

## **THE CALCULATION OF THE ECONOMIC EFFICIENCY FOR THE ESTABLISHMENT AND MAINTENANCE FOR AN ORGANIC APPLE TREE PLANTATION**

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### **Abstract**

*The aim of any producer is a high yielding, high quality crop that satisfies the end user. There are a large number of agronomic factors which can influence this, many are within the control of the grower, under given growing systems, climatic and soil conditions. A wide range of planting systems are used for apples. All aim to produce high, early yielding, top quality crops. Ease of harvesting and management are also key factors taken into account. Commercial fruit yards aim to produce large fruit amounts for sale in various forms. This type of plantation includes 1-3 species, with a small number of varieties, which allows an increased efficiency of care technologies. Plantations can be made in a super-intensive system (with over 1250 trees / ha, trees grafted on small and very small rootstocks), intensive system (with 400-1250 trees / ha, trees grafted on medium and small force rootstocks) and less in the classic system. The growth and development of trees, especially fruit productivity and quality, depend on a number of factors such as zoning, choice of land, water source, choice of species / varieties. This paper resembles some technical and economical aspects of a super-intensive apple tree plantation.*

**Key words:** super-intensive yard, apple tree, harvest, economic efficiency.

### **INTRODUCTION**

The area is located in the West Plain, Campia Crisurilor district. The main relief is the low field with a flat relief, with little difference between microrelief, grind and microdepression. Microrelief is planar and microdepressionary with excess moisture in periods with higher amounts of winter-spring precipitation. Weather data was taken from the Oradea weather station. The average annual temperature is 10.5 ° C Oradea. Absolute maximum temperature 39.5 ° C Oradea, July 29, 1936. Absolute minimum temperature - 29.0° C Oradea, 24.01.1942. The annual amplitude is 22.7 ° C. 92.6 days are recorded annually at temperatures below 0 ° C and 90.3 days at temperatures above 25 ° C.

Late spring bruises are common in March, rarely in April and exceptionally in May. Annual average rainfall is 635.0 mm / m<sup>2</sup> Oradea. The most rainy months are May, June, July. Rain fall is relatively well distributed throughout the year. The more frequent winds are in the south, southeast with the highest intensity.

Examining the deficit and the excess moisture, it is observed that in July-August-September there is a small moisture deficiency which does not

particularly affect the development of the trees. In the rest of the year there is a surplus of not too much moisture. The aridity index by Martone has an annual average value of 30.98. The climate of the studied area can be included in the climatic zone C.f.b.x. after Koppen. The climate is temperate continental moderate with warm summers and relatively mild winters with precipitations all year round.

Fruit growing in the area is poorly developed, more walnut, apple, plum. The vegetative development of these tree species is good. In the conditions of relief, climate, vegetation, underlying rock and mother rock shown above, the soil type that was formed is Eutricambosol. Eutricambosols are soils with good physical properties, with medium content in the clay, low alkaline soil reaction, very low content of organic matter (humus). There are soils that are located on the positive plan area with average fertility.

## **MATERIAL AND METHOD**

The organization and arrangement of the land is aimed to ensure the conditions of mechanization, fast transportation and the possibility of applying a high technological level (Fassman, 2017). It mainly includes: plotting the land, establishing the road network and return areas. (Berar, 2012)

The area actually planted is 10,000 square meters. The apple variety is Florina, grafted on M9 rootstock. The planting distances are 2 m per row and 4 m between rows. (1250 apple trees). The plantation was set up in 2010 and is super-intensive.

Florina variety - Description: Medium vigorous tree, with orchard or large fruit, spherical or truncated spherical, yellow background with red aniline with white whitish on the entire surface of the fruit ( Stanciu , 2009). Consistent, creamy colored pulp, suitable for a sweet and slightly acidic pleasant aroma of high quality (Drăgănescu, Mihuț, 2005).

As the crown forms used to drive trees in intensive systems, but also in small plantations in the gardens of the population, the "bush", the "vertical cord" and the "slender spindle" are increasingly recommended. These crowns are generally used on trees grown on medium and small force rootstocks (apple, pear, peach, but also cherry, cherry, plum grafted on vegetative rootstocks) (Cepoiu, 2000). Compared to the palm crowns these forms of crowns have the advantage that: they are driven to the natural tendency to grow the tree, do not use some patterns rigid, are simpler to achieve (Stănică, Braniște, 20110) and the skeleton elements can be replaced and rejuvenated easily, thus obtaining very good quality fruits and the vertically growing balance of the tree can be kept much better. (Chira, Chira, 2005)

The apple cultivated in intense plantations begins to grow in the second year since planting, with a production of between 10-15% of the production potential. In the third year it can reach 40% of the production potential (Sanders, 2012). In the 7th year since planting it reaches its maximum production. The period of economic efficiency of a super-intensive planting is up to 15 years of culture. (Phillips, 2005)

Harvesting is preferably done manually, a man can harvest a day, from a plantation with a production of less than 20 kg of fruit per tree (young plantation), 280 kg of apples; (Schmid, 2007) and from a plantation with a production of more than 30-50 kg of fruit per tree, a man can harvest 440 kg of fruit a day (Riess Hans, 2016). The maximum yield achieved by this type of planting can be 50 tons / ha. (Meyer- Rebentisch, 2018)

## RESULTS AND DISCUSSION

Table 1

Direct investment costs at apple tree yards

	Workmanship		Machinery		Material s	Transport		Total
	1 Ha		1 Ha		1 Ha	1 Ha		1 Ha
	Z.O	Value	Ha a.n	Value RON	Ron	T/km	Value RON	Ron
0	1	2	3	4	5	6	7	8
Field training	34,48	3103,2	13,18	5931,0	2850,0	570,0	285,0	12169,20
Establishing the yard	48,07	4326,3	2,48	1116,0	18347,7	259,71	129,85	23919,85
Maintenance 1 <sup>st</sup> year	32,84	2955,6	4,87	2191,5	870,0	1,5	0,75	6017,85
Maintenance 2 <sup>nd</sup> year	54,75	4927,5	4,36	1962,0	6290,0	376,0	188,0	13367,5
Maintenance 3 <sup>rd</sup> year	26,16	2354,4	2,96	1332,0	672,0	0,6	0,3	4358,7
<b>TOTAL</b>	<b>196,3</b>	<b>17667,0</b>	<b>27,85</b>	<b>12532,5</b>	<b>29029,7</b>	<b>1207,81</b>	<b>603,9</b>	<b>59833,1</b>

Df= 22 years

De= 19 years

It= 59.229,2 lei

Setting up expenses= 35.674,2 lei

Handmade works= 7429,5 lei

Mechanical works= 7047,0 lei

Materials 21197,7 lei

Maintenance costs= 23555,0 lei

Handmade works= 10237,5 lei

Mechanical works= 5485,5 lei

Materials = 7832,0 lei

Ca=59229,2: 19=3117,3 lei/year

Operating expenses (Ce)=15024,3 lei

Handmade works= 8759,3lei  
 Mechanical works 2295,0 lei  
 Materials= 3970,0 lei  
 $C_d = 3117,3 + 15024,3 = 18141,6$  lei  
 $C_i = 18141,6 \times 6\% = 1088,5$  lei  
 $C_t = 18141,6 + 1088,5 = 19230,1$  lei  
 $P = 30000$  kg/ ha  
 $C_p = 19230,1 : 30000 = 0,64$  lei/kg  
 $P_v = 1,5$  lei/kg  
 $V = 30000 \times 1,5 = 45000$  lei  
 $P_{ab} = 45000 - 19230,1 = 25769,9$  lei/ year  
 $I = 25769,9 \times 16\% = 4123,2$  lei/ year  
 $P_n = 25769,9 - 4123,2 = 21646,7$  lei  
 $R = 21646,7 : 19230,1 \times 100 = 112,6\%$   
 $T = 59229,2 : 21646,7 = 2,7$  years  
 $P_t = 21646,7 \times 19 = 411287,3$  lei  
 $Rec = 411287,3 : 59229,2 \times 100 = 694,4\%$   
 $C_d$ = annual direct expenditure  
 $C_i$ = annual indirect costs  
 $C_t$ =annual entire costs (Ghic G. &co, 2015)  
 $P$ =Production  
 $C_p$ =Cost of production  $= C_t/P$  (Kaschel N., 2017)  
 $P_v$ =Selling price  
 $V$ =Value of annual production  
 $P_{ab}$ =Gross annual profit  
 $I$ =Tax=  $P_{ab} \times 16\%$   
 $P_n$ =Net annual profit  $P_{ab} - I$   
 $R$ =Annual profit rate  $P_n : C_t \times 100$   
 $T$ = Term of investment recovery=  $I_t / P_n$   
 $P_t$ = Entire operating profit=  $P_n \times D_e$  (Fischer M. &co, 2018)

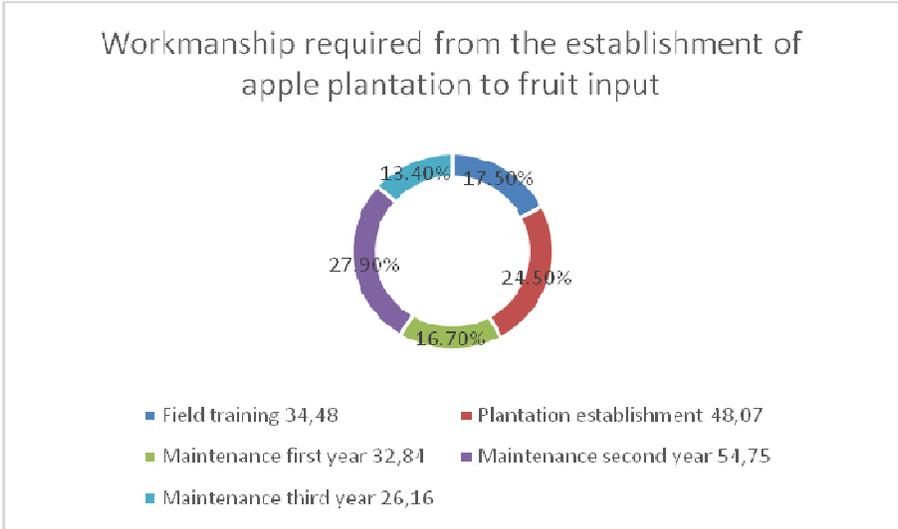


Fig. 1. Workmanship required from the establishment of apple plantation cu fruit input

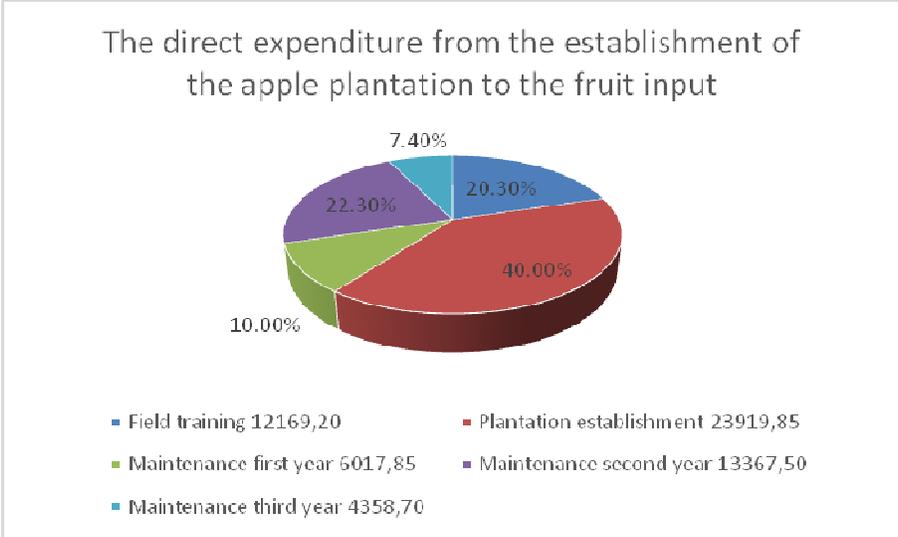


Fig. 2. The direct expenditure from the establishment of apple plantation to the fruit input

**CONCLUSIONS**

The highest expenses are recorded when the yards is established, due to the value of the fruit planting material.

In the second year of maintenance the expenses are higher due to the organic fertilization works, which are applied in the yard, with ecological technology.

At a total expenditure level (direct+ indirect expenditure) of 19.230,1 lei/ ha and an average production of 30000 kg/ha, is reached a cost of production of 0, 64 lei/ kg.

At a production of 30000 kg/ ha is registered a gross annual profit of 25.769,9 lei/ ha.

Over the entire 19-year exploitation period, is registered an economic yield of 694,4%.

The recovery term of investment made with one hectare of super-intensive apple yard is 2,7years.

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