any visited during this assignment.

The walls of the facility were made of brick and mud with straw mixed in that helps with the insulation of the storage. The boxes used were all card board cartons and all the boxes were placed on pallets in the store with water being spread under the pallets to help increase the humidity of the room. Mr. Dout was very interested in increasing the efficiency of his storage operation and was willing to implement new storage management techniques. However, Mr. Dout was not interested in implementing any new sorting, grading and packing systems as he felt his quality and condition was already at a reasonable level for the market he is selling to.

D. Association Name: Fruiti
Location: Gjilan
Crop: Fresh Apples
Area: 10.5 Hectares
Tons: 110
Members: 11
Varieties: Golden Delicious, Red Delicious, Granny Smith, Ida Red, Melrose, Gala (300 trees)

The Fruiti association consists of family and neighbors located throughout the Gjilan area. Initial interviews were conducted with the members of one of the families in the association who have two hectares of apples in production. The head of this family, Mr. Agim, is a leader in his community and was found to be very receptive to the new concepts in post harvest handling that were introduced to him. The condition of the storage facilities found were the worse of any of the associations with fruit being stored in basements and rooms of family homes. No insulation, ventilation or management systems were being used. No quality control methods were being implemented and the majority of the fruit was being stored in either old, used wooden crates or used card board carton boxes.

Even though this association was starting at a very low level of understanding of post harvest handling they were by far the most receptive to making changes. All of the systems introduced to them were applied with extensive training being conducted at the farm level and new systems as well as new infrastructure being implemented.

TASK FINDINGS AND RECOMMENDATIONS

As stated previously that level of understanding and of implementation of post harvest handling systems with the grower members of the KCBS apple associations is poor. Based on the initial analysis of each of the associations and growers met with and based on the physical and financial resources of the growers systems were developed that would show an immediate impact on the growers in regards to their ability to store their apples for a longer period with higher quality that will result in increased income to the growers with minimal initial cost.

The systems that were introduced and implemented at the farm level to the growers consisted of new sorting, grading and packing of the apples either at harvest time or during repackaging of the apples. Updated storage systems included pallet spacing and ventilation fans to increase air flow throughout the storage rooms and the use of pallets to keep the boxes off the floor and so water can be spread underneath the boxes to increase the humidity inside the storage room. Temperature, humidity and inventory management and reporting systems were also established. Finally quality and condition training to increase the level of quality found in the packed boxes for sale and to remove apples that will adversely affect the long term storage ability of the product.

1. Systems Implemented

Farmers are in general risk adverse and are not prone to implementing new systems at the farm level. To be able to obtain a high level of success in implementing new systems the work must be done at the farm with the farmers actively participating in the implementation of the new program. Once growers understand a new system, sees it work and it increases his income he will implement it. If a new system does not affect the grower's bottom line in a positive fashion, taking the increased value of his product and deducting the cost of the system, there is no reason for him to implement it.

2. Sorting, Grading and Packing System

The system used by the growers for sorting, grading and packing of their apples consists of workers, usually family members, setting of boxes between the rows in the field and conducting a style of field packing. Very little attention is paid to the quality and condition of the fruit being packed and the conditions of the workers is difficult with the growers working in a very uncomfortable fashion. Tables were designed, locally produced and brought to the growers that would allow the growers to more efficiently sort, grade and pack their fruit with significantly increased comfort to the workers, increased productivity and better control of the grading and packing of the fruit.

Annex I shows the design for the tables that were built and implemented at the farm level for the growers.

Annex II shows the building of the prototype tables by a local carpenter in Peja. The carpenter was more than happy to work on this project as a USAID program had helped him reestablish his carpentry business after being burned out during the war with the purchase of new equipment.

Annex III shows pictures of the old sorting, grading and packing system and the new system implemented by KCBS

The packing system consists of three different processes. First, the apples are sorted. Sorting is a process that takes any apples that show either condition defects or severe quality defects. Condition defects are defined as defects that will change over time.

These include deep bruises, cuts, stem punctures, mechanical damage or decay. The reason for removing these defects is they are considered un-desirable by the consumers and secondly they will adversely affect the ability of the fruit to hold in storage for long periods. Any condition defect will ultimately lead to the fruit breaking down and decay forming. Once decay forms the spores of the decay will spread throughout the storage facility and infect other apples. By removing the condition defects the overall appearance and selling price of the fruit is increased and the amount of storage losses due to decay is decreased thus increasing the total revenue to the grower. Quality defects are defined as defects that will not change over time such as shape, size, color and russeting. By removing the severe quality defects the overall appearance of the packed box is increased which allows the grower to earn increased confidence in his product from the buyers and thus selling more fruit and with a higher price also increasing his revenues.

Grading is a process where the fruit is separated into different quality standards. Quality standards that were used for this assignment followed the standards already set in the local market. International quality standards for the USA and EU already exist but were not used at this time. The quality standards used were simple and created the base understanding of grading fruit that was easily accepted by the growers. Future work will be done to begin the process of applying international standards to the fruit packed by the Kosovo growers. Two different grades were established, number one and number two. Number one fruit was fruit that showed more than 50% of the color of the variety and had no major quality defects and no condition defects. Number two quality fruit was the fruit left over.

Packing is the last process of the sorting, grading and packing system but is equally important as the rest. Once the fruit is sorted and graded packing it in an attractive manner that minimizes the chance for damage occurring is very important. Fruit is bought with the eyes first. If the packaging is attractive and the fruit in the box is of consistent quality throughout the box the buyers will have increased confidence in the grower and will purchase more product from him.

Separation of the fruit into two different qualities is important to maximize the value of the product. It was found that the growers being worked with packed all their fruit into one box with out concern for quality. In the market number one or "premium" fruit sells for between 0.60 and 0.70 euro cents per kilo while number two fruit sells for 0.40 euro cent per kilo. The wholesaler purchasing the fruit from the growers would take the fruit and separate it themselves into number two and premium boxes and earn more income from the premium boxes sold. By implementing the sorting, grading and packing system at the farm level the growers are now separating their fruit into number two and premium and earning the difference in the price themselves instead of the wholesaler. A breakdown of the increased revenues earned by the growers with the new systems implemented will be shown in the financial section of the report.

Annex IV shows pictures of the fruit before implementation of the new packing system and after. The boxes were separated by grade standards that were written on the box so that the growers can easily find the fruit in the storage when getting ready to sell. The use of basic labeling techniques and of storing fruit by quality class and variety has increased the efficiency of the growers and allows them to manage their inventory and to know how much of what variety and class they have to sell to better meet the demands of their customers.

3. Storage

The condition of the storage facilities found during the assignment ranged from poor to fair. No systems for monitoring fruit pulp temperature (the internal temperature of the fruit), no air flow management systems, no inventory control systems and little to no insulation systems were found at the majority of the facilities worked with. A detailed inspection of all the facilities was conducted and then a program was developed on how to increase the efficiency of the storage systems at the lowest cost was developed and implemented.

The most important consideration for the storage facilities was their ability to manage temperature. The growers in Kosovo must deal with temperatures that range from too high during and just after the harvest and too cold during the winter months when they are attempting to store their fruit to wait for a higher market. The optimum temperature for storing of apples is 0 degrees Celsius or 32 degree Fahrenheit. The freezing point of most varieties of apples is between -1 and -1.5 degrees Celsius depending on the total soluble solids, or "sugar", content of the fruit. None of the growers had any type of refrigeration units available to them for the warmer months while all of them used some sort of heating devices to help protect the fruit during the colder months.

A program of using the ambient air temperatures (actual air temperatures) to control the fruit temperature was implemented. By using the cold air of the night, ranging between -1 and 1 degrees Celsius during the time of the assignment, and managing the air by opening the doors of the storage facility during the night and closing them during the day the growers were able to bring the temperature of their fruit down by an average of three degrees Celsius during the short time the process was implemented. The consistency of the fruit pulp temperature was also helped by using this process. One of the determining factors in a grower's ability to store fruit for long periods of time with good quality and condition after three to four months of storage is holding the fruit to a consistent temperature and minimizing fruit pulp temperatures. By minimizing the up and down cycle of fruit pulp temperatures the respiration rate of the fruit is held lower thus decreasing the rate of maturation and thus decreasing the breakdown in the fruit.

All of the growers worked with participated in implementing systems for allowing better air flow throughout their storages by providing proper stacking of the fruit and creating air flow channels of between five and ten centimeters between apple pallets. These air flow channels allow proper distribution of the air throughout the storage and allow the fruit to maintain the best possible temperature. The growers were trained in the two most basic concepts of fruit cooling. First, fruit does not absorb cold; heat is removed from the fruit thus making it cold. The only way to cool fruit is by passing cold air over the product that is colder than the fruit itself and thus removing the heat from the fruit. The second basic concept is that air is lazy. Air will travel the path of least resistance. By adjusting the storage of the apples to allow for proper air flow the process of cooling is significantly enhanced.

Annex V shows photos of the way product was "block" stored in the warehouse allowing minimal air flow to reach the apples. The result of this type of storing of the apples is that the pulp temperature is ever increasing in the middle of the storage due to the respiration of the fruit building on itself. One of the reasons for the growers to use this type of system in the past was to protect the apples during the colder winter months. Without the use of any type of heating system the apples in the middle of the blocked stores are essentially insulated by the apples on the outside of the block. This system, while working to keep a small percentage of the apples from freezing, is wholly inadequate for any type of proper storing of apples. The growers gained a false sense of success using this system and sacrificed a large percentage of their fruit in the process.

Systems for the proper spacing of the pallets and apple boxes were implemented at the farms worked with. One of the farms, in the Fruiti association in Gjiilan, actually went so far as to begin the process of re-grading all their fruit using the new sorting, grading and packing system and then re-stocking their storage facility using pallets and proper spacing to allow for adequate air flow. The facilities in Ishtok and Peja implemented a program of removing fruit from the stores during sales so air flow channels would be opened up. Annex VI shows how spacing was implemented in the storage facility along with the use of pallets to allow for air flow under the apples boxes and to keep them off the floor so water can be used to increase humidity in the store. Ventilation fans were supplied by the KCBS project to all of the farms worked with during this assignment to help remove the build up of ethylene gas in the stores and to help facilitate air flow within the stores.

Lack of insulation use in the stores is one of the primary constraints to the long term storage of fresh apples in Kosovo. The Fruiti association was assisted by the project in installing insulation at one of their storage rooms. The Fruiti association was chosen for this activity as it showed the most willingness to implement all the systems being introduced by this assignment. Approximately half of the materials needed to insulate the one storage room were provided by the project while the balance of the material and the labor needed to install the insulation was provided by the grower. The fact that the grower was willing to invest his own money into the insulation process was a great success as it shows his willingness to make the necessary changes needed and to begin investing himself in the process.

Annex VII shows the process of installation of the insulation material. Five centimeter thick Styrofoam was used as the insulation material. This material is easily found in the local market and many local craftsmen have good knowledge on how it is to be installed. The Styrofoam was installed to the outside of the storage room and a layer of cement was applied afterwards to protect the Styrofoam from damages. Temperature readings were taken before the insulation material was installed, during the process and after. The fruit pulp temperatures showed a consistent decline in temperature and the fluctuation from morning to night in the inside air temperatures and fruit pulp temperatures were decreased.

The total cost to the project for the insulation material was 150 Euro with the grower paying for the balance. The total cost of insulating the room is estimated at 400 Euro. This is a very inexpensive system, not ideal, but well within the ability of small farmers to handle the expense with some help from the project.

4. Management Systems

Management systems are essential tools in creating self sustainability for the growers and associations working with the project. Management systems are also an excellent tool to determine which growers and associations are serious about implementing new technology which enables the project to focus efforts on those growers and associations most willing and capable to make improvements. Two management systems were implemented at the farm level, temperature mapping and analysis and humidity management. Temperature and humidity management are critical factors in providing the growers with the information needed to maximize the storage condition of their fruit to increase its shelf life and quality to be able to earn higher monetary returns.

A system of temperature mapping of the storage rooms was implemented at three different facilities. Temperature mapping is a system where the storage room is mapped

onto a document with areas for recording specific temperature and humidity data. The temperature data that is recorded consists of ambient air temperature and fruit pulp temperature. Both measurements are equally important when analyzing the overall temperature management of the stores but achieving the proper fruit pulp temperature is the ultimate goal. By monitoring the air and pulp temperatures twice a day, one first thing in the morning and once in the afternoon, the growers will obtain the data needed to make adjustments in air flow and cold and warm air delivery systems to create the optimum conditions for long term storage. Optimum storage pulp temperature of apples is zero degree Celsius or 32 degrees Fahrenheit. The freezing point of most apple varieties is negative one degrees Celsius or 30.5 degree Fahrenheit. By implementing the temperature management system the growers are better prepared to monitor and adjust the temperature of their stores by themselves over the long term.

Humidity control is also a critical component in ensuring the apples being stored have the proper shelf life necessary to withstand long term storage. The optimum humidity level for apple storage is 90 – 95%. During the course of the assignment humidity levels were measured at each of the stores being worked with and the average level was between 72% and 84%. Each store used a basic hydrometer for measuring humidity levels but none had any type of humidifiers to increase the humidity levels in the rooms. As stated earlier, pallets have been introduced for use in the store to place the apple boxes on. This is done to help increase the air flow in the room but most importantly the boxes are not in contact with the floor which allows the growers to spread water throughout the store room floors. While the water evaporates from the floor the humidity level is increased in the room. This is a very simple and inexpensive system that, while not being optimal, allows the growers to reach humidity levels in the range of 85% - 90% and higher at times which will decrease the amount of dehydration in the fruit and thus improve overall quality and condition of the fruit over the long term storing.

Annex VIII shows an example of the temperature and humidity maps created for one of the grower associations and shows how the growers have placed these maps in the rooms next to the hydrometer for easy daily documentation. The KCBS local staff is following up with the growers to assist them with any questions regarding this new system and the project is providing fruit pulp temperature probes and new hydrometers to the growers to ensure they have the tools to implement the new system accurately. A calibration protocol for the temperature probes has been taught to the growers to make sure that the temperature probes are reading accurately. This protocol is also available in Annex VIII and has been left with the technical staff of KCBS.

This chart shows the results of the temperature monitoring during the process of installing the new insulation at the Fruiti association storage facility in Gjilan. Notice that the fruit pulp temperature has consistently decreased over the three different recording days. This is an indication that the temperature in the room is becoming more consistent and that the fruit, with better air flow, is now becoming colder. The temperature readings are not optimum but the decrease in the fruit pulp temperature is a good indication that the new insulation is working and that the growers are gaining benefit from the new technology being implemented.

Date	Air One	Fruit One	Air Two	Fruit Two
November 3	11.4	9.0	11.8	12.5
November 7	9.7	8.7	8.6	10.4
November 11	9.8	8.5	10.2	9.6

5. Packaging

One of the constraints facing the apple grower associations working with the KCBS project is their access to proper packaging material. The apples garnering the highest prices in the market are imported apples typically from Macedonia and Montenegro. The packaging used by these countries is card board cartons, typically 30 cm x 50 cm in size holding two layers of fruit. This package style is recognized by the consumers as holding premium fruit as the imported fruit is generally graded and packaged better than the fruit locally grown in Kosovo. The locally grown fruit is either packed in old banana cartons, wooden crates or used cartons purchased from the local super markets. By introducing a source of card board cartons and fiber board trays used to separate the apples to help prevent damages to the local Kosovo apple producers they could then pack their premium fruit into the new packaging style and more easily compete with the imported fruit.

Meetings were held with a local box manufacturer located in Rahcovec, Mr. Selajdin, in regards to him joining the KCBS associations and possibly becoming an agent for a carton box manufacturer located in Albania. There is a USAID funded project, SBCA, located in Albania working with a small scale carton manufacturer. Initial discussions have been conducted with the COP of SBCA regarding the possibilities of creating a link visit between the two projects so Mr. Selajdin and some of the association members can explore the idea of Mr. Selajdin becoming an agent for the Albanian carton manufacturer and supplying the local apple associations with higher quality packaging material. By having Mr. Selajdin join the KCBS apple associations the business cluster affect within the association will be enhanced with additional services and products becoming more readily available to the association members.

6. Donor Agency Cooperation

Kosovo has a plethora of donor agencies from all over the world working to help improve the condition of the Kosovars. In addition to USAID working in agricultural projects a Swiss group, Inter Cooperation, is also working in the agriculture sector of Kosovo. Meetings were held with the director and technical staff of the Inter Cooperation project to determine what activities they were working in and what type of synergies could be developed by the two projects cooperating together. The Inter Cooperation project is heavily focused on working with individual growers and within the apple sector have done excellent work in introducing and trialing new apple cultivars that will bring added benefits to the local apple industry. While Inter Cooperation is working in post harvest technologies they are not putting the level of effort that the KCBS project is. KCBS is working with production issue in apples but not putting the effort that Inter Cooperation is. The opportunity to work together to maximize the returns to the growers between the two projects is obvious. Many of the growers working with the Inter Cooperation project are members of associations that KCBS is working with already. The Inter Cooperation project attended a field day held during this assignment that focused on training new growers on how to use the new post harvest handling technology and management systems and they attended the debriefing held at the USAID office. Technical data concerning post harvest handling was shared with the Inter Cooperation technical staff so that it can be more widely distributed to apple growers throughout Kosovo. With this type of cooperation between donor agencies more focused and efficient work can be done by both groups with the small Kosovo growers taking the maximum benefits possible.

ECONOMIC IMPACT

The economic impact of the assignment can be shown in two different areas, the reduction of losses of sellable fruit due to new post harvest systems and the increase in value of the fruit due to proper sorting, grading and packing. The following chart shows the impact of new post harvest handling techniques implemented on one individual farm worked with during the course of the assignment and is then extrapolated into the affect the new technology has over all the growers working with the KCBS associations.

Statistics

Farm Example			Total KCBS Associations Example		
Harvest	110,000	Kilos	Harvest	900,000	Kilos
Current Losses			Current Losses		
No Sorting	10%		No Sorting	10%	
Improper Storage	20%		Improper Storage	20%	
Total	30%		Total	30%	
Total Volume Loss	33,000	Kilos	Total Volume Loss	270,000	Kilos
Saleable Volume	77,000	Kilos	Saleable Volume	630,000	Kilos
Loss Reduction			Loss Reduction		
Proper Sorting			Proper Sorting		
Old System Losses	10%		Old System Losses	10%	
New System Losses	5%		New System Losses	5%	
Net Gain	5%		Net Gain	5%	
Proper Storage			Proper Storage		
Old System Losses	20%		Old System Losses	20%	
New System Losses	5%		New System Losses	5%	
Net Gain	15%		Net Gain	15%	
Total Volume Gain %	20%		Total Volume Gain %	20%	
Total Volume Gain	22,000	Kilos	Total Volume Gain	180,000	Kilos
Sales			Sales		
Old System Volume	77,000	Kilos	Old System Volume	630,000	Kilos
New System Volume	99,000	Kilos	New System Volume	810,000	Kilos

As can be clearly seen above the volume loss due to improper or lack of post harvest handling technology is 30% of the total fruit harvested. This is a combination of a 10% loss due to poor sorting systems and a 20% loss due to improper storage conditions. Losses can be reduced by 5% in sorting and by 15% in storage, for a total net volume gain of 20% of harvested fruit, by implementing simple and inexpensive technology introduced by the KCBS project. This equates to an increase at the individual farm of 22,000 kilos (22 metric tons) of saleable fruit and an increase of 180,000 kilos (180 metric tons) of saleable fruit throughout the KCBS apple associations.

The increase of monetary returns to the growers is two fold. First, the increase by 20% of total saleable fruit and second the increase in the value of the premium fruit graded separately from the class two fruit. The price of premium fruit in the local market is between 0.60 euro cents and 0.70 euro cents. By separating the fruit into two classes the growers take advantage of the higher prices achievable from the premium fruit, prices the wholesalers once took advantage of, with no affect on the price of class two fruit. The following chart outlines the monetary benefits to an individual grower and to all the fresh apple grower associations working with the KCBS project.

Farm Example

Old System Value	Class II Price € 0.40	Class II % 100%	Total Value € 30,800
	Class I Price € 0.65	Class I % 0	Total Value € 0.00
Old System Total Value			€30,800
New System Value	Class II Price € 0.40	Class II % 65%	Total Value € 25,740
	Class I Price € 0.65	Class I % 35%	Total Value € 22,523
New System Total Value			€48,263
Total New System Value			€48,263
Percentage Increase			36%

Total KCBS Associations

Old System Value	Class II Price € 0.40	Class II % 100%	Total Value € 252,000
	Class I Price € 0.65	Class I % 0	Total Value € 0.00
Old System Total Value			€ 252,000
New System Value	Class II Price € 0.40	Class II % 65%	Total Value € 210,600
	Class I Price € 0.65	Class I % 35%	Total Value € 184,275
Total New System Value			€394,875
Percentage Increase			36%

Total Value Increase

	Farm Example	KCBS Associations Example
Old System	€ 30,800	€ 252,000
New System	€ 48,263	€ 394,875
Total	€17,463	€142,875
%	36%	36%

As can be seen by these numbers the total value increase to growers working with the new post harvest technology is 36%. The increase to the individual grower is 17,463 euros while the total increase to the growers participating in the KCBS project is 142,875 euros. This increase in revenue is achieved with minimal capital investment on the part of the individual growers.

The impact of the increased revenues earned by the growers will be felt throughout the community. First, growers typically invest in either increasing their acreage (or hectares as is the case in Kosovo) and / or invest in new technology such as post harvest handling systems to continue the process of earning more money. As all of the growers worked with are family run operations this will help the economic situation of the entire family and also prepare the grower to be able to pass on economically viable farm operations to his sons and daughters when they come of age. Additional benefits are felt throughout the community as money is spent by the growers to hire local craftsmen to implement the new post harvest systems such as insulating the storage rooms and building sorting, grading and packing tables. Once the grower begins to increase his acreage / hectares he will then need to hire local labor to help with the harvesting, sorting, grading and packing operations as they will be too large for him to handle himself. These are just some of the secondary benefits that will be felt throughout the apple growing areas due to increased revenues earned by the growers working with the KCBS project.

CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE ACTIVITY

The current level of understanding of post harvest handling at the grower level in the Kosovo apple industry ranges from zero to very little. As stated previously, this is not to be unexpected. The importance of post harvest handling as a science has only recently, within the past 15 – 20 years, become fully appreciated in the most developed nations. To expect developing and third world countries to be at the same level is not realistic. There are certain advantages of starting new technologies at zero. It is easier to implement a new technology to farmers if they don't have any previous experience. To train growers with a little knowledge or incorrect knowledge the first step is to clear their minds of the poor information and then you can start to train in the proper systems and technologies. The apple growers in Kosovo are starting with a clean slate and as was seen during this assignment many of them are eager and willing to learn and implement updated post harvest technologies.

The apple industry of Kosovo is rebuilding itself after many year of hardship throughout the region. As is typical in so many agriculture systems throughout the developing and third world countries the growers are producing a very high quality product. The challenge is to have this high quality product that is on the tree arriving to the end consumer in the same high quality and condition. This is the role of post harvest technology. Post harvest technology is not the most glamorous sector of agriculture and many growers have little to no knowledge of it importance. Once growers are shown the advantages and positive affect on their earnings of post harvest handling systems they are ready and willing to implement it.

A strategy that is used in working with growers is what is referred to as the “jealousy” factor. Growers are typically risk adverse and it can be difficult for them to change the agriculture practices that have been used from one generation to the next. The goal of an assignment such as this one is to find the few risk takers and community leaders in every group and convince them to implement the new systems. Once a few community leaders work with the new systems and start to gain benefits from it in improved quality and increased earnings then the neighbors will become “jealous”. Once this happens the change becomes exponential. The challenge with agriculture is that it takes time. If your timing is off you miss the season and must wait another year to implement the new technology. But, the returns on working in agriculture both in relation to increased monetary earnings and the social affect on the community is tremendous. Most agriculture labors fall into the lower socio-economic class of any society. These are the people that need the most help and are usually a large part of the population in developing and third world countries. A recent USAID publication noted that fifty percent of all people in the world work in agriculture. If social and economic change is going to be made it must start with the people with the most need and are the most affected by incremental increases in their life style, this is the agriculture sector.

On the final Saturday of this assignment a field day was taken to observe how product from one of the associations worked with was being received in the local wholesale market. The results were incredible. This was the second Saturday that the grower had taken his newly graded and packed fruit to the market after implementing the new systems introduced by the KCBS project. During the first Saturday the buyers found a new pack style and increased quality, but they wanted to see if this was a one time deal or was this a new system for the grower. The day we visited the market the sales for the growers product had increased in volume, just by offering properly size fruit his class two product increased by 0.10 euro cent per kilo and the end result of all the hard work done by the grower was

obtaining a contract with a local supermarket for directly supplying apples on a weekly basis. The grower was already discussing possible new packaging systems that he could use to better service his clients.

Members of the association were with the grower in the market that day and became believers in the new system. Nine growers want to begin implementing the new post harvest technologies and most importantly the association members are planning how they can begin to distribute the talents of the different association members to maximize the benefits to all the members. Discussions were held with association members on how one, who has a back ground as a trader, can be responsible for the sales, another who is strong in production can assist the other members in growing and how others can continue their training in post harvest technology so they can assist other members. The association is very interested in creating their own label so they can distinguish themselves in the market and to ensure the local client know their product is "produce of Kosovo". There were even discussions of the association members combining resources to purchase a permanent spot in the wholesale market to better control and display their product.

This result was much faster than expected but was a great indication of how fast the apple associations in the KCBS project and hopefully other associations in other products can embrace a new technology and take it even further than expected by working together. The willingness and ability to change is evident with the growers and associations that were worked with during this assignment. That in itself is probably the most important factor in having confidence that the investment being made into helping these people will pay off as long as enough time and effort is allocated to them.

Specific Recommendations:

1. Ensure that all growers who participated in implementing new post harvest handling technology receive fruit pulp temperature probes and hydrometers.
2. Continue to monitor the temperature and humidity management systems implemented at the KCBS apple farm associations throughout the winter months, until the apples are taken out of long term storage for sale.
3. Monitor the sale price of the association apples that have implemented the new sorting, grading and packing and storage systems introduced by KCBS.
4. Continue to visit the associations to answer technical questions they may have and to convince more growers to participate in the program for the next growing season.
5. During the winter months design new cold stores and packing houses that can be provided to the associations showing the most willingness to implement the new post harvest technologies.
6. September 2006 an ex-patriot STTA should be brought in for at least two weeks before the harvest begins to ensure that the storage facilities are set and that the sorting, grading and packing tables are available for the start of the harvest.
7. October 2006 an expatriate STTA should be brought in for at least two weeks during the harvest season to continue to train growers in the use of the sorting, grading and packing systems, train and implement temperature and humidity management systems and to ensure that proper inventory management and air flow systems in the storage rooms is understood and implemented.
8. Improved labeling with grade standards and highlighting "produced in Kosovo" needs to be implemented within the apple grower associations. Quality standards

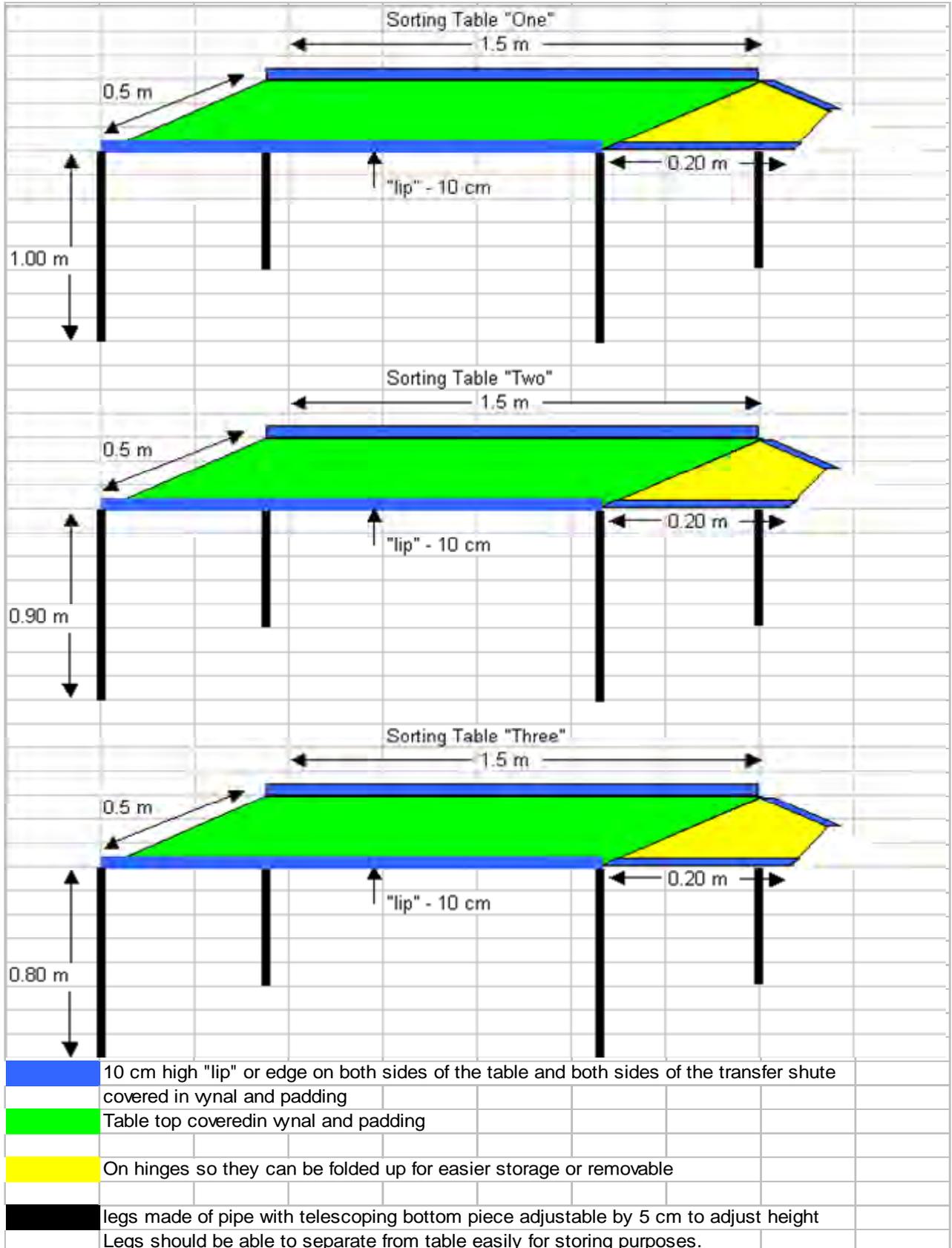
must be set that will ensure that the growers are meeting the minimum standards of premium and class two fruit so better confidence is created in the "Kosovo" brand to better compete with the imported apples.

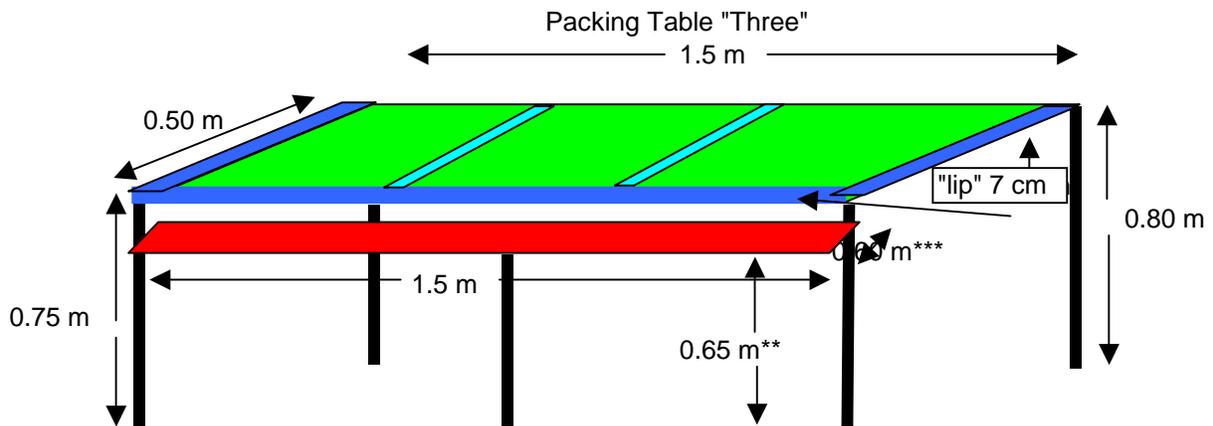
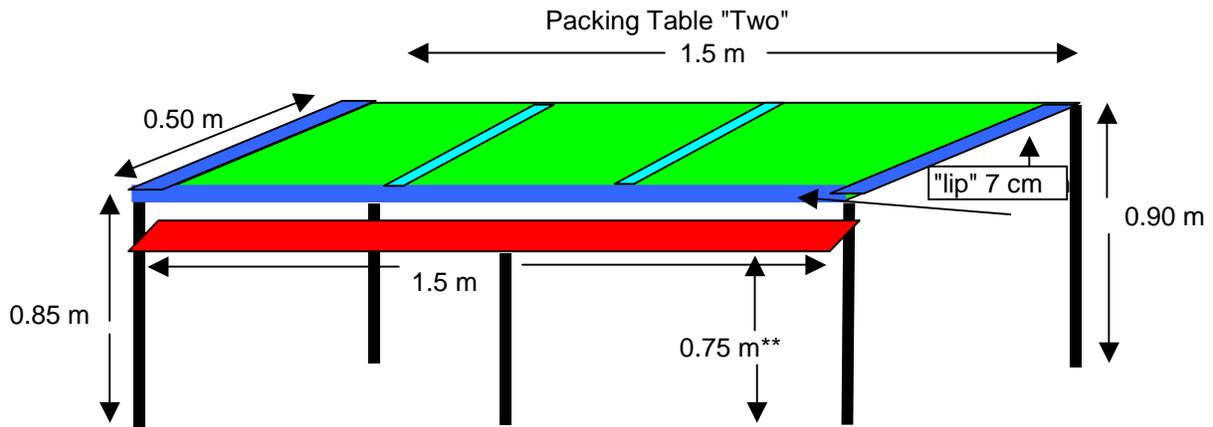
9. A link visit including association growers and Mr. Selajdin, a box manufacturer, and an Albanian carton manufacturer needs to be coordinated during the winter months so access can be made to improved packaging material.
10. Sources of fiber board or plastic pan-o-pac systems need to be researched and if possible made available to the association growers to help improve the protection of the apples packed into premium packaging.
11. Young agriculture graduates or students willing to participate in an internship need to be found who can work with the KCBS technical staff and ex-patriot STTA's. The concept is to find young, interested agriculture students who can "shadow" the KCBS technical staff and ex-patriot STTA's as trainees. After six months to a year of training with the highly qualified technical staff in the field the trainees could then be hired as part time employees to help monitor and implement new technologies introduced by the project. These young students would then become the genesis of a desperately need extension service in Kosovo.
12. Post harvest technology needs to be introduced and implemented throughout the agriculture industry of Kosovo, not just in the apple industry. For Kosovo to begin to think about exporting any products and to be able to compete with imported products a full post harvest handling system industry wide needs to be established.
13. Greater access to proper refrigerated storage facilities and packing stations must be made. This can be done by building small scale post harvest centers, PHC's, in strategic locations in Kosovo that can be used by a range of agricultural crops throughout the year. The PHC's can be designed in based on a modular system of forced air coolers, cold stores and packing houses that can be easily replicated and can be adjusted to fit the needs of a region by simple adding or subtracting the different units needed or not. The PHC's need to be designed to meet European food safety regulations.

ANNEXES

- Annex I. Sorting, Grading and Packing Tables Design
- Annex II. Sorting, Grading and Packing Tables Being Built
- Annex III. Sorting, Grading and Packing Tables Implementation
- Annex IV. Graded Apples with Quality Codes
- Annex V. Block Storage of Apples
- Annex VI. Proper Air Flow and Use of Pallets in the Stores
- Annex VII. Insulation of Storage Facility - Gjilan
- Annex VIII. Temperature and Humidity Management
- Annex IX. Daily Log of Activities

ANNEX I - SORTING, GRADING AND PACKING TABLES DESIGN





"**" Check before final design!

 Edges "lips" of tables, 7 cm high, covered in vynal with padding

 Table tops, covered in vynal and padding

 Wood inserts, 50 cm in length, 5 cm wide, 7 cm high, covered in vynal and padding

 Wood shelf for placing boxes on, 0.60 cm wide but check width for cofmfort of packing before making final decision. Preferably on hinge for easier storgae

 Legs made of pipe with telescoping bottom piece adjustable by 5 cm to adjust height for each table. Legs should be able to separate from table easily for storing purposes.

Materials List

 **Covered plywood tops** - 5 pieces, each 1.5 m x 0.50 m

 **Covered wood sides** - 2 x 3 = 6 x 1.5 m length for sorting tables, 1 x 2 = 2 x 1.5 m for packing tables, 2 x 2 = 4 for x 0.50 m for packing tables

 **Coverd wood inserts** - 3 x 2 = 6 x 0.50 m

 **Wood shelf** - 1 x 2 = 2 x 0.60 cm width x 1.5 m length

 **Metal legs** - 5 x 2 = 10 for packing / grading tables, 4 x 3 = 12 for sorting tables

ANNEX II - SORTING, GRADING AND PACKING TABLES BEING BUILT

Building of prototype sorting, grading and packing tables by local Peja carpenter.



Building the prototype tables



Grading and packing table



Covering tables to avoid bruising of the apples on the wood



Final covered tables at the workshop and then delivered to the farm

ANNEX III - SORTING, GRADING AND PACKING TABLES IMPLEMENTATION



Old packing system, between the apple tree rows and on the ground. The labor either bends over to work or sits on metal can to work. Boxes are on the soil and grass which damages the boxes by absorbing water and getting dirty.



New sorting, grading and packing tables set up for use in the apples orchards. The owner of the farm was not convinced of the system until his wife, who is responsible for the packing of the fruit, worked with the tables and became convinced that they would make her job easier and more comfortable.

ANNEX IV - GRADED APPLES WITH QUALITY CODES



Old system packed apple box



Grading and sorting of apples "new system"



Apples packed in the new system in cardboard cartons and in wooden crates



Cardboard cartons and wooden boxes showing the quality classification marked on the box

ANNEX V – BLOCK STORAGE OF APPLES



No air flow channels in the store and an open door that allows warm air in during the day



Zero air flow channels in these two store rooms



Apples blocked stored all the way to the back of the room with only minimal air flow channels

ANNEX VI - AIR FLOW CHANNELS AND USAGE OF PALLETS UNDER THE APPLE BOXES



Air flow channels in store



Use of pallets to create air flow



Boxes on pallets so water can be used on floor to increase humidity

ANNEX VII - INSULATION OF STORAGE FACILITY - GJILAN



Starting the installation of the insulation on the store in Gjilan



Styrofoam insulation installation almost complete



Insulation complete and protective out coding applied

ANNEX VIII - TEMPERATURE AND HUMIDITY MANAGEMENT



Temperature map in use at the Gjilan storage facility. Notice the hydrometer on the box above the thermometer and the temperature map. New fruit pulp temperature probes are being provided to the growers and associations to help growers in taking accurate ambient air and fruit pulp temperatures.

TEMPERATURE PROBE CALIBRATION

The temperature probe should be calibrated a minimum of once a week, preferably twice a week. A log of every calibration should be kept with the date of calibration and the results of the test shown on the log.

The procedure for calibration is as follows: take an insulated cup, preferably a container that has a one to two quart capacity and is made of plastic with insulated sides. Use a combination of crushed ice and water to create an ice slurry. The ice slurry should be at a point where the ice has stopped melting. Insert the temperature probe into the ice slurry, keeping it as close to the middle of the container as possible. The ice slurry, at the point the ice has stopped melting, will be at 32 degrees Fahrenheit. After allowing the probe ample time to adjust to the water temperature, check the reading on the probe. The probe should read 32 degrees; if the probe reads anything different the probe must be adjusted.

Many of the probes have an adjustment screw on the probe; turn this screw until the probe reads 32 degrees. If the probe does not have an adjustment screw, then a record of the temperature it is reading must be recorded and the difference between this reading and 32 degrees noted. When the probe is used, this factor needs to be taken into consideration and the reading adjusted appropriately.

ANNEX IX – DAILY LOG OF ACTIVITIES

October 18, 2005

Meetings in AM with COP and Reshat from fruit and vegetable department.

Reviewed write up on two FA's
 Fruiti located in Kravic – Gjilan Municipality
 PEMA located in Kovrage

Based on photos shown to me the reality is that the FA's have no to limited infrastructure, no access to proper packaging or storing facilities, no washing, drying or grading system and little to no packinghouse or cold store infrastructure.

The FA's are selling their product through traditional channels to the local market and one, PEMA, is working with a wholesale company, Elkos based in Peja, who has a distribution system throughout Kosovo. This system of marketing will be the best opportunity for the growers / FA's until they can improve their systems and infrastructure.

Varieties being grown include Red Delicious, Golden Delicious, Granny Smith and some others that I will obtain more information on once in the field.

Activities that need to be developed during the next week:

- Quality control report format with detailed explanation of its use
- Quality control specification form
- Harvest system
- Packing system
- Basic packinghouse set up
- Washing tanks if possible
- Cold store / store management system
- Palletization and / or box stacking system
- Percentage chart for inspectors
- Cold store / store check list

Traveled with Reshat to the Pristina wholesale market. Overall the wholesale market is very small but has a full range of fresh and some packaged fresh and dried produce and some other products. The inspection of the apples that were available showed both locally produced, typically in local small wood box/trays holding 5 kg (reality is that the box/tray can only hold 3 – 4.5 kg) average price for the local product was 3 euro per box/tray. Imported apples, primarily from Macedonia, were also available. Packaging was done in a 5 kg carton box. The packaging was better than the local market packaging.

Quality for both the local and imported apples was variable from box to box. All boxes seen were "face" packed i.e. placing poorer quality product in the bottom of the package and the higher quality on the top. Speaking with Reshat he explained that this was done at the market, not by the grower / shipper. Varieties seen included Red Delicious, Golden Delicious, Rome and Granny Smith. There was no indication that there were different qualities packed. There were different qualities within each box or each variety but there was no labeling of a quality code. Overall there is high quality and low quality product available per box or per variety. With some basic sorting and grading the higher quality product might be able to be sold as a "premium" product to the supermarkets.

Visited a supermarket, InterEx

The apple quality in the super market ranged from good to very poor. The good quality product, selling for 1.25 Euro per kilo was very inconsistent in size, shape, color and showed many defects. Compared to the product seen at the wholesale market selling for 0.60 Euro per kilo this product was not much better. There were apples selling for 0.60 Euro per kilo in the supermarket that showed very poor quality with shriveling, puncture wounds, misshapen, inconsistent size and color and a range of other defects found.

The packaging used consisted of the carton packs used by the Macedonian exporters and plastic folding crates with fiber inserts. The folding crates are very good as they are reusable, easy to break down and store and keep the product protected if used properly and with fiber trays for the apples.

Recommendations: If the growers at the associations can be taught basic grading and packing practices and have access to better packaging, especially the returnable folding plastic crates and fiber trays then the "premium" fruit can be packed for sale to the supermarkets. The supermarkets in Kosovo are locally owned and operated which makes access to them much easier than if they were large international operations. The quality that could be developed with this basic packing and packaging system would allow the growers to ship a superior quality product to the supermarkets and earn a higher price for at least their best product. Currently growers are selling their apples to distributors or at the local markets for 0.30 Euro per kilo. It must be noted that by taking out the higher quality product the price for the second quality product will not decrease. But, by leaving the high quality product mixed with the low quality product the price will not increase and the grower will earn the same low price for his entire product or while someone else in the logistics chain could possibly sort the product and take advantage of the higher quality product to make more money.

Two immediate needs include access of the farmers associations to proper packaging and stores that will allow the farmers to hold their product longer into the cold winter season. If the project can help one or two growers per association obtain reusable plastic crates and arrangements can be made for a return system for these crates from the super markets then this can act as a model to other growers to start making the investment necessary in packaging material to gain access to higher priced markets. We also need to investigate the current storage systems utilized by the growers to determine what can be done to increase the storage life of the apples. Currently the longer the apples are in storage the lower the price goes as the growers become worried that they will lose the product due to low temperatures so they dump the product onto the market at the last minute. This is inverse to the classical thinking of storing product. Storing product should allow the growers to maintain adequate quality until the volumes in the market decrease sending price higher due to increased demand. After a tour of the facilities being used the best facilities in each area will be designated and an attempt at a low cost adjustment to the stores to allow for longer storage will be done. After a cost analysis of this activity it could be highly beneficial to the project to release some funds and assist the growers in updating their storage facilities.

Experience in many different regions of the world shows that farmers have a tendency to be risk adverse. The challenge to any project working directly with growers is to find the one or two growers in the region who is willing to take risk and work with them to implement new beneficial and applicable technology. Another constant with farmers throughout the world is what I refer to as the "jealousy" factor. If one farmer implements new technology that increases his profit his neighbors will hear of it and will implement the technology the next year. The technology then will spread at an exponential rate throughout a region as long as it increases farmers revenue. Again, the key factor is to find the one or two farmers in each

region who are willing to take a risk, work with the farmers with a “hands-on” approach at the field or store level and increase his income, then, the others will follow. Also, once there is one success from the introduction of a new technology it becomes much easier to introduce and have accepted other new technologies. Finally any new systems developed for the farmers must be kept simple and based on applicable technology that is easily replicable based on the specific conditions of the region being worked in.

October 19, 2005

Field Visit

Location:	Gjilin
Association Name:	Fruiti
Contact person:	Agim
Activity:	Primary contact and facility inspection
Crop:	Fresh Apples
Area:	10.5 Hectares
Members:	11
Varieties:	Golden Delicious, Red Delicious, Granny Smith, Red Ida

Traveled to Gjilin to visit fresh apple storage facilities and to meet with farmers association representatives.

Storage Facilities:

The storage “facilities” are located around the family home of the farm owner. Multiple rooms are used that are located in three different areas. The farmer is using rooms in the basement of his house, a store room and a room in an unfinished building. The stores used can not be considered purpose built stores; rather the farmer is placing his product in any available enclosed space. The fresh apples are packed in locally produced wooden crates and used produce cartons. The apples are block stacked, floor to ceiling, with little to no air flow. The boxes are not placed on pallets in the stores. This is the traditional way of storing the fruit.

Packing:

Apples are packed directly into wooden crates and used cartons in the field at the time of harvest. The product is left outside overnight to bring the temperature of the fruit down and then transported to the stores. A basic quality sort is completed in the field.

Sorting / Grading:

The apples go through a quality sort in the field. The concept of quality is not well understood by the grower. The sort that is done consists of separating the severely damaged fruit, basically fruit that is not edible, from fruit that is edible. Inspection of the fruit in the stores showed multiple sizes, grade defects and condition defects in the crates and cartons. The farmer conducts additional sorting after one to one and one half months in the store to remove the fruit that is breaking down.

Findings:

The concept of post harvest handling is not understood by the growers. The production shows a range of fruit quality with a significant amount of fruit of good quality and condition. Sorting, grading, packing, packaging and storing are activities that have not yet been

properly introduced to the farmer. Upon discussion of the benefits of implementing a basic sorting and grading system with a re-organization of the stores the grower was very receptive and is willing to take a percentage of his harvested crop and re-sort and pack based on basic quality standards. Overall this grower is open to implementing new technology to improve the quality of his fruit. Based on discussions with Reshat of the KCBS office this grower is a leader in his community and provides technical production advice to many of the surrounding farms.

Recommendations:

The goal of implementing new technology at the farm level is to find a one or two growers in a community who are “risk takers” and work with these growers. This grower is willing to implant new technology and will open his farm to his neighbors so they can come and see the benefits of the new activities. The farmer is also interested in building a purpose built storage and packing facility, already has land purchased for this and is waiting for advice. The KCBS project needs to support this grower and use his facility as a model farm that can then be visited by other farmer associations to learn the benefits of the new technology. The first activity to implement will be to build basic sorting and grading tables, train the farmers on sorting, grading and packing systems, introduce basic quality standards and train them in proper storing techniques to improve the quality of their fruit after long term storage. Along with sorting and grading tables pallets need to be introduced to the farmer in his stores and access to proper packaging material needs to be investigated.

October 20, 2005

Field Visit

Location:	Ishtok
Association Name:	Pema
Contact person:	Hasn
Activity:	Primary contact and facility inspection
Crop:	Fresh Apples
Area:	20 Hectares
Members:	12
Varieties:	Golden Delicious, Red Delicious, Granny Smith, Red Ida

Traveled to Ishtok to visit fresh apple orchards and storage facilities and to meet with farmers association representatives.

Storage Facilities:

The primary storage facility is located adjacent to the family home of the farm owner visited. The stores, referred to by the grower as “magazines” is a purpose built building consisting of one large building separated into four rooms. The construction is of block walls, cement floor and tile roof. No consideration was given to the use of the rooms as a store. No insulation is used; the ceilings are open beamed with different materials being stored above the apples. The fresh apples are packed in locally produced wooden crates and used produce cartons. The apples are block stacked, floor to ceiling, with little to no air flow. The boxes are not placed on pallets in the stores. This is the traditional way of storing the fruit.

Packing:

Apples are packed directly into wooden crates and used cartons in the field at the time of harvest. The product is left outside overnight to bring the temperature of the fruit down and then transported to the stores. A basic quality sort is completed in the field.

Sorting / Grading:

The apples go through a quality sort in the field. The concept of quality is not well understood by the grower. The sort that is done consists of separating the severely damaged fruit, basically fruit that is not edible, from fruit that is edible. Inspection of the fruit in the stores showed multiple sizes, grade defects and condition defects in the crates and cartons. Once the product placed into storage it is not moved again until the time of sale four to five months later. The farmer explained that by moving the fruit it disturbs the dust in the room and this leads to increased breakdown of the product during long term storage.

Findings:

The concept of post harvest handling is not understood by the grower. The production shows a range of fruit quality with a significant amount of fruit of good quality and condition. Sorting, grading, packing, packaging and storing are activities that have not yet been properly introduced to the farmer. Upon discussion of the benefits of implementing a basic sorting and grading system with a re-organization of the stores the grower was very un-receptive and is not willing to change any of his current activities regarding post harvest handling. The grower visited is only one of twelve members of the association and the hope is another grower is more receptive to making basic changes in his activities can be found. Members of the association cooperate well together and share the use of different implements used during production. Based on a history of cooperation it might be possible to create a centrally located post harvest operation that can be used by all of the association members.

Recommendations:

The grower visited is very risk adverse and is not willing to make any changes to his current system. Even after lengthy discussions with the grower explaining the benefits and the minimal risk he will be exposed to he still was not in agreement to make any changes. Another visit to the farmers association will be conducted to find a grower receptive to new post harvest technology. Once a grower is found who is willing to implement the new technology the first activity to implement will be to build basic sorting and grading tables, train the farmers on sorting, grading and packing systems, introduce basic quality standards and train them in proper storing techniques to improve the quality of their fruit after long term storage. Along with sorting and grading tables pallets need to be introduced to the farmer in his stores and access to proper packaging material needs to be investigated. The farmers in the association are all located with in close proximity to each other. With the history of previous cooperation between the growers it is recommended to create a centrally located post harvest operation that will be used by all the growers in the association.

October 21, 2005

Office Work

Created design for basic sorting, grading and packing tables for use by the farmers associations for packing of fresh apples. Set specifications for the tables, created drawings with size and material specifications that can be given to a carpenter to build. Created a materials list for that sorting, grading and packing tables. Continued work on grading

manual with quality control report form, defects with explanations and good operating procedures for the sorting, grading and packing operation.

October 22, 2005

Continued work on post harvest manual and creation of systems for sorting, grading and packing operations that will be implemented at the farmer associations.

October 24, 2005

Field Visit

Location:	Peja
Association Name:	UVB
Contact person:	Hasn
Activity:	Initial contact with association
Crop:	Fresh Apples
Area:	15 Hectares
Tons:	200
Members:	13 total, 10 active
Varieties:	Golden Delicious, Red Delicious, Granny Smith, Ida Red, Melrose and some pear trees

Summary

This association has been growing apples for the past six years. The association has had assistance from other donor agencies in the past. The primary area of the association revolves around six members living in close proximity to each other and are all related. The cooperation within the association is good with production equipment, technology and stores being shared amongst association members when necessary.

Activities

Conducted discussions with some association members regarding crop, varieties, harvest systems, sorting / grading / packing systems and storage systems. Toured two storage facilities to inspect current conditions and to begin training in proper storage systems, reengineering needs and management systems. Introduced the concept of sorting / grading / packing systems and tables.

Findings

The association members understand that their current storage systems are not adequate to maintain optimum temperature and quality conditions. Association members explained that they would like to improve their storage systems but they do not have the funds to invest in post harvest handling systems. The sorting / grading / packing systems were generally accepted as a concept but the members want to see the system in use.

Recommendations

Implement the sorting / grading / packing system to show the practical applications and benefits of the tables and quality control concepts. Continue work with the association members to create three different storage areas, long term, medium term and short term stores utilizing locally available insulation products and implementation of storage management systems.

Location: Peja
Company Name: Local carpenter
Contact person:
Activity: Building prototype sorting / grading / packing tables

Summary

Met with a local carpenter to discuss the building of a prototype sorting / grading / packing table system. Presented designs, dimensions and materials list to the carpenter and obtained a quote on building of the system. Agreed upon conditions and the carpenter prepared for building of the tables.

October 25, 2005

Location: Peja
Company Name: Local carpenter and UVB association
Contact person: Hasn
Activity: Building prototype sorting / grading / packing tables, training of use of tables

Summary

Worked with carpenter on ensuring that the prototype sorting / grading / packing tables met specifications. Purchased material to act as padding between the wood surface of the tables and the apples to reduce the chance of bruising and mechanical damages. Completed two of five tables, transferred tables to UVB association and began training session. UVB association had limited boxes and further training was delayed to the next day.

October 26, 2005

Location: Peja
Company Name: Local carpenter and UVB association
Contact person: Hasn
Activity: Building prototype sorting / grading / packing tables, training of use of tables

Summary

Worked with carpenter on the completion of the prototype sorting / grading / packing tables. Took possession of final three tables and transported tables to the UVB association. Upon arrival at the association discovered that all the association members were at the local wholesale market selling their products. Worked with two sons of association members on storage systems and management. Toured two storage facilities and trained in proper spacing of boxes and pallets, use of water the floor to increased humidity and the importance of high humidity to the long term storing of fruit.

Traveled to the wholesale market and toured market inspecting local and imported apples and checking prices. Imported apples with high quality were being sold for 0.75 Euro cent per kilo, local apples in decent condition were being sold for 0.50 Euro cent per kilo and for local apples in poor condition 0.40 Euro cent per kilo (?).

October 27, 2005

Field Visit

Location: Peja
Association Name: UVB
Contact person: Hasn
Activity: Initial contact with association
Crop: Fresh Apples
Area: 15 Hectares
Tons: 200
Members: 13 total, 10 active
Varieties: Golden Delicious, Red Delicious, Granny Smith, Ida Red, Melrose and some pear trees

Summary

Set the work schedule to implement sorting / grading / packing systems for the final day harvest at the association. Harvest and packing teams were set up in the field and training commenced. An overview of the entire operation was discussed with the association members with new systems trialed as demonstration systems.

Activities

Training was conducted in using of harvest bags instead of steal buckets during harvest operations. The harvest supervisor is not convinced that the harvest bags are better than the metal buckets. His son used the harvest bags very efficiently, with minimal damage to the fruit and less stress to the harvesters.

The sorting / grading / packing tables were set in the fields and training with the labor teams implementing the new system after training. The packing team consists mostly of female family of association members. After the initial poor reaction to the system by the field supervisor that women workers had a very positive reaction. The reaction by the female labor was that the new system is more efficient, more comfortable to work with and will enable them to pack better overall quality of fruit.

Recommendations

Continue to work with this association in implanting the new systems prior to next harvest season. The focus must be on the female labor who has fully accepted the sorting / grading / packing system and the younger harvesters who have accepted the use of harvest bags. The harvest bags are the standard system used throughout the world apple industry and have been used on a limited based in Kosovo in the past. With continued practical training the benefits of both systems can be engrained into the minds of the association members. All association members want to make changes but are hesitant; with continued practical assistance they will continue to accept the new systems.

Location: Ishtoc
Company Name: Daut Farms
Contact person: Mr. Daut Blakaj
Activity: Farmer
Crop: Apples

Summary

This was my Initial contact with Mr. Dout. Mr. Dout has 6 hectares of fresh apples. Varieties include Ida Red, Melrose, Red Delicious, Golden Delicious and Granny Smith. Mr. Dout uses primarily carton boxes to store his product. He has used pallets to place his boxes on in the store to help with air flow and so water can be spread on the floor to help increase humidity. The store walls are made of brick with mud and straw on the inside of the bricks. This insulation is better than using only ordinary bricks but can still be improved. Mr. Dout uses a hydrometer to monitor humidity levels and has a thermometer in his store to monitor temperatures.

I recommended to Mr. Dout to increase air flow in his stores by removing different lines of boxes to allow air flow to reach the back of the room. Mr. Daut states that when the outside temperature is reaches negative 8 degrees Celsius that the inside temperature is 0 degrees Celsius. As a precaution when the air temperature falls below negative 8 degrees Celsius Mr. Dout uses heaters to minimize the chance of freezing.

October 28, 2005

Field Visit

Location:	Peja
Association Name:	UVB
Contact person:	Hasn
Activity:	Initial contact with association
Crop:	Fresh Apples
Area:	15 Hectares
Tons:	200
Members:	13 total, 10 active
Varieties:	Golden Delicious, Red Delicious, Granny Smith, Ida Red, Melrose and some pear trees

Summary

Re-set long term storage system at one of the UVB association farms, cleaned area for storing, set pallets in proper spacing worked with grower to show how to maximize air flow in stores and to utilize temperature monitoring equipment to manage temperatures of stores by adjust air flow channels.

October 29, 2005

Office

October 31, 2005

Field Visit

Location:	Gjilin
Association Name:	Fruiti
Contact person:	Agim

Activity: Deilivery and final adjustments to sorting and grading tables, initial training on use of sorting and grading tables, second contact with farm

Crop: Fresh Apples

Area: 10.5 Hectares

Tons: 110

Members: 11

Varieties: Golden Delicious, Red Delicious, Granny Smith, Ida Red, Melrose, Gala (300 trees)

Summary

This was the second visit to the farm. The primary purpose was to make delivery of the basic sorting / grading / packing tables and to complete these tables, working with the members of the association, to meet final specifications. More members of the association were present for this visit, which was encouraging. The Fruiti association members cooperate well with each other and are the most open association in regards to accepting new technology of the three apple associations in the KCBS project.

Activities

The sorting / grading / packing tables needed to have protective padding and vinyl coverings applied to the working surface areas prior to commencement of the apple handling process to protect the apples from damages such as bruising and mechanical damage from sharp edges. The activity was conducted with the assistance of the members of the association, which allowed all the members to gain hands on experience in the development of a new system being implemented at their facility. During this process training was conducted regarding the concept of the line and the reason for the different design concepts. It was emphasized to the members of the association that the system that was being implemented was a prototype. The primary concern for the association members is to understand the system, how the product flows and the purpose of the system. The members were encouraged to begin thinking how to change the system to better meet their specific needs and to meet the quality standards of their specific markets.

Findings

The current system for apple packing is that the fruit is packed directly into either wood crates or used carton boxes in the field after harvest. Basic sorting / quality grading is done during the "field" packing of the boxes. The sorting / grading done in the field consist only of ensuring that the most severely damaged fruit is not packed. No sorting or grading for quality standards such as size, color or shape or for no severe condition damages is done. The fruit is stored in three different locations around the main living areas of five of the association members. The storage conditions are primitive at best and have not been purpose built for the storing of horticultural product. Upon discussions with the association's members it was found that members of the association worked with an automated sorting / grading / packing line before the war and packed 30 – 40 tons of fresh apples per day. The packaging material being used by the association generally consists of either used wood crates or used cartons. The cost for this packaging material costs between 0.10 Euro cents and 0.50 Euro cents. The maximum number of boxes that can be obtained at one time is between 50 and 100 units or between 700 and 1,000 units per month.

Recommendations

In regards to the quality of the fruit found in the stores it was recommended that the fruit be "re-packed" separating fruit by quality standards and discarding severe condition defects.

Fruit needs to be graded into two quality specifications, "premium" or number one quality and number two quality. The number one quality fruit should earn a premium price for the growers while the number two quality price will stay as is. It was recommended to the growers to take out any condition defects, no matter how small, and to sell this fruit immediately.

The stores need immediate improvement of the association wants to store fruit for any length of time and expect the fruit to meet basic quality and condition standards three to four months from harvest. At least one store needs to be re-engineered to act as a "long term" store with better insulation and basic ventilation systems. One store needs to be set as a "medium term" store and one other store use for "short term" storage.

November 1, 2005

Field Visit

Location: Gjilin
Association Name: Fruiti
Contact person: Agim
Activity: Training on use of sorting / grading / packing tables, establishment of quality standards
Crop: Fresh Apples
Area: 10.5 Hectares
Tons: 110
Members: 11
Varieties: Golden Delicious, Red Delicious, Granny Smith, Ida Red, Melrose, Gala (300 trees)

Summary

The final adjustments to the sorting / grading / packing tables were completed and the line was set for use. A training session with five members of the association was conducted that covered the system of the sorting / grading / packing line. Basic quality standards, based on local buying conditions, were set and two grade standards with three sizes per grade were defined.

Activities

All members of the association participated in the sorting / grading / packing of the fruit. First the system of placing the bulk apples on the sorting table with out damaging the fruit was discussed, shown and then each member of the association completed this task on their own to ensure that they understood the process and could do it properly. Sorting of the fruit then commenced. Quality and condition standards were explained and shown to the association members and again each member was worked on this activity to ensure they understood what needed to be removed during this process. All association members conducted grading of the fruit also and finally packing of the fruit into both wood boxes and cartons was shown and then each member completed boxes on their own to ensure they understood. Four different varieties of fruit were sorted, graded and packed; one yellow variety, one green variety and two red varieties. After school was released for the day many of the children of the association members also participated in the activities and were trained in all the different activities as well.

Findings

At the beginning of the activity there was some hesitancy on the part of the members of the association. The members believed in the system but needed it to be shown to them. After the sorting / grading / packing line was put into practice the association members were fully convinced and started to discuss with me how the separation of the fruit into number one and number two qualities will improve their earnings and their reputation in the market. All of the members said that they will continue implementing the system this year to “re-pack” the fruit they currently have in the stores and then implement the system next season in the field during harvest. The association members have already made some recommendations on how the tables could be improved and will make more of the tables for next years harvest.

Statistics

Total Tons:	110
Total Kilos:	110,000
Current ratio of #2 and #1 quality:	100% #2
Current sale price #2 fruit:	0.40 Eurocent / kilo
Ratio of #1 & #2 fruit after repack:	65% #2, 35% #1
Estimated sale price of #1 fruit:	0.60 – 0.70 Eurocent / kilo
Average estimated sale price of #1 fruit:	0.65 Eurocent / kilo
Previous fruit value:	$110,000 \times 0.40 = 44,000$ Euro
Value after repack:	$71,500 \times 0.40 = 28,600$ $38,500 \times 0.65 = 25,025$
Total:	53,625
% increase:	18%
Monetary increase:	9,625 Euro

Recommendations

Re-engineer at least of one the stores to become a “long term” store. Continue working with the association to re-pack the remaining fruit in store, and then place the premium fruit into the long term store. Monitoring of the prices achieved for both grades of fruit throughout the selling season is very important to begin to build a data base local market prices based on time of year and quality of fruit.

November 2, 2005

Field Visit

Location:	Gjilin
Association Name:	Fruiti
Contact person:	Agim
Activity:	Storage condition training and implementation of re-engineered storage facility
Crop:	Fresh Apples
Area:	10.5 Hectares
Tons:	110
Members:	11
Varieties:	Golden Delicious, Red Delicious, Granny Smith, Ida Red, Melrose, Gala (300 trees)

Summary

As fruit went through the sorting / grading / packing operations space in one of the storage areas became available. Discussions were conducted with the associations members and training conducted regarding the proper way to store fruit, the basic needs on a store in relation to insulation, ventilation, pallets, humidity control and monitoring and temperature control and monitoring. The association understood the importance of this information and was willing to make necessary changes immediately to help improve the storage condition of their fruit.

Activities

After discussions with the association regarding the importance of having better storage conditions material was purchased to insulate one of the storage areas to make it a long-term store. The total cost of the materials needed to re-engineer the storage came to approximately 300 Euro not including labor of which the KCBS project paid 150 Euro and the association paid 150 Euro and the cost of the labor. A local contractor was hired by the association to install the insulation material and to install a ventilation fan. The local contractor hired had previous experience working with the United States military in insulation installation and was well qualified for the work.

Additional training was conducted on the importance and use of hydrometers for monitoring humidity levels and temperature recording devices for monitoring temperature levels. The beginning of a store management system was outlined with additional training to be conducted over the period of two to three days.

Findings

The importance of better storage conditions has been well received and understood by the members of the association. One of the key successes of this activity was the willingness of the association to share in the cost of the re-engineering of one of their stores. The association members paid one half of the material costs and one hundred percent of the labor cost. This is an excellent indication of the commitment of the association to improving their activities. By the end of the working day approximately 15% of the store had been insulated with expected completion to be in four days. Based on better storage conditions combined with the re-packing of the fruit to take out condition defects there will be an increase in the value of the fruit combined with a reduction of the loss of fruit for a net affect of an increase in the total monetary income to the association members.

Statistics

Total Tons:	110
Total Kilos:	110,000
Expected losses due to dehydration:	10%
Expected losses due to condition problems:	10%
Increase in the value due to better quality:	30%

Recommendations

Continue monitoring the progress of the re-engineering of the storage facility. Create a system to conduct daily monitoring of outside humidity and temperature, inside humidity and temperature and fruit pulp temperature so data can be collected to help refine the temperature and humidity management systems. Work with the association in the proper

placement and spacing of pallets and boxes in the store to maximize airflow. Ensure that the association members understand the critical importance of different temperature ranges and how to monitor and manage them.

November 3, 2005

Field Visit

Location: Gjilin
Association Name: Fruiti
Contact person: Agim
Activity: Ambient and pulp temperature monitoring, follow up on status of re-engineering of storage facility
Crop: Fresh Apples
Area: 10.5 Hectares
Tons: 110
Members: 11
Varieties: Golden Delicious, Red Delicious, Granny Smith, Ida Red, Melrose, Gala (300 trees)

Summary / Activities

Follow up on the actual ambient and pulp temperatures of the fruit found in all three of the storage facilities currently being used. Temperature readings, both ambient and pulp, were taken throughout each storage area as well as possible and the findings compared to each other and to what is optimum storage conditions for apples. Reviewed the progress of the re-engineering of the storage facility.

Findings

As expected the temperature readings showed for both ambient and pulp temperatures well outside acceptable ranges for storage of fresh apples. Due to the fluctuation of temperature between day and night and the mismanaging of the airflow in the storage rooms pulp temperatures were found to be on average 10.0 degree C with ambient temperatures averaging 11 degrees C. Of the four storage areas one only showed pulp temperatures lower than the ambient temperature. It is expected that the pulp temperatures would be lower than the ambient as the fruit become colder over night when temperatures have dropped. The other two stores showed pulp temperatures higher than ambient, which is an indication of poor airflow and ventilation not allowing the cold night air reaching the majority of the fruit.

Statistics

Store	Outside Ambient	Inside Ambient	Pulp
1	10	11	9
2	9.5	10.6	11.5
3	9.5	10.6	11.5
4	9	7.2	7.9

Recommendations

Continued training in storage management and daily monitoring and recording of outside ambient, inside ambient and pulp temperatures of the stores. The temperature data is critical for the farmers to begin to understand how to manage temperatures in their current situation to maximize the life of the fruit over long-term storage.

November 4, 2005

Field Visit

Location: Rahovec
Company Name: Pisha
Contact person: Selajdin
Activity: Wood box manufacturer
Crop: Fresh product

Summary / Activities

Visited Mr. Selajdin's company, Pisha, located in Rhovec, that manufacturers wooden crates that are used as packaging material for fresh produce. The facility has relatively modern equipment for the Kosova reality.

Findings

During discussions with Mr. Selajdin he informed me that the boxes he is currently making are popular with the local agriculture producers and that business is good. He is able to make a range of different sizes but make primarily boxes that are close to 30 cm x 50 cm and designed for either one layer or two layers of product. Mr. Selajdin understands that carton boxes are being used in the industry and that the trend in Europe is to use carton or returnable plastic boxes when packing fruit. Mr. Selajdin is open to gaining more experience regarding cartons and returnable plastic crates. He informed me that a company had tried to manufacture and sell plastic crates in Kosova in the past but that it was not successful. Mr. Selajdin has voiced an interest in cooperating with or even joining some of the apple producer associations.

Recommendations

Mr. Selajdin has shown interest in learning more about new packaging styles and about internal packaging requirements for different crops and in cooperating with or joining associations working with the KCBS project. Mr. Selajdin should be encouraged to join fruit producer associations working with KCBS to help extend the "cluster" of businesses that an association needs to fully serve its members. It would be advisable to have link visits with Mr. Selajdin to different grower associations so he can meet with members and explain his products. If Mr. Selajdin becomes a member of an association then some sort of discount for association members may be advisable.

As Mr. Selajdin is interested in learning more about new inner and outer packaging styles and systems it would be advisable for him to participate on a link visit, along with members of growers associations, to a carton box manufacturer located in Albania. Mr. Selajdin is open to representing packaging companies in Kosova and provides a valuable service to the industry if through his contacts he can provide wood and carton packages as well as a range of internal packaging supplies.

Location: Ishtok
Company Name: Doubt Farms
Contact person: Mr. Dout
Activity: Farmer
Crop: Apples

Summary

Mr. Doubt currently is the largest private operated apple orchard in Kosovo. Mr. Dout has six hectares of fresh apples with a range of varieties. Mr. Dout is a leader in his community and has been a focus of attention for the attempt to implement new sorting / grading / packing technology and new storage systems and management. The meeting was held to discuss plans to work with his farm during the week of November 7 – 11 in sorting / grading / packing and storage systems. Mr. Doubt is very open and interested in working with the KCBS in implementing new storage systems and management. After a tour of Mr. Douts facility the previous week it was found that he is using pallets to store boxes on, using water on the floor to increase humidity and other activities to improve the storageability of his crop and thus the quality. Mr. Doubt is not interested in working with the sorting / grading / packing system and he believes that his system is more than adequate for now and there is no need to change. Work will be done with Mr. Doubt on storage systems and management and further discussions will be held with him to try and convince him of the benefits of the sorting / grading / packing system.

November 5, 2005

Office

November 7, 2005

Location: Gjilin
Association Name: Fruiti
Contact person: Agim
Activity: Ambient and pulp temperature monitoring, follow up on status of re-engineering of storage facility
Crop: Fresh Apples
Area: 10.5 Hectares
Tons: 110
Members: 11
Varieties: Golden Delicious, Red Delicious, Granny Smith, Ida Red, Melrose, Gala (300 trees)

Summary

Field visit to check on progress of installation of new insulation system and conduct training in temperature monitoring and storage management.

Activities

Reviewed all new insulation systems and worked with contractor to advise him on the best system of dealing with windows and doors during insulation installation. Recommendations were made to make the insulation for a glass door and glass window removable to take advantage of the suns radiation during very cold days to help keep the temperature of the

room from going below freezing. Reviewed the ventilation system and advised to add a small wall ventilation system to help remove ethylene gas and accumulated heat.

Conducted temperature and humidity monitoring activities while explaining the process to the farm owner. Created a storage "map" for recording of both pulp and ambient temperatures inside and ambient temperatures outside of the storage. Walked the farm owner through the map and explained the system and how to best implement it. Held a training session with the farm owner and two other association members on the use of temperature probes, calibration techniques and the use of the storage map in managing the temperature of the storage.

Findings

The farm owner has been keeping track of ambient air temperature inside the storage for the past four days, ever since the beginning of the insulation installation. He reported that the inside ambient temperature is currently not raising about 10 degrees Celsius during the day with only three quarters of the insulation installed. Previously the storage room, with out insulation, was raising to between 15 and 18 degrees Celsius during the day. This result will help keep the apples at a constant temperature that will increase shelf life and overall quality after long term storing.

A follow up field visit will be conducted in conjunction with a link visit between this association and associations in Peja and Ishtok. The link visit will show the successful use of the sorting / grading / packing tables and the use of insulation and store management in enhancing fruit quality in long term storage.

Recommendations

Follow up with the association on the prices they are obtaining after apples have been repacked into a premium and number two boxes.

November 8, 2005

Location:	Ishtoc
Company Name:	Dout Farms
Contact person:	Mr. Doubt
Activity:	Farmer
Crop:	Apples

Summary

Field visit to work with temperature management and store management for long term storage of apples. Outside temperature was 9.5 d C, inside ambient air temperature ranged from 8.9 – 10.3 d C. The difference in ambient air temperature inside is an indication of poor airflow in the store and different levels of efficiency in the insulation of the room. The highest ambient temperature reading found also coincided with the lowest fruit pulp temperature found. The location in the room of the temperature check is next to a floor vent that was left open. The night time air temperature gets below 1 d C and this brought the fruit pulp temperature down but by leaving the vent open during the day which allowed the warm day air into the room the air temperature was raising. Pulp fruit temperature found in the storage ranged from 8.0 – 8.5 d C. The consistency of the temperature is misleading as the room is block stored and the fruit temperature reading were taken from fruit on the one aisle passing through the middle of the storeroom. Temperature reading must be taken throughout the room to ascertain the true efficiency of the insulation system.

Recommendations

After working with the grower on the issues of temperature reading and recording, temperature management and storage management it was recommended to the grower to make additional air flow passages in the store. Also it was recommended to create at least a 10 centimeter gap between the boxes and the walls of the store to allow for better air flow. The grower has agreed to all of these measures and the project will supply a ventilation fan and a floor fan to help create better air circulation in the store.

November 9, 2005

Field Visit

Location:	Peja
Association Name:	UVB
Contact person:	Hasn
Activity:	Initial contact with association
Crop:	Fresh Apples
Area:	15 Hectares
Tons:	200
Members:	13 total, 10 active
Varieties:	Golden Delicious, Red Delicious, Granny Smith, Ida Red, Melrose and some pear trees

Summary

Purchased and delivered a ventilation system to be used in the primary medium term storage facility. Conducted training on storage temperature readings, temperature management and overall storage management. The facility is having improvements made with new doors being hung to help minimize the effect of the low night time air temperatures. The association representatives discussed the need for additional insulation and the process of implementing new changes for the future to improve the storage conditions.

Activities

Walked through the store and conducted temperature readings for ambient and pulp temperatures. Worked with one of the association members to discuss the relationship between outside ambient temperature, inside ambient air temperature and fruit pulp temperature. A map of the store was created and the system for filling in the map with temperature records and how to analyze the map to help manage the fruit pulp temperatures was conducted.

Findings

After working with the association members on the storage and temperature management issues I discussed the use of the sorting / grading / packaging tables. The tables are being used by the association members while conducting repacking of their apples prior to sales. This was not the original intent of the tables but has proven very useful to the association members. They are capable of repacking more fruit in less time with significantly less stress to the workers. This is an excellent example of new technology being implemented to meet the specific needs of the growers and of the growers starting to think for themselves how they can implement new systems to meet their specific needs.

Recommendations

Follow up with the association on a weekly or bi weekly basis to collect temperature data and to advise the growers on how to best manage the store temperatures. Work needs to be done with the growers prior to the next apple harvest season to ensure that their storage facilities are updated or that a purpose built storage facility is in place for use to the two associations in the region.

Location: Ishtoc
Company Name: Dout Farms
Contact person: Mr. Doubt
Activity: Farmer
Crop: Apples

Summary

Purchased and delivered a ventilation and air flow fan for use inside the apple storage facility. Conducted training on the best placement of the fans to achieve the desired results for increasing airflow and maintaining more consistent temperatures throughout the storage facility.

November 10, 2005

Meetings with Swiss group to discuss ways to cooperate with growers that both projects are working with. Gave an outline of the activities that I have worked on over the past month and the technology systems implemented at the farm level. Conducted an overall review of the post harvest handling situation that I have found at the field level and my recommendations of different activities that can be conducted to improve the problems found. Discussed different low technology and inexpensive systems that are have been applied such as the use of sorting / grading / packing tables to enhance the efficiency of the packing systems and to be able to achieve better overall quality and homogeneity in the packed boxes. Also outlined the systems of temperature management and storage management that I have been training the growers in.

November 11, 2005

Summary

Location: Gjilin
Association Name: Fruiti
Contact person: Agim
Activity: Ambient and pulp temperature monitoring, follow up on status of re-engineering of storage facility
Crop: Fresh Apples
Area: 10.5 Hectares
Tons: 110
Members: 11
Varieties: Golden Delicious, Red Delicious, Granny Smith, Ida Red, Melrose, Gala (300 trees)

Field day in Gjilan with the Fruiti association.

Held a field day for introducing the new technologies implemented at the Fruiti association. Growers from the Fruiti association participated along with the COP of the KCBS project and representatives of Inter Cooperation. A complete explanation of all the new systems implemented at the farm was conducted. New systems included new sorting, grading and packing tables, new insulation of one of the storage facilities that will be used for long term storage of apples and training on temperature, humidity and storage management systems. The day was very successful and new growers have become interested in working with the systems that have been implemented.

November 12, 2005

Summary

Traveled to the Gjilan wholesale produce market to check on the prices for the quality sorted fruit from the Fruiti association.

November 14, 2005

Traveled to Peja to meet with possible new growers interested in improving post harvest systems in apples and other crops.

November 15, 2005

Debriefing presentation at KCBS to the KCBS staff and USAID representatives and beginning of travel.

November 16, 2005

Travel Day

KCBS

Short Term Technical Assignment

Debriefing

November 15, 2005

Peter L. Wetzel

Purpose of STTA

- Initiate post harvest handling methods and improved storage conditions in order to provide the additional storage life necessary to lengthen the marketing season for apples.

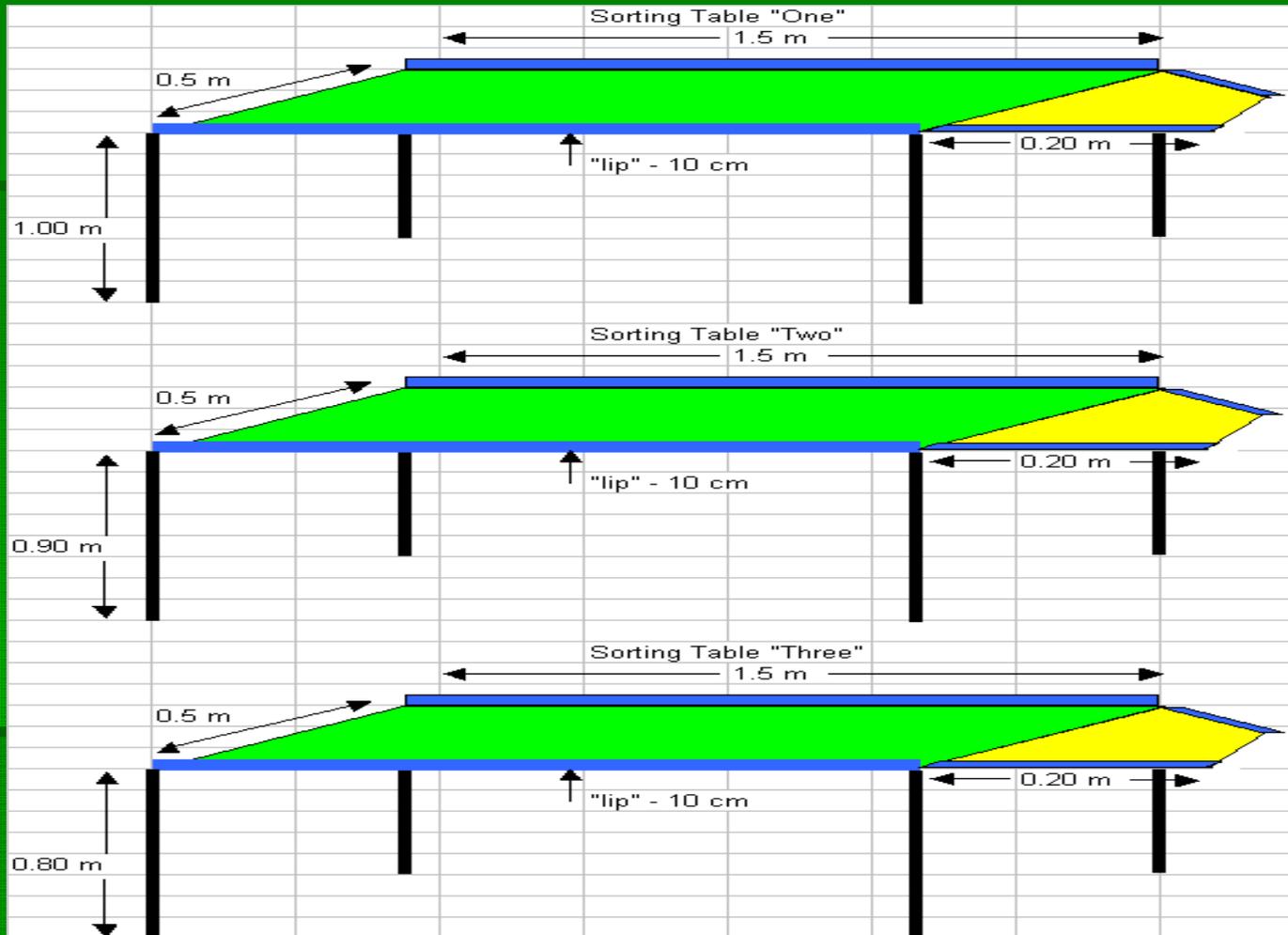
Association / Grower Initial Contact

- Gjilan Association
 - 11 Active Members
 - 110 Tons
- Peja Association (Minority)
 - 10 Active Members
 - 300 Tons
- Ishtok Association / Private Grower
 - 12 Active Members
 - 500 Tons (200 Association, 300 Private Grower)

Sorting Tables

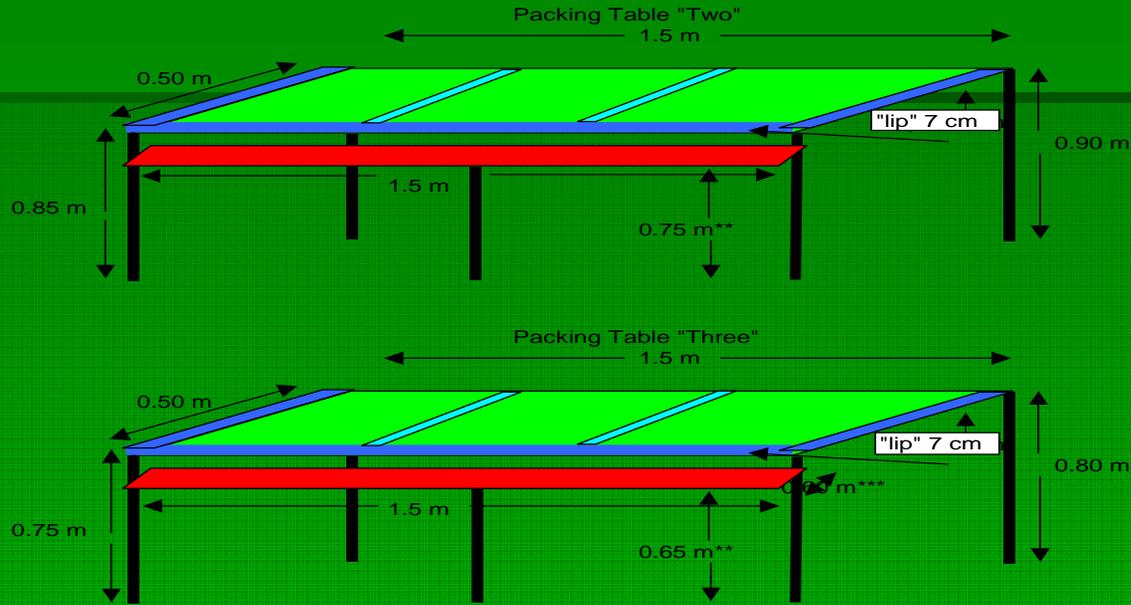
- Purpose
- Design
- Building
- Implementation
- Grade Standards
 - Class I
 - Class II

Design



-  10 cm high "lip" or edge on both sides of the table and both sides of the transfer chute covered in vynal and padding
-  Table top covered in vynal and padding
-  On hinges so they can be folded up for easier storage or removable
-  legs made of pipe with telescoping bottom piece adjustable by 5 cm to adjust height
Legs should be able to separate from table easily for storing purposes.

Design



Check before final design!

 Edges "lips" of tables, 7 cm high, covered in vynal with padding

 Table tops, covered in vynal and padding

 Wood inserts, 50 cm in length, 5 cm wide, 7 cm high, covered in vynal and padding

 Wood shelf for placing boxes on, 0.60 cm wide but check width for comfort of packing before making final decision. Preferably on hinge for easier storgae

 Legs made of pipe with telescoping bottom piece adjustable by 5 cm to adjust height for each table. Legs should be able to separate from table easily for storing purposes.

Materials List

 Covered plywood tops - 5 pieces, each 1.5 m x 0.50 m

 Covered wood sides - 2 x 3 = 6 x 1.5 m length for sorting tables, 1 x 2 = 2 x 1.5 m for packing tables, 2 x 2 = 4 for x 0.50 m for packing tables

 Coverd wood inserts - 3 x 2 = 6 x 0.50 m

 Wood shelf - 1 x 2 = 2 x 0.60 cm width x 1.5 m length

 Metal legs - 5 x 2 = 10 for packing / grading tables, 4 x 3 = 12 for sorting tables

Building Sorting Tables



Old Sorting / Packing Implementation



New Sorting / Packing Implementation



Grading of Fruit



Stores

- Problems

- No or Poor Insulation
- No or Poor Ventilation
- No or Poor Temperature Monitoring
- No or Poor Humidity Monitoring / Management
- No or Poor Management

Insulation Improvement

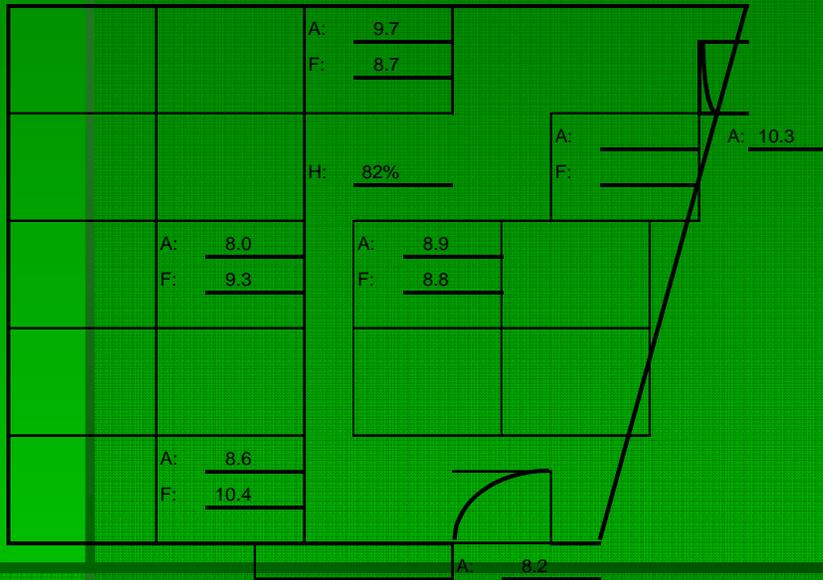


Ventilation Improvement



Temperature Monitoring / Management

Pallet Spacing and Temperature Map



Date	Air 1	Fruit 1	Air 2	Fruit 2
Nov. 3	11.4	9.0	11.8	12.5
Nov. 7	9.7	8.7	8.6	10.4
Nov. 11	9.8	8.5	10.2	9.6



Date: November 7, 2005

Time: 11:00:00 AM

Person: Peter L. Wetzel

Note: All temperatures are in degrees Celsius
 "A" - Ambient Air Temperature
 "F" - Fruit Pulp or Internal Fruit Temperature

Statistics - Volumes

Individual Farm Example			Total KCBS Associations Example		
Harvest	110,000	Kilos	Harvest	900,000	Kilos
Current Losses			Current Losses		
No Sorting	10%		No Sorting	10%	
Improper Storage	20%		Improper Storage	20%	
Total	30%		Total	30%	
Total Volume Loss	33,000	Kilos	Total Volume Loss	270,000	Kilos
Saleable Volume	77,000	Kilos	Saleable Volume	630,000	Kilos
Loss Reduction			Loss Reduction		
Sorting			Sorting		
Old System Losses	10%		Old System Losses	10%	
New System Losses	5%		New System Losses	5%	
Storage			Storage		
Old System Losses	20%		Old System Losses	20%	
New System Losses	5%		New System Losses	5%	
Net Volume Gain%	20%		Net Volume Gain%	20%	
Total Volume Gain	22,000	Kilos	Total Volume Gain	180,000	Kilos
Sales			Sales		
Old System Volume	77,000	Kilos	Old System Volume	630,000	Kilos
New System Volume	99,000	Kilos	New System Volume	810,000	Kilos

Statistics - Value

Farm Example	Volume in Kilos	Class II Price Per Kilo	Class II %	Class II Value Euros	Class I Price Per Kilo	Class I %	Class I Value
Old System	77,000	0.40 Euro	100%	33,800	0	0	0
New System	99,000	0.40	65%	25,740	0.65	35%	22,523
Total New System Value	48,263		Value Increase	17,463		% Increase	36%
KCBS Associations Example	Volume in Kilos	Class II Price Per Kilo	Class II %	Class II Value Euros	Class I Price Per Kilo	Class I %	Class I Value
Old System	630,000	0.40 Euro	100%	252,000	0	0	0
New System	810,000	0.40 Euro	65%	210,600	0.65 Euro	35%	184,275
Total New System Value	384,875		Value Increase	132,875		% Increase	36%

Additional Inputs

- Packaging
 - Outer
 - Inner
- Box Maker
 - Currently only wood boxes
 - Willing to represent carton manufacturer
 - Willing to join associations to help create “cluster” within associations
 - Link visit to USAID / SBCA project in Albania carton manufacturer

Growth In Horticulture

- Finding the one risk taker
- The “jealousy” factor
- Exponential growth
- Time is needed

Donor Agency Cooperation

- Meetings held with Inter Cooperation to coordinate activities
 - Working with same growers
 - Inter Cooperation working in production & introducing new varieties
 - KCBS coordinating with post harvest technology assistance to Inter Cooperation
 - Inter Cooperation participated in KCBS association field demonstrations for sorting / grading / packing tables, temperature improvement and storage improvement

Final Success Story - Gjilan

- 0.10 Increase only due to proper sizing
- Increased customer confidence in quality
- Increased whole sale market sales
- Super market direct sales, Mr. Burim Bajrami – Venesa supermarket owner
- New packaging styles being used
- Using sorting table for display
- Association working together



Thank You For Your Time

