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Work organization and economic analysis of the postharvest of an unique Hungarian product

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Summary: We have viewed a business in the south of the Great Plain Region from an economic point of view in 2004-2005. The main activity there is pear growing and storage. Four varieties of different time of ripening and storing are grown there. We have measured all the relevant activities, worked out a local normative and prepared a detailed technology. The economic evaluation was based on this data. Activities, like disinfection, pre-storage disinfection and selection, in-storing and out-storing, classification after storage, packaging, as well as loading trucks, were monitored by variety. Storage loss was determined and widely varied according to varieties, length of storage and time of out-storing. Different varieties resulted in different quality classes after storage. Price depended on the quality classes. Economic evaluation was carried out when all the relevant costs and revenues were known. Fixed and variable costs of storage were determined, break-even point was calculate and the market position of the product was evaluated.

Key words: pear-storage, economic evaluation, work organization

Introduction

The vineyards and the orchard plantings between the river Tisza and the river Danube abounded in different kinds of pears. The microclimate and the brown sandy soil assure good conditions for growing pears. The region of Kecskemét, Nagykőrös and Kunfehértó were traditionally considered to be famous fruit growing areas. Already in the 19th century, pear varieties of good quality were grown in these areas that even the vice-bailiff of the county got them as a present (*Fodor*, 2004).

Nowadays the pear-growing centre of the Great Hungarian Plain is Kunfehértó. The pear from Kunfehértó is successful because the rainfall, the soil and the nutrient the pear needs are present in this area. Having chosen a good variety of pear, the local people started to grow pear successfully on the loess and sandy soil. The pears grown in the gynoecium of Kunfehértó were selected from one generation to the other (*Nyéki*, et al, 2002).

The especially winter pears are the most delicate, the autumn ones are less delicate, however, the summer pears cannot be stored but they ripe early and they are tasty and full of flavour. The pear is harvested by hand that requires a great expertise (*Soltész*, et al, 2003). Storage is an important part of fruit production. As far as pear fruit is concerned this question is even more important as certain varieties (especially those matured in autumn and winter) can only be consumed and enjoyed after cold storage (*Sas*, 1986).

A further function of storage is that the fruit may stay on the market and the period of consumption is prolonged. Especially important this matter when the buyer needs continuous shipment (*Hajduné* et al., 2000). By storing fruit, a higher profit can be realised. In some cases vast amounts of fruit, at the time of harvest, can be saved from selling it at a low price. A valuable, up-to-date construction is needed that requires necessary implementing resources (*Gonda*, 1995, 2000; *Holb*, 2005).

In this recent article I wish to present the main management solutions and their profitability of growing in a case study.

Materials and methods

Conditions of the enterprise

In our study we processed the data of a small enterprise in Bács-Kiskun County, where the pear crop, grown on 50 hectares, is stored. The orchard is 14 year old. Four pear varieties are grown that differ in ripening and storing time. Data concerning storage of different varieties are shown in *Table 1*. The 1000 ton-capacity storage was built in 1994, its atmosphere is not controlled only the temperature and humidity is adjusted. The cooling medium used is ammonium. The store comprised 6 rooms and a corridor. The area of one room is 116 m^2, the total net area is 696 m^2. In addition there is a 105 m^2 corridor and a 528 m^2 room for manipulation. The total net area is 1452 m^2 with the height of 5.3 m. The thickness of the wall is 0.5 m. 0 °C and 92–94% relative humidity were maintained during storage. The elements of cooling system is shown in *Table 2*.

Methods of evaluation

All the relevant actions were considered and evaluated, furthermore, the local normative and detailed technology was defined. These served as basis for the economic

Table 1. The characteristics of different stored pear varieties (2004–2005)

Variety	Date of harvest (hectare)	Area Yield	Yield (ton)	End of storage
William	August 3	10	133	November 2
Bosc Kobak	September 2	15	246	January 2
Packham's Triumph	November 3	15	333	March 3
Hardenpont	October 1	10	164	March 1

Table 2. Equipment applied equipment in pear storage

Name	Type	No of units	Nominal output
Cooling compressor	2V4/140-11	2	244 KW
Condensator	AVAKO-200	2	279 KW
Air-cooling	SM-125-16-8	30	19 KW
Ventillator	AV-63-1440-12	30	9000 m^3/h
Ammonia pump	D 412 H	2	100 dm^3/min

evaluation. The loss during storage varied between varieties and length of storage. Varieties sold belonged to different quality classes, their price varied according to the date of sale. By computing costs and incomes, profitability was calculated according to storing unit and stored quantity. Fix and variable costs, the return on storage, the level of cost and the profitability of storage were calculated.

As unique Hungarian product and market position of pear were considered too. We evaluated the strong as well as the weak points and the possibilities of development in the area of Kunfehertó.

Results and discussion

Characteristics of pear storage

Synchronising harvest and storage. Success of storage largely depends on the quality of fruit harvested. This is why picking workers are qualified and well paid. Damage caused by harvesting was supervised closely. Those who do too much harm to the fruit are excluded. Transport is also performed gently, roads were improved before harvest, loading and unloading of fruit was performed by fork lift trucks. In this given farm, the front-yard of the storage is paved, and transport is done by IFA trucks. Pear is picked into small containers that can maximally loaded by 280 kg fruit. Containers are unloaded by fork-lift trucks and transported to FMC machine where the pear is disinfected.

Disinfecting. The FMC container's capacity is 2000 litre (STOP SCALD etoxyanin effective agent, 0.25% concentration). It is important to emphasise that after every 100 ton of pear, new solution has to be mixed (for the total 876 tons of fruit altogether 18000 litre solution). The variety 'William's' yield was 133 ton what was harvested in two days. For a daily 66.5 tons of fruit 238 crates are needed. The IFA truck can load 15 containers, so transport vehicles must return in 38 minutes. The duration of tretment per container was 5 minutes. The transport of the disinfected containers and the loading is done by different fork-lifts. The normative of these lifts: 3.36 t/hour. The normative of the loading fork-lifts is 2.24 tons/hour. The yield of 'Bosc kobak' variety was harvested in four days. For the transport 220 containers are needed, the normative of one vehicle is 40 minutes. 'Packham's Triumph' variety's 333-ton yield was harvested in five days, and for the continuous processing and disinfection the IFA trucks had to return in 38 minutes. 'Hardenpont' variety yielded 164 tons of fruit and it took the pickers 3 days to harvest and store. Daily storing amount was 55 tons, which assumes 46 minute turns of the vehicles.

Organising, preparing operations. It is basically necessary to check the storing rooms thoroughly. Proper technical conditions of storing must be ensured (isolation, spare parts etc.). Rooms must be disinfected, cleaned and ventilated. All these should be terminated before the first time of storing (3 August). After storing, rooms are closed and ventilated thoroughly (*Ferencz,* 2000).

Storing order. The six rooms make altogether 3688.8 m^2 storing capacity. There are 99 pallets in one room with 6 storeys of pear on each pallet that is altogether 1680 kg pear (6 x 280 kg). An important issue was: do not mix varieties. Another important matter is that no stored fruit should be manipulated until it is stored out, that is a newly loaded amount of pear should not neighbour an already stored one. 'William' makes 79 pallets resulting 80% utilisation of the place. In 'Hardenpont's case, in the second room this index is 87.7%. 'Bosc kobak' makes 146 pallets altogether in two rooms (3^{rd} and 4^{th}) resulting 100% and 47.5%, respectively. 'Packhams' fill exactly the 5–6^{th} rooms. The average utilisation of the room 6 is 87.7%.

Management of sorting

Sorting is done by an FMC type of machine. The average number of workers is 60. The capacity of the machine is 6.5 tons per hour and divides four quality categories. Its operating cost is 2950 Euro and the labour cost is 551 Euro. Workers put the sorted pear into cases and assure proper technical conditions. Woman workers put pears one by one into M30 cases. Containers contain 280 kg pear, the machine processes 23.2 containers hourly, therefor 2 fork-lifts are necessary. For 'Williams' 20.4 hours (2 days), for 'Bosc kobak' 37.8 hours (4 days), for 'Packham's Triumph' and 'Hardenpont' 51.2 hours (6 days) and 25.2 hours (3 days) respectively. Quality classes are shown in *Table 3.*

Table 3. Quality classes

Variety	Storing loss Rate	1^{st} class Rate	2^{nd} class Rate	3^{rd} class Rate
William	13.3 ton = 10%	53.2 ton = 40%	39.9 ton =30%	26.6ton = 20%
Bosc kobak	22.14ton = 9%	105.8 ton = 43%	86.1 ton =35%	32 ton = 13%
Packham's	26.64 ton = 8%	153.2 ton = 46%	120 ton = 36%	33.3 ton = 10%
Hardenpont	18.04 ton =11%	64 ton = 39%	52.5 ton =32%	29.5 ton = 18%

Evaluation of pear storing profitability

The main storing costs are summarised in *Table* 4. These calculations are not variety specific. As it can be seen amortisation means the highest cost. It can be said that storage is very costly to farms. The profitability indexes are summarised in *Table* 5. The break-even point is at 264 kg/m^2. This farm stores 187.3 tons of pear on the average on 1 m^2). It can be pointed out that the farm produces profit due to storage.

Table 4. Costs and cost factors of pear storage (2004–2005)

Cost factor	Cost per 1 m^2 (1000 Euro)	Storing cost per 1 ton of pear (1000 Euro)
Material cost	1.4	1.1
Labour cost	120.0	6.3
Social insurance+tax	3.3	96.9
Depreciation	744.1	59.1
Cost of machinery	5087.7	3471.9
Other (FMC) cost	7.3	7.3
Direct cost	1155.9	1155.9
General cost	16.4	1984.5
Total cost	132.3	132.3

Table 5. Profitability indexes of pear growing (2004–2005)

Main natural specific costs:	
total cost per 1 m^2 area (growing+storing)	5911.5 Euro
total cost per 1 ton of pear fruit (growing+storing)	623.9 Euro
income per 1 m^2 storing are	713.9 Euro
income per 1 ton of stored fruit	753.1 Euro
profit per 1 m^2 storing are	122.4 Euro
profit per ton of stored fruit	129.2 Euro
Main profitability indexes:	
profitability %	21%
level of cost	83%

The market position of the product

This unique Hungarian product has different characteristic features. The values of this product derive from the conditions of the cultivated area and the expertise of the local people. It has got a juicy pulp, a specific smell, taste and highly delicious quality. Because of the climate conditions in the region of Kunfehértó, the quality of the product is higher than the average quality of the other cultivated areas. As far as the market position is concerned there has been a great demand for this product during the last few years. Raw pears are sold from autumn to winter and can be bought in processed form throughout the year. The *strong points* of the pear grown in the areas of Kunfehértó are that it can be easily transported, it is not easily damaged and can be stored and ripened for a long time. Its distillate (brandy) is of excellent quality ('William'). The food processing level of the product determines its high quality. The fresh fruit was also used for making tinned fruit, fruit juice, distillate and dried fruit even after storing. Instead of pear, also other winter fruits (apple) can be consumed. The *weaks* of the product are that the protection of its origin is unsolved; it is not marked on the product where it is from and why it is unique. The resistance of cultivars grown is different to diseases and pests. That is why pesticides of different quantities must be used. This will have an influence on how much residues the product contains.

The marketing resources to utilize the *possibilities* are the following: in case of winter pears the size, the shape and the stalk make it possible to have significant markings. Information labels indicating the origin can be stuck on the product or tied onto the stalk. Marking the geographic origin is good for conveying additional information as well (e.g. chemical-free, number of hours of sunshine ripening the fruit). It is suitable for making a product for delicacy (candied). "Pálinka", a famous unique Hungarian brandy is made of it and this is suitable for the marketing its "image".

Conclusions

- It would be ideal to store pear by size and colour. That would make storing more differentiated. Storing parameters could then be altered making possible a lower rate of and a longer storing period. This extra managerial work and cost would increase profit definitely.
- In order to better utilise storing capacity and lower specific costs, this farm should purchase pear. The 87.71% utilisation rate should definitely be increased.
- Income could be increased if storage were leased out in "dead period".
- Generally, it is practical to repeat the SWOT analysis every 2–3 years, or more frequently as needed, and to compare it to the previous results of examination.
- To increase the popularity and the market revenues of this Hungaricum, tha chances of the producers ought to be improved (*Hofmeister, Tóth.& Totth,* 2004).
- The processing of this product as a "Hungaricum" should enhance the added value of the respective product on the market.
- The application of well-selected marketing tools helps in the development of the regional and the national „image" (*Józsa & Deli,* 2003). The Hungaricum products are not well marketable on their own, but together with the appropriate „historical and cultural background". The consumer, in this case, does not purchase merely a product – products are available anywhere – but also flavours, aromas and traditions.

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