ECONOMIC PROFITABILITY OF CONSTRUCTION OF AN ULO COLD STORAGE PLANT FOR APPLE FRUIT STORING

BRANKA KALANOVIĆ BULATOVIĆ PhD.[1]
BOJAN DIMITRIJEVIĆ M.Sc.[2]

Family agricultural farms and companies occupied in production of fruit have a considerable role in the overall production and commerce of fruit in Serbia. Large competition, but also low purchase and sale prices, have forced producers to find the way to store their products, to preserve them in order to sell them at the moment they can get the highest possible sale prices on the market. Recently, an ULO cold storage plant construction has frequently been mentioned in our country as a reliable solution which would provide long-term and high-quality preservation of fruit until the moment it has been take out on the market. This kind of a cold storage plant shall make placement of fruit (in this case, apples, as observed in the work) possible to take place in the interval from December to May. The time chambers open and apple fruit is taken out on the market shall be in accordance with the decision of the management, while the latter shall directly depend upon the estimated circumstances on the market and financial strains of the farm or company members.

Construction of an ULO cold storage plant requires great financial investments, therefore the economic effectivity of the investment in question has been analized within the work, and it has been concluded that the construction of an ULO cold storage plant is economically justifiable.

When determining economic profitability of investing in an ULO cold storage plant, methods such as investment calculation, encompassing determination of all financial incomes and expenditures during the investment period, have been applied in the work.

Key words: ULO cold storage plant, fruit, expenses, economic effectivity.

Introduction

ULO (Ultra Low Oxygen) is a type of cold storage freezer where in addition to low temperature and atmosphere is achieved with very low oxygen content, allowing long-term preservation of fruit quality to the moment of placement on the market. Unlike conventional cold storage plant, a series of ULO cold storage benefits that are reflected in: the preservation of epidermis and color meson carp fruit crops, preserving their freshness, fruit-term care is much longer, and most

[1] Faculty of Agriculture, Nemanjina 6, Zemun, Serbia, kalanovicbranka@yahoo.co.uk
[2] Faculty of Agriculture, Nemanjina 6, Zemun, Serbia, dimitrijedi@yahoo.com

importantly, loss of weight is the ULO cold reduced to only 0.5% compared to conventional cold storage, where loss of weight goes up to 10%. In this way, ULO cold storage and allow the realization of large profits, because it is postponing placement provides the opportunity to achieve higher selling prices.

Material and Methods

Subject of this study was to investigate economic profitability of ULO cold storage building for storage of apple fruit. Survey was conducted by comparing sale price that could be achieved in different periods of placement.

Applied method in determining investing economic viability is in investment calculations ULO cold storages that included a determination of all cash receipts and investment period issuance. All elements of the microeconomic calculations (calculations that are compiled for a specific company-cold) are determined on the basis of certain production-economic conditions (yield, technical standards and market prices) is to be exercised in a particular production company. Fixed investment calculations for two specific periods – in October and May at order shows economic effects use of ULO cold storage.

For making paper used are: internal data company that has raised cold, internal data cooperative that owns ULO cold storage, as well as the results of research published in the works of other authors.

Results and Discussion

Total investment value of ULO cold storage (2006) reached 1,123,194 €. In structure of the total required funds investment, construction of ULO cold storage makes 85.43% (959,636.4 €), the value of the purchased land is 9.5% (106,666.7 €), while the electrical power connector and power stations (44.000 €) account for 3.92%. Aqueduct and sewerage, fire protection and environmental feasibility study (12,121.21 €) participate with 1.08, while video surveillance (769.7 €) makes only 0.08% of total required investment funds.

Total expenses incurred for construction of ULO cold storage costs are included in all papers concerning the preparation of land for raising the cost of building and works to raise the building. Work costs done included are the costs of preparing the ground for lifting the building, the cost of refrigerated ground spillage of concrete, steel construction costs of the facility, and any other costs pertaining to installation of refrigeration equipment and putting into operation and verification of parameters for cooling. Work discharge and verification of parameters included cooling the test bearing chamber, checking insulation and ULO operation of equipment (reducing the percentage of oxygen in the air at 5% for 24 hours).

Total expenditure incurred on building works ULO cold storage amounted to 210,588.4 €, which most of the earthwork amount to 145,716.7 €. Total expenditure structure for construction of cold storage, earthwork participate with 69, 2%. Mounting panels costs, thermal insulation doors and refrigeration equipment in expenditure structure incurred for construction of refrigerated participate with 21.3%. Value expressed, these costs amount to 44,902.67 €. Preparation of project documentation in total expenditure incurred for raising

building works, amount to 7.2% or 15,111.51 €. With 2.3% of total expenditure costs involved in the work putting cold storage and verification 4,857.45 €.cooling parameters.

Total value of embedded equipment included value of: thermal insulation, introduction electrical and lighting costs, refrigeration and ULO equipment and spare parts.

Values embedded in equipment structure, largest share of a refrigeration (30.3% or 227,102.1 €) and ULO equipment (16.7% or 125,208.6 €).Behind them followed by thermal insulation with a share of 30.8% or 231,224.1 €. Aforementioned costs are higher, but economically justifiable and understandable, given that the ULO cold storage differs from traditional right by this equipment. Steel construction value of 148,955 € is part of total value of equipment with built-in 19.9%. Electrical costs (5,008.48 €) are 0.7%, installation of lighting (7,286.061 €) 1%, and spare parts (4,263.636 €) 0.6% of implanted equipment.

Calculation operating costs of ULO cold storage

Cold storage plant is used in the period from October to May, and a year has been in use for eight months. Cold storage capacity is 1,900 tons, of which 1,700 tons in ULO mode and 200 tons in plus mode. It is planned to exploit capacity available when needed. This is why it is possible that apple placing in period from December to May. When will we open the chamber and make placement of apples, making the government co-operative, depending on the perceived market conditions and financial strain of its members, and their need for cash. Cold storage plant operating costs, no matter how much capacity in a different period is used (Table 1). As the most significant cost of refrigeration, there is electricity. Power consumption as a cost variable character the largest share in refrigeration cost is period when cold storage plant used to store the apple offspring (from October to May). As more variable expenses occur post office service costs and the consumption of water, but they are on an annual basis in relation to the total cost of cold storage negligible.

All other expenses are fixed or largely fixed nature and level of capacity utilization has no effect on their annual amount. It is because of this, as in, because there is no rule either in time or in amount of apple sales, in determining the cost of cold storage is managed from the fact that the freezer for a period of eight months is used to full capacity.

The monthly cost of electricity is determined by dividing the annual amount by the number of months of cold storage. Although electricity consumption in the period when there is a cold storage plant is not in use, the amount of expenses in that period is far lower than in the period when the cold storage plant to use. These costs include energy consumption for lighting of offices and a fee to access. Calculate the cost of electricity for eight months was done in order to show the financial strain in the period when the cold storage plant in use, and no income to cover expenses.

The estimated lifetime of the cold storage plant is 20 years, and annual depreciation rate is 5%. The basis for depreciation taken calculated value and building facility and ULO equipment that is built into it, because the lifetime of equipment as same as depreciation object period. Also, base is included and value of other expenses incurred in building rising, because they increase value of the building and condition of his work. As for the video surveillance, which can be amortized in particular, it is not done, because its value appears less than 1 % of the value of the object itself. Taking into account the value of the object itself, the cost of depreciation of up to participate in the total cost of cold storage. Depreciation and amortization can be expressed on a monthly basis, but since the basis of them have cash outflow, it is not done.

In the country maintenance cost services of fixed assets include regular provider cost of equipment built in the cold storage. They, together with the costs of provision that is set aside for the removal of any faults that may arise in refrigeration work and replacement parts for ULO and cooling equipment once produced. For this reason, their calculation is not shown on a monthly basis. A similar situation is with the intangible expenses related to taxes on real estate, or in this case the tax to land tax and ULO cold storage.

Table 1. Cold storage plant operating costs

Serial No.	Description	Amount ( )	
		Per month	Per year
1.	Electricity cost	2,370.92	18,967.33
2.	Other material overhead cost	17.91	214.96
3.	Postal services cost in country	26.34	316.12
4.	Wage and salary cost (4.1. + 4.2.)	2,107.48	22,760.8
5.	Depreciation charge	-	44,185.19
6.	Maintenance services cost of fixed assets in country	-	6,322.44
7.	Requisition cost	-	1,053.74
8.	Intangible cost – tax costs	-	4,404.64
Total work cost of cold storage on an annual basis			98,225.22
Work costs per kilogram of stored refrigerated goods			0.05

It should be noted that more work is engaged in cold storage two permanent employees and one temporary employee. The temporary employee was hired to monitor and control parameters, cooling, and it breaks his engagement in the period when cold storage plant is not in use. Because of that, gross wages cost for temporary workers were calculated for a period of eight months and it is not stated taxes and contributions on the basis of gross earnings or net amount of its income.

In determining the cost per kilogram of stored goods is taken into account in overall capacity of the cold storage plant. Therefore, cost of refrigerated storage of apples per kilogram is 0.05 €.

Determination of income and expenditures to cold storage capacity level

In order to arrive at the amount of revenues and expenditures is necessary to calculate their amount up to capacity of cold storage. Namely, in order to projected revenues and expenses and based on them determine financial result to be achieved in period of deferred investments, it is necessary to calculation of income that would have made placement 1,900 tons of apples and expenses incurred for the same amount of stored apples.

Before the approach to the income and expenditure for the level of 1900 tons, and cold storage capacity, it is necessary to determine the amount of stored apples varieties. Taking into account representation of the observed three varieties of apples, it is defined by their relationship to capture capacity of cold storage. The ratio is determined by the calculated share of each of the studied species, and then multiplied by current cold storage capacity of 1,900 tons.

Since stores are not only first class apple and that for each class earn different selling price, before the approach to revenue that would be achieved, it is necessary to calculate the amount of stored apples by class for each variety separately.

Calculation of the classes derived by the principle of class relations is in the overall race with percentage points, which for the first class is 50%, Class II 30%, and 20% class III. For example, the calculation for Eidered was obtained by the total stored amount of 1292 tons quantified the percentage of each class, and have obtained is from: 646 tons of Class I, II 387.6 tons to 258.4 tons of class and for III class. Stored volumes for all three varieties of apple by class are: 950 tons for the first class, 570 tons of Class II and 380 tons of Class III.

Determined amounts of apple varieties studied by classes that can be placed on the market are the basis for the calculation of income from sales that would have made their placement in different periods. Revenue from 2008, the sale to be made in the month of October is determined by multiplying quantity with sales prices from October. In the same way it is established and proceeds from sale of which would be achieved placement in May.

Proceeds from the sale to be made in May are far greater than the revenue that would be made in October. The difference between these two Eidered is income of 249,142.26 € in favor of the revenue that would be made in May. A similar situation is with the varieties Golden Delicious and Granny Smith. The difference between the revenues that would be achieved by selling apples in May compared to October month for the Golden Delicious is 179,388.83 €, and Granny Smith 87,211.8 €. This difference occurs as a result of higher selling prices that can be achieved later placement apples, and its placement in May. Total income to be made selling apples in October amounted to 606,558.48 €, while the sale of apples in May revenue with 1,122,301.37 €. Proceeds from sale were 1.85 times higher in May than in October.

Before approaching to financial results it is needed to determine level of expenditure in accordance with capacity of cold storage. Regular production costs and depreciation costs have to be determined by kilogram stored apples, which

means that they must be re-calculate cost per hectare to cost per kilogram of cold storage occupancy. As with determination of income, access to first determine relationship between observed varieties, according to representation of land surfaces. Then this established relationship or participation quantified with total annual cost of regular production expenses and depreciation, to get amount in their varieties, and accordance with full capacity cold storage with each of these varieties. Total annual cost of regular production and depreciation costs that have been shown in calculations per hectare are presented here for entire area in which observed species are planted. In this way, resulting costs of regular production and depreciation costs per year for each of varieties are in accordance with capacity to take in cooler. As for the cost of insurance, since they are calculated on basis of production value, this is not taken into account.

Calculation of income and expenditure and on the basis of their financial results for the capacity of cold storage, or for 1,900 tons of apples, is for October and for May to determine difference of incomes occurred subsequent placement apples. Calculation of revenues, expenditures and financial results for the capacity of cold storage is given at Tables 2 and 3.

Table 2. Financial results for the capacity in cold storage for October

Selling price on varieties and classes (/ kg)			**Stored amount on varieties and classes (kg)**			**Production value for all varieties and classes ( )**		
Idared	**Golden Deliceus**	**Grenny Smith**	**Idared**	**Golden Deliceus**	**Grenny Smith**	**Idared**	**Golden Deliceus**	**Grenny Smith**
0.44	0.51	0.64	646.000	190.000	114.000	281311.2	96528.37	73085.76
0.30	0.34	0.44	387.600	114.000	68.400	117213	38611.35	29785.9
0.15	0.17	0.21	258.400	76.000	45.600	37508.16	12870.45	93.77041
Production value						436032.4	148010.2	112248.7
Serial number	Description					Amount	Amount	Amount
1.	Regular production cost					133252.7	39191.97	23515.18
2.	Depreciation plant cost					35534.05	10.45119	62.70715
3.	Insurance costs gender 6.58%					28691.06	973.9083	73.85993
4.	Insurance costs gender 11.3%					49271.68	16725.17	12684.04
Total cost						246749.5	76107.42	49855.93
Financial result ( )						189282.9	71902.75	62392.77

Calculation of income and expenditure and on basis of financial results for 1,900 tons of apples, allowed seeing difference in financial effects of placement in October apples and apple sales in May. Namely, total financial result of placement 1,900 tons of apples to be made in October amounted to 281,878.08 €. If the apple placed on the market with delayed maturity, and in May, the financial result for same amount of apples would be 2.17 times higher than the financial results from October, and amounted to 611,707.8 €. Observed by varieties of apple that is stored in cold storage, the greatest effect of the subsequent placement of Golden Delicious exercised where the financial results in May compared to October increased by 3.05 times. Difference in financial results for May and October for

variety Eidered is 140,880.72 €, and Granny Smith 60,374.5 €. Financial result is thus increased by 1.85 times to 2.11 times Eidered and the variety Granny Smith.

Table 3. Financial results for the capacity in cold storage for May

Selling price on varieties and classes (□ / kg)			Stored amount on varieties and classes (kg)			Production value for all varieties and classes (□)		
Idared	Golden Deliceus	Grenny Smith	Idared	Golden Deliceus	Grenny Smith	Idared	Golden Deliceus	Grenny Smith
0.63	1.05	1.05	646.000	190.000	114.000	408429.9	200210.7	120126.4
0.44	0.74	0.74	387.600	114.000	68.400	171540.6	84088.51	50453.11
0.19	0.32	0.32	258.400	76.000	45.600	49011.59	24025.29	14415.17
Production value						628982.1	308324.6	184994.7
Serial number	Description					Amount	Amount	Amount
1.	Regular production cost					116080.1	34141.2	20484.72
2.	Depreciation plant cost					30954.69	9.10432	54.62592
3.	Insurance costs gender 6.58%					41387.04	20287.67	12172.6
4.	Insurance costs gender 11.3%					71074.92	34840.67	20904.43
5.	Cold storage plant operating costs					63715.07	18739.73	11243.84
Total cost						323211.8	117113.6	70268.18
Financial result (□)						305770.3	191211	114726.6

Financial results recap for varieties stored for October and May, has enabled the assessment of total revenues and expenditures to be made selling apples in the observed month. Total revenues realized by selling the refrigerated apples in May compared to October increased by 515,742.89 €. Total expenditures also increased by 185,913.17 €, as a result of slightly higher costs due to higher amount of depreciation that is calculated on the value of production and due to the added cost of refrigeration. Financial results that made sale of cold storage apple in May would be 2.17 times higher compared to financial results of October.

Conclusions

Construction of ULO cold storage lets you store fruit at optimum conditions which ensure preservation of quality, thus placing on the market when the best conditions for it.

Observed ULO cold storage is used for apple fruit in period from October to May, and therefore placement can be done in period from December to May, depending on the assessed market conditions and financial strain. In the summer, as an additional source of income, cold storage plant may be necessary to rent storage peaches or other fruit, but work is not included because they wanted to show financial result of cold storage of apple fruit intended for storage. All extraordinary revenues can only contribute to a better financial result cold storage plant.

Calculating the economic cost of construction ULO cold storage calculations included the production value and total cost of stored apples in cold storage

occupancy level. Calculating the economic cost ULO cold storage building included two periods - October and May in order to realized the difference in the financial results of investments apples immediately after harvest and placement of apples stored in ULO cold storage and placed on the market when there is the greatest demand for it. Retail prices are taken from weekly report from wholesale market in Belgrade for October 2008, and May 2009.

Apple calculation of cost price has led to following facts:

- apple production costs for May include the addition of regular production expenses, depreciation costs, insurance costs and costs of cold storage, in contrast to October, where the cost of cold storage there since apples sold prior to storage in cold storage;
- comparison of cost calculations for all three apple cultivars observed achieved higher cost of apples in May compared to October as a result of a larger amount of insurance costs and the added cost of refrigeration;
- comparing apples cost calculations for all three varieties observed and realized significantly higher selling prices in May compared to October is the month for which financial score much higher.

Calculation of financial results for the level of ULO cold storage for fill capacity cold storage is derived in order to show how ULO cold storage contributes to better financial results due to better and better preservation of offspring apples and opportunities due to subsequent placement of apples to market. The financial result of the May month (611,707.8 €) is 2.17 times higher than the financial results of the October month (281,878.08 €). Selling price you can get the said member for his apple in May is about two times greater than that which can be achieved in October. This fact shows how the demand for apples higher in period when ordinary cold storage plant is gone or is there but not of satisfactory quality. Greater demand and less supply leads to higher sales prices so in May.

References

1. Andrić J., Vasiljević Zorica, Sredojević Zorica: "Investicije, osnove planiranja i analize", Poljoprivredni fakultet, Beograd, 2005.
2. Vasiljević Zorica i grupa autora: "Ocena društvene i ekonosmke opravdanosti investiranja u proširenje i rekonstrukciju hladnjače u Ljuboviji", Institut za ekonomiku poljoprivrede, Beograd, 1986.
3. Vukelić Gordana, Oparnica Č, Spremo Snežana: "Utvrđivanje vrednosti višegodišnjih zasada na RJ Plantaže i vrednosti radova na obali, pristupnim putevima, vodnoj mreži, objektima i uređenju zemljišta na RJ Jezero", 2007.
4. Vukelić Gordana, Oparnica Č, Spremo Snežana: "Projekcija procene prinosa zasada jabuka u 2007. godini na RJ Plantaže", 2007.
5. Milić D., Kalanović Bulatović Branka, Trmčić Snežana: "Menadžment proizvodnje voća i grožđa", Monografija, Poljoprivredni fakultet, Novi Sad, 2009.
6. Mišić P., "Jabuka", Nolit, Beograd, 1994.