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The efficiency of vineyard exploitation by increasing mechanical works with the establishment and maintenance of vine plantation

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Abstract Research has been conducted in several vine plantations of various sizes in Buzias Silagiu and Recaş.

Works have been pursued to establish new plantations and provide maintenance of bearing vineyards, carried out both by conventional technologies with a high degree of manual work and modern technology after a series of works (planting, harvesting, soil maintenance, operations in green) were made automatic.

By comparing the two technologies, it has been more than obvious the advantage of modern technologies in terms of both cost and duration of lower enforcement which has allowed a better framing of works during the best execution period.

Technology variants with high degree of mechanization can be adapted to plantations with different climatic conditions and largely removes the shallowness of performing work under a less skilled, less conscious or less involved workforce.

Key words

modern technology, classic technology, vine plantations

Viticulture technologies go through ongoing change required by society's evolution with an increasingly difficulty in finding skilled labour (1).

Increased costs with manual labour and the poor quality in the practice of manual work have led to the growing need of adapting technologies based on mechanized work, without compromising the quality and their effect on the vine and wine products obtained (2).

Highly variable climatic conditions in recent years have put considerable pressure on the technology by restricting the time periods in which different operations can be performed in the best times (cutting, treatment plant, harvest). (3).

Through the use of modern machinery and high throughput, the speed of execution of certain works could be increased, which led to shorter intervals of time allocated to these works and made possible the classification of works in the best times of execution (4).

Material and Method

The research was organized into four vineyards, in the years 2007-2010, in Buziaş-Silagiu and Recaş areas and aimed at differentiated work carried out for establishing and maintaining plantations.

Research has been conducted comparing conventional technology based largely on manual performance of certain key works: the planting of vines, doing several works in green, the soil line maintenance, installation of support systems and harvesting grapes.

Vineyards in which investigations have been conducted are young plantations, in full production potential; the distances between rows are 2.2 m between the rows and 1 m in a row. They are equipped with modern support systems that allow mechanized for all maintenance works.

In these two types of technologies, both traditional and modern, the following have been pursued: the cost of works, their duration and the possibilities of using them in the optimal period of works.

Preparing the ground for planting was done mechanized in both variants, specifying that with modern technology with mechanized planting it is no longer necessary to do the picketing.

The fixing of the support system was made by hand in the classical technology and mechanized with the modern technology.

Ground maintenance in classic technology was made in the black field system and in the case of modern technology the soil maintenance was made through permanent grassing between the rows and cultivating with the spring cultivator.

The cuts of fructification and the lead of vine chords were made by hand in both variants. Operations in green were performed manually in case of conventional technology and mechanized for modern technology.

Pest and disease control was achieved with atomisers in both variants, and harvesting was done manually in the classical technology and mechanized in the modern technology.

Results obtained

Establishing vineyards through classic technology had a cost per hectare of 14 081 euro and a number of 119.8 work days required. Through modern technology and due to mechanization of planting and installing the support system, both the cost per hectare and needed work days were significantly reduced.

Besides saving around 2600 euro / ha with the establishing, modern technology greatly compresses the time required to set up the plantation, which is very important in case of less favourable climatic conditions, which reduces to the minimum the optimum time of planting the vine.

Making a planting during the optimum time of planting ensures increase in rooted vines and more favourable conditions for growth and development.

Maintaining fertile plantations through a classic framework technology had a cost of 3350 Euro / ha / year and required 96 days of work.

The modern technology, through mechanization and efficiency of technological sequences as: maintenance of soil, green and grape harvesting operations managed halving the number of work days / ha / year and reduce annual spending to 2555 euro / ha.

Mechanization of technological sequences besides the two already mentioned advantages, and better ensures the maintenance work flow, creating the possibility to perform their best ages, by avoiding the congestion of some works.

Although mechanization involves some important initial investments, through the financial savings achieved it becomes a profitable and compulsory sequence for making the vine exploitation activity efficient.

Table 1

Work efficiency of establishing a vineyard through classic technology (area 1 ha, 4545 vines / ha)

Work / Materials	Cost of work (euro)	Expenditures (euro)	Required working days
Preparing the land (no deforestation)	1800	-	5
Preparation of the vine for planting	45	-	1,5
Handling vines	10	-	0,7
Planting	2272	-	90
Watering the vines	200	-	6,6
Installing the support system	700	-	16
Grafted vines	-	5454	-
Complete support system	-	3500	-
Other expenses	-	100	-
Total	5027	9054	119,8
	14081		

Table 2

Work efficiency of establishing a vineyard through modern technology (area 1 ha, 4545 vines / ha)

Work / Materials	Cost of work (euro)	Expenditures (euro)	Required working days
Preparing the land (no deforestation)	1600	-	4
Preparation the vine for planting	45	-	1,5
Planting and watering	410	-	2
Installing the support system	310	-	1
Grafted vines	-	5454	-
Complete support system	-	3500	-
Other expenses	-	100	-
Total	2365	9054	8,5
	11419		

Table 3

Maintenance work efficiency of bearing vines with classic technology

Work	Cost of the work (euro/ha/year)	Number of working days / ha / year
Ground maintenance (black field + hand weeding per line)	750	30
Fruition cuts	500	18
Leading the cords	300	10
Operations in green	500	20
Fighting diseases and pests	550	2
Harvesting grapes	500	16
Other expenses	250	-
Total	3350	96

Table 4

Maintenance work efficiency of bearing vines with modern technology

Work	Cost of the work (euro/ha/year)	Number of working days / ha / year
Ground maintenance (black field + hand weeding per line)	475	7
Fruition cuts	500	18
Leading the cords	300	10
Operations in green	250	5
Fighting diseases and pests	550	2
Harvesting grapes	230	0,3
Other expenses	250	-
Total	2555	42,3

Fig.1 Aspects of experimental fields

Conclusions

Progress in major growing countries of the world have called for an urgent need for change and the activity of Romanian wine farms to cope with competition and become competitive.

Reduction of manual work and increased mechanization has become a necessity because of the lack of skilled labour, increasing financial demands of manual labour exaggerated as compared to the quality of benefits offered.

The mechanization of work that until recently was exclusively and intensive manual labour (planting, green operations, ground maintenance and harvesting grapes) managed to save around 3,500 euro / ha, and a significant shortening of the interval to perform works.

Mechanization in viticulture is a very important work for establishing the optimal age of exploitation, when their effect reaches a peak.

Through the mechanization of their work, congestion is avoided even in less favourable climatic conditions, in certain periods when the field is impenetrable.

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