

RESEARCH REGARDING THE ECONOMIC EFFICIENCY OF THE TECHNOLOGIES APPLIED TO AN APPLE ORCHARD IN NORTH-EASTERN BUCHAREST

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Abstract

In the Bucharest area, the steady increase in fresh fruit demand and the need to increase the profitability of agricultural fields resulted in setting up a fruit tree plantation at the Moara Domneasca Teaching Farm.

The main goal of any farmer is to obtain high quality yields to meet the market requirements, but there are also sustainability issues provided by yield levels and the ability to back up expenses.

Given the need for high and steady yields while reducing pollution extent, fertilizers and pesticides inputs, the economic efficiency and the output maximization can be achieved only through the optimization of fertilizer and herbicide inputs.

The present paper aims to analyse economic efficiency for the applied technologies so as to determine the best fertilization and weed control solution in an apple orchard in the pedoclimatic conditions of Moara Domneasca.

Following the performed research, there was observed that the yields varied greatly between 8.3 t/ha and 18.1 t/ha according to the fertilizer and herbicide treatments.

The production expenses varied between 4200 lei/ha for the unfertilized and unherbiced treatments and had a maximum level of 6900 lei/ha.

Regarding economic efficiency, the best results were obtained in the treatments where weed control was performed through two herbicide applications, and fertilization was performed both on soil and leaves.

INTRODUCTION

High and steady yields with low inputs are the goal of any farmer, but this goal needs to be consistent with the requirements of environmental protection, pollution reduction and biodiversity conservation.

Weed control is a major problem for any agricultural holding because weeds use a part of the applied fertilizers, which are no longer available for plants when applied, even if they are returned to the soil when destroying the weeds. Weeds are hosts to pests and diseases that decrease yield quality and by efficient control of weeding, these populations are indirectly controlled. Setting up an adequate weed

management strategy in a sustainable agriculture system focused on biodiversity conservation and the reduction of pesticides consumption means reducing weed expansion up to the damage threshold, given that a total weed destruction is neither necessary nor efficient.

When setting up an optimal fertilization scheme in an orchard, one needs to take into account the planned yields, fruit quality and the holding profitability, all of which require an integrated approach to apple tree cropping system with all the technological elements interconnected.

The goal of the research was to identify the best fertilization and weed control treatments economically speaking for apple tree growing technology in the pedoclimatic conditions of Moara Domneasca.

MATERIAL AND METHODS

In order to assess the economic indicators in the years 2008 and 2009, a bifactorial experiment was set up where:

Factor A *weed control*

- a₁ - Unweeded unherbiced
- a₂ - Clean-up 2 l/ha Glyphosat 360 g/l
- a₃ - Clean-up 4 l/ha Glyphosat 360 g/l
- a₄ - Clean-up 2 + 2 l/ha Glyphosat 360 g/l

Factor B *fertilization*

- b₁ - Unfertilized
- b₂ - Complex N:P:K 500 kg/ha (500 g/tree) 20:20:20
- b₃ - Complex N:P:K 500 kg/ha (300 g/tree) + 500 kg/ha 20:20:20 +
Foliar Murtonik (3 kg/ha) 20:20:20 + microelements
- b₄ - Complex N:P:K 500 kg/ha (300 g/tree) + 500 kg/ha 20:20:20 +
Foliar Murtonik (3 kg/ha) 20:20:20 + microelements
- b₅ - Complex N:P:K 500 kg/ha (300 g/tree) + 500 kg/ha 20:20:20 +
Foliar Fertitel 6,6:6:4.1 + microelements

Research was carried out in the intensive apple tree plantation of Delicios breed sited in Moara Domneasca Farm in North-Eastern Bucharest.

RESULTS AND DISCUSSION

When analysing *the influence of the weed control method factor A on apple production (Table 1)*, there can be seen that the mean apple yield in the unherbiced treatments was of 13.3 t/ha and it reached 15.7 t/ha when herbiciding with 4l/ha Clean-up.

The influence of the weed control method factor A on the amount of apple production for each fertilization method (the same graduation of factor B)

The data analysis regarding apple production shows that in all the tested fertilization treatments, the application of herbicides determine yield boosts, which are significant when applying a single treatment with Clean-up 2l/ha and very significant boosts when applying a dose of 4 l/ha.

The influence of fertilization factor B on apple production

The mean data in Table 1 show that fertilization led to very significant yield boosts in all the tested fertilization treatments in comparison with the unfertilized treatment.

The influence of fertilization factor B on apple production for each weed control method (the same graduation of factor A)

When assessing the results regarding the obtained apple production, there can be seen that in all weed control treatments, the application of different fertilization methods was followed by a very significant increase in production in comparison with the unfertilized witness treatments. The highest production was recorded in the treatment herbicided with 4 l/ha Clean-up and fertilized with complex fertilizer and two applications of Murtonik.

Table 1

Yields obtained under different weed control and fertilization methods in a Delicios apple plantation in Moara Domneasca Farm (t/ha)

	Factor A				Yield boost							Mean b
	a ₁	b _n - b ₁	a ₂		a ₃		a ₄		a ₂ - a ₁	a ₃ - a ₁	a ₄ - a ₁	
b ₁ -unfertilized	8.3	S Mt	9.4	S Mt	10.2	Mt	10.8	S Mt	1.1*	1.9***	2.5***	9.7
b ₂ -Complex N:P:K 500 kg/ha	13.2	4.9	14.1	4.7	14.8	4.6	15.6	4.8	0.9*	1.6***	2.4***	14.4
b ₃ -Complex + Murtonik 2 l/ha	14.9	6.6	16.3	6.9	16.9	6.7	17.2	6.4	1.4**	2***	2.3***	16.3
b ₄ -Complex + Murtonik 2+2 l/ha	15.8	7.5	16.9	7.5	17.8	7.6	18.1	7.3	1.1*	2***	2.3***	17.1
b ₅ -Complex + Fertitel 2 l/ha	14.5	6.2	15.8	6.4	16.1	5.9	16.9	6.1	1.3**	1.6***	2.4***	15.8
Mean a	13.3		14.5		15.1		15.7		1.16**	1.82***	2.4***	
	A	B	AxB	BxA								
DL5%	0.61	1.09	0.73	1.23								
DL1%	0.83	1.61	1.12	1.97								
DL0.1%	1.39	2.28	1.55	2.88								

In Table 2, there can be seen the mean expenses in the Golden Spur apple plantation in the two experimenting years. When analysing data, one can notice that the lowest expenses, were recorded for the unweeded and unfertilized

treatments. Apart from these steady expenses all the applications involve increases in expenses.

The analysis of the mean variable expenses for factor A show that in comparison with the unweeded and unherbiced, the application of herbicides determines expenses increases of up to 1630 lei/ha.

Fertilization application leads to increases in expenses of up to 1190 lei/ha in comparison with the unfertilized treatments.

The mean expenses for factor A – weed control – vary between 5014 lei/ha for the unweeded and unherbiced treatments and 6644 lei/ha for the treatments where the Clean-up herbicide was applied in a dose of 2+2 l/ha.

The mean expenses for factor B fertilization varied between 5208 lei/ha in the unfertilized treatments and 6288 lei/ha when fertilizing with Complex+Murtonik 2+2 l/ha (b_4).

Table 2

Yield expenses in the apple tree plantation when applying weed control and fertilization, averages of 2008-2009 (lei/ha)

		a ₁ unweeded	a ₂ Clean-up 2 l/ha	a ₃ Clean-up 4 l/ha	a ₄ Clean-up 2 + 2 l/ha	
		-	800	1600	1630	Mean b
b ₁ -unfertilized	-	4200	5000	5800	5830	5208
b ₂ -Complex N:P:K 500 kg/ha	960	5160	5960	6760	6790	6168
b ₃ -Complex + Murtonik 2 l/ha	1020	5220	6020	6820	6850	6228
b ₄ -Complex + Murtonik 2+2 l/ha	1140	5280	6080	6880	6910	6288
b ₅ -Complex + Fertitel 2 l/ha	1190	5210	6010	6810	6840	6218
Mean a		5014	5814	6614	6644	

The analysis in Table 3 of the data regarding the levels of yields obtained in the apple tree plantation show that the lowest income was of 8300 lei/ha and was recorded in the unfertilized and unweeded treatments while the highest income was of 18100 lei/ha and was recorded in the a₄b₄ treatment herbiced with Clean-up 2+2 l/ha and fertilized with Complex + Murtonik 2+2 l/ha.

The mean values of income when applying methods of weed control (factor A) varied between 13300 lei/ha where there was no herbicide and 15700 lei/ha in the treatments herbiced with Clean 2+2 l/ha.

The mean values of income when applying different fertilization methods (factor B) varied between 9675 lei/ha in the unfertilized b_1 treatment and 17150 lei/ha in the b_4 treatment fertilized with Complex 500 kg/ha + Murtonik 2+2 l/ha.

Table 3

Income obtained in the apple tree plantation under weed control and fertilization (lei/ha)

Treatments	a ₁	a ₂	a ₃	a ₄	Mean b
	unweeded	Clean-up 2l/ha	Clean-up 4l/ha	Clean-up 2 + 2 l/ha	
b ₁ -unfertilized	8300	9400	10200	10800	9675
b ₂ -Complex N:P:K 500 kg/ha	13200	14100	14800	15600	14425
b ₃ -Complex + Murtonik 2 l/ha	14900	16300	16900	17200	16325
b ₄ -Complex +Murtonik 2+2 l/ha	15800	16900	17800	18100	17150
b ₅ -Complex + Fertitel 2 l/ha	14500	15800	16100	16900	15825
Mean a	13300	14500	15100	15700	

Table 4 contains the data regarding the profit obtained in the apple tree plantation under weed control and fertilization.

Table 4

Profit obtained in the apple tree plantation when applying weed control and fertilization methods (lei/ha)

Treatments	a ₁	a ₂	a ₃	a ₄	Mean b
	unweeded	Clean-up 2l/ha	Clean-up 4l/ha	Clean-up 2 + 2 l/ha	
b ₁ -unfertilized	4100	4400	4400	4970	4467
b ₂ -Complex N:P:K 500 kg/ha	8040	8140	8040	8810	8257
b ₃ -Complex + Murtonik 2l /ha	9680	10280	10080	10350	10097
b ₄ -Complex +Murtonik 2+2 l/ha	10520	10820	10920	11190	10862
b ₅ -Complex + Fertitel 2 l/ha	9290	9790	9290	10060	9607
Mean a	8286	8686	8486	9056	0

Data analysis show that the profit levels were between 4100 lei/ha in the unweeded and unfertilized treatments and 11190 lei/ha in the a_4b_4 treatment herbicided with Clean-up 2+2 l and fertilized with Complex+Murtonik 2+2 l/ha.

The analysis of the influence of factor A weed control on the profit obtained in the apple tree plantation indicates a variation between 8286 lei/ha in the unweeded

treatments and 9056 lei/ha in the treatments where weed control was performed with the herbicide Clean-up 2+2 l/ha.

When analyzing the influence of fertilization factor B on profit there can be seen that it was of 4467 lei/ha in the unfertilized treatments and 10862 lei/ha in the treatments fertilized with Complex+Murtonik 2+2 l/ha

CONCLUSIONS

The analysis of yields, expenses, income and profit renders the following conclusions:

1. The mean apple yield in the unherbiced treatments was of 13.3 t/ha and reached 15.7 t/ha when herbiciding with Clean-up 2+2 l/ha.
2. The application of weed control methods led to significant yield boosts;
3. The application of fertilization led to yield boosts.
4. The lowest expenses were recorded in the unweeded and unfertilized treatments.
5. The application of weed control and fertilization methods determine increases in production expenses.
6. The lowest income was recorded in the unweeded and unfertilized treatments.
7. Weed control and fertilization application led to income increases.
8. The lowest profit was in the unweeded and unfertilized treatments.
9. Fertilization and weed control determine increases in profit.

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