Bulgarian Journal of Agricultural Science, 14 (No 5) 2008, 509-516
Agricultural Academy

EFFECT OF TECHNOLOGICAL AND REGIONAL CONDITIONS ON COSTS IN WINE GRAPE PRODUCTION

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Abstract

KOSTADINOV, G., D. IVANOV and V. PEYKOV, 2008. Effect of technological and regional conditions on costs in wine grape production. *Bulg. J. Agric. Sci.,* 14: 509-516

The objective of this work was to assess the extent of effect of the factors related to production costs in wine grape production. An approach and methods for technological and technical analysis of grape production have been developed. The analysis showed that the costs related to plant protection had the greatest share in the total costs (40%), followed by the costs related to grape harvesting (17%), fertilizing (14.5%) and selective pruning (11%). The fertilizer costs were 1/6 of the total costs and those of preparations – 1/3. It was found that the analyzed factors definitely influenced the costs of grape production in plantations up to 30 – 40 ha. Their effect decreased considerably in larger areas. For the different factors that effect differed from parts of one percent to 20%. Within the range of the possible price of the used power means, its effect on the variable costs reached the greatest value among the analyzed factors – up to 20%. The effect of its annual load was also considerable. The functional relations obtained in this study and analyses allow using them to elaborate programm modules for functional multi-criterion analysis of agricultural production.

Key words: wine grape growing, technology, costs in wine grape production

Introduction

New conditions of land use in the last years presuppose also a new approach to technological sets of machines and to conditions of their use. Competitive conditions of development presuppose that the one will succeed who realizes efficiently produced and high-quality produce. On the other hand, the requirements for sustainable development of agriculture necessitate social progress conformed to the needs of everyone, efficient environmental protection and reasonable use of natural resources. That necessitates a balance of the interests and multi-criterion assessment of technological and technical decisions (Vachevska and Peykov, 2007; Getsova and Peykov, 2007; Ochβner, 2006).

That predetermines also the degree of mechanization of technological operations to a great extent. But on the other hand, the new conditions require of the owner to determine on his own the degree and type of mechanization that he will use according to his vision of successful business. He must be given the possibility for a rapid and multifunctional analysis of production, so as to can build a correct strategy for de-

velopment of his business. Knowledge of the extent of effect of different factors allows rationalizing the making of managerial decisions, as well as decisions for directions of development of research activity.

In this connection the objective of this work was to assess the extent of effect of the factors related to production costs in wine grape production.

Analysis of Obtained Results

The conducted reform in agriculture created prerequisites for management of plantations differing in form and size. Under our conditions, these characteristics were formed not only as a result of the conditions, under which the plantations had been established, but also in consequence of the land reform. On the other hand, a number of factors exerted an influence on the production costs – variable and fixed ones. Assessment of their effect corresponded to the tasks of the study. Factorial space of variation of these costs was of a large size and in view of the broader vision in the analysis of effect of the different factors, the spatial analysis was used.

Figure 1 presents the degree of participation of main technological operations in grape production costs. The results are on the basis of the traditional technological system of cultivation under average conditions for our country.

It is evident from the figure that the costs related to plant protection had the greatest share in the total costs, followed by the costs related to grape harvesting, fertilizing and selective pruning. The costs of the other technological operations were relatively small. The share of the costs of phytopharmaceutical preparations and fertilizers was the greatest.

Among the variable costs, the share of grape harvesting costs was the greatest. Selective pruning, spraying and hoeing followed them. The analysis of the degree of participation of these costs allowed predicting the sensitivity of the total costs under respective variation in the operations.

In case of 2/3 participation of the costs of preparations in the fixed costs, any variation in the consumption rates of preparations would reflect on them with this weight. The other 1/3 of the fixed costs would be at the expense of the used fertilizers. Usually the variable and fixed costs in grape cultivation were approximately the same in areas of over 32 ha. That meant that the fertilizer costs were 1/6 of all costs and those of phytopharmaceutical preparations – 1/3. The fertilizer costs were related to consumption rate, which was determined on the basis of nutrient status of soil

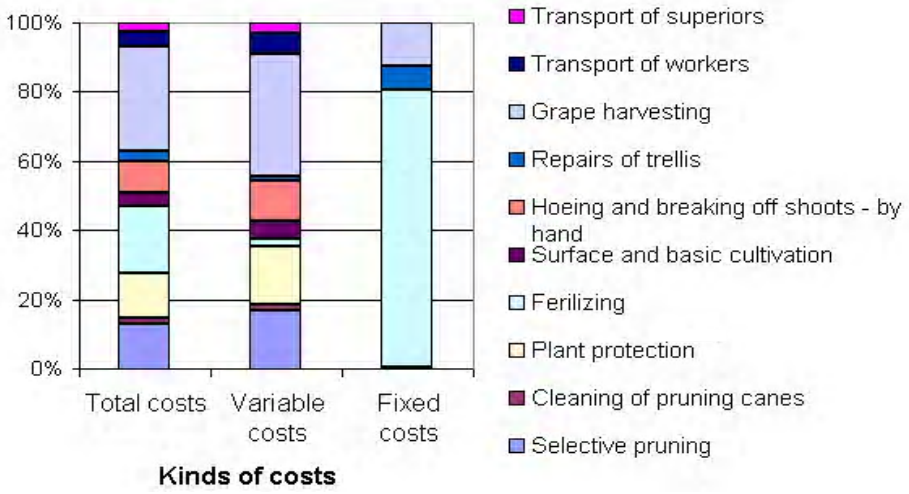

Fig. 1. Relative participation of main technological operations in the fixed, variable and total costs of wine grape production

in the concrete plantation. The quantity of used preparations for each concrete measure depended on the used technology and technique to conduct it. Not only the quantity, but also the variation in prices of the fertilizers and preparations influenced the costs with the above weight.

The share of the operations requiring most manual labour was the greatest in the variable costs. These were the selective pruning and harvesting. The costs of these operations included in them the half of the variable costs. They were followed by the costs related to plant protection and hoeing. In view of the

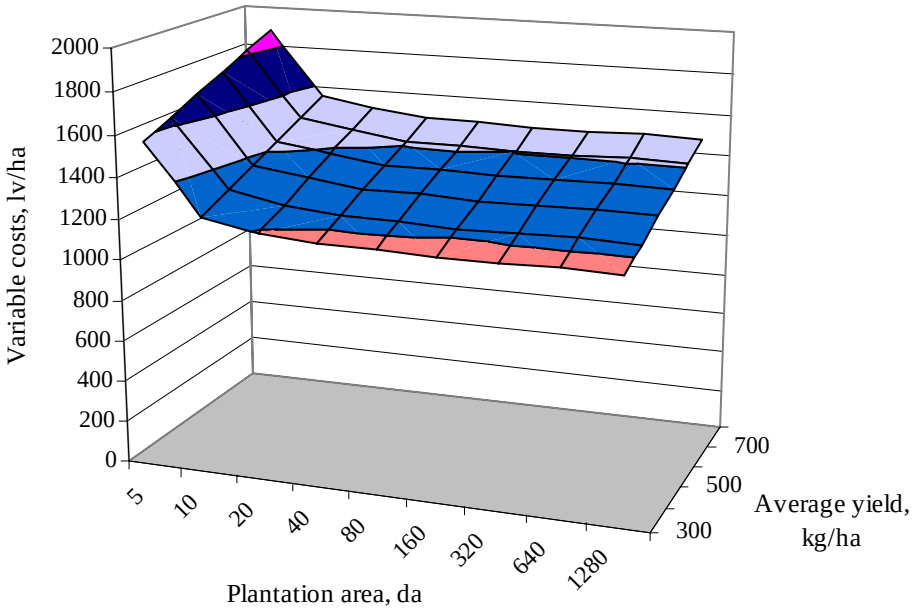

Fig. 2. Effect of plantation area and average yield on the variable costs

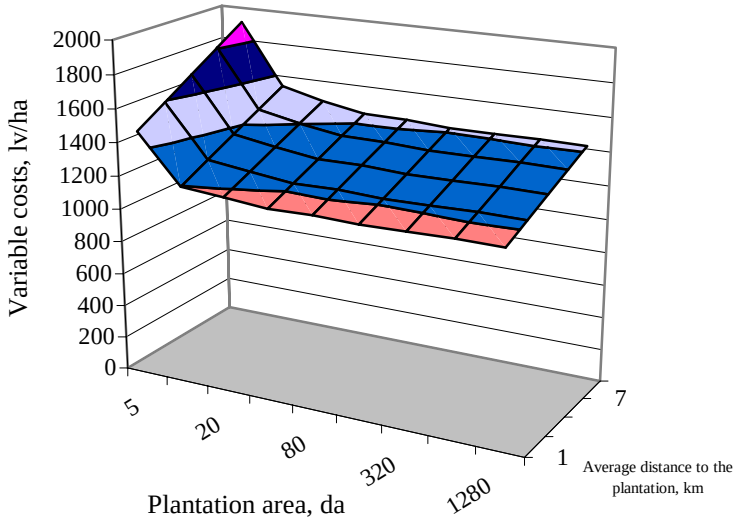

Fig. 3. Effect of plantation area and average distance to the plantation on the variable costs

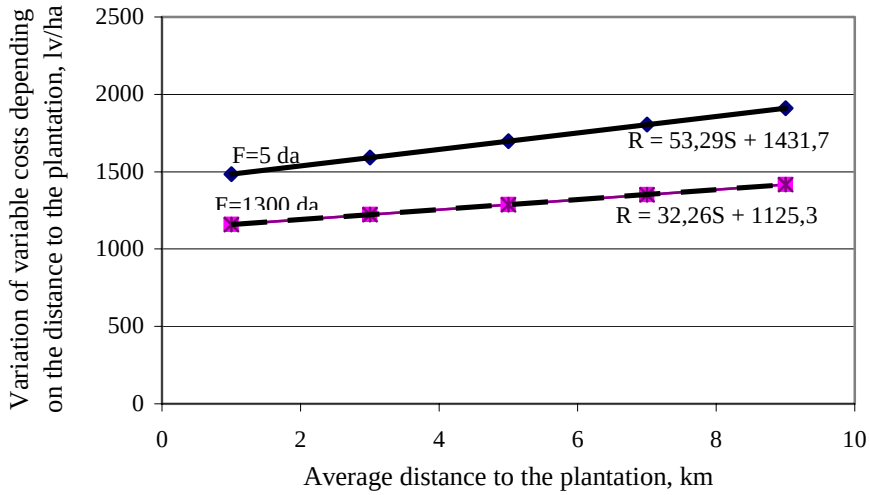

Fig. 4. Variation of variable costs depending on the distance to the plantation for areas of 5 and 1300 da

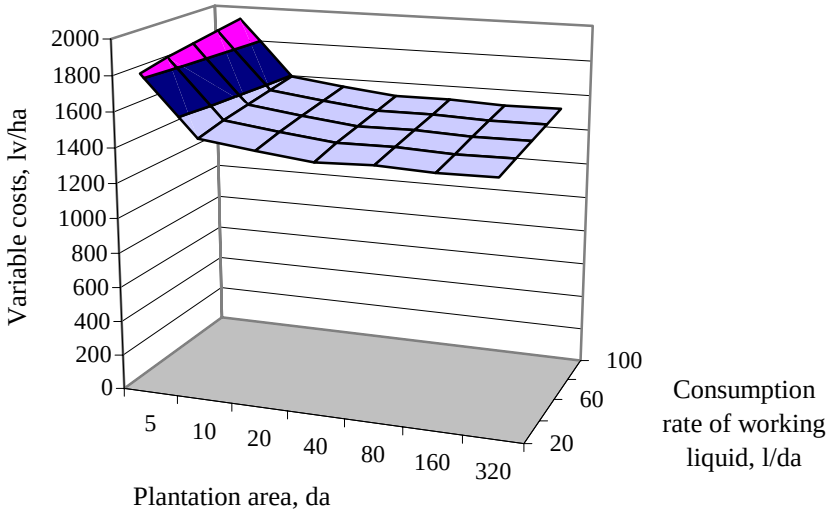

Fig. 5. Variation of variable costs depending on the consumption rate of working liquid and plantation area

nature of the performed operation, the manual labour in the selective pruning could not be mechanized, but only made easy and its productivity could be increased. At the present price of the manual labour and conditions of land use, there are not yet conditions for efficient implementation of mechanized gathering of wine grapes at this stage. There are conditions to improve the technologies for conducting plant protection and hoeing through increase of productivity of these operations.

The effect of plantation area and average yield on the variable costs is shown in Figure 2. Logically, the costs decreased with increase of the area. That effect was strongest in areas up to 30-40 da. After that practically, the plantation area did not influence the costs.

It is evident from the graph that irrespective of the plantation area, the average yield had a constant linear pattern of influence. That connection was approximated by the linear relationship **G = - 0.0146D + 39.48, % at R^2 = 0.995**. With increase of the yield,

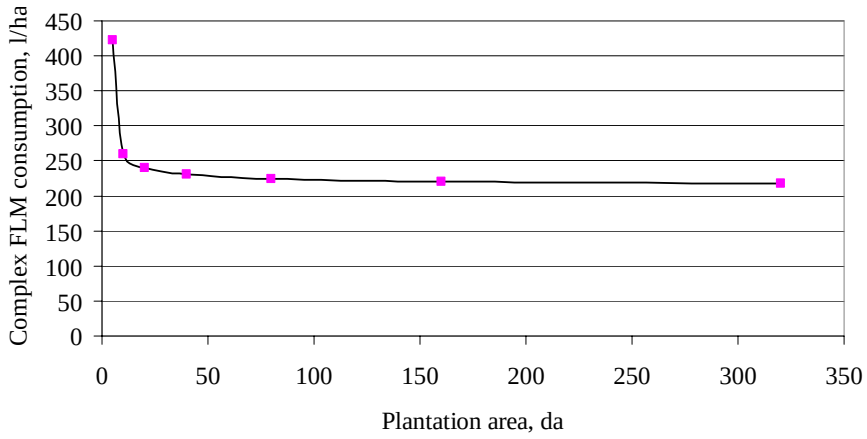

Fig. 6. Variation of complex FLM consumption per unit area depending on the plantation area

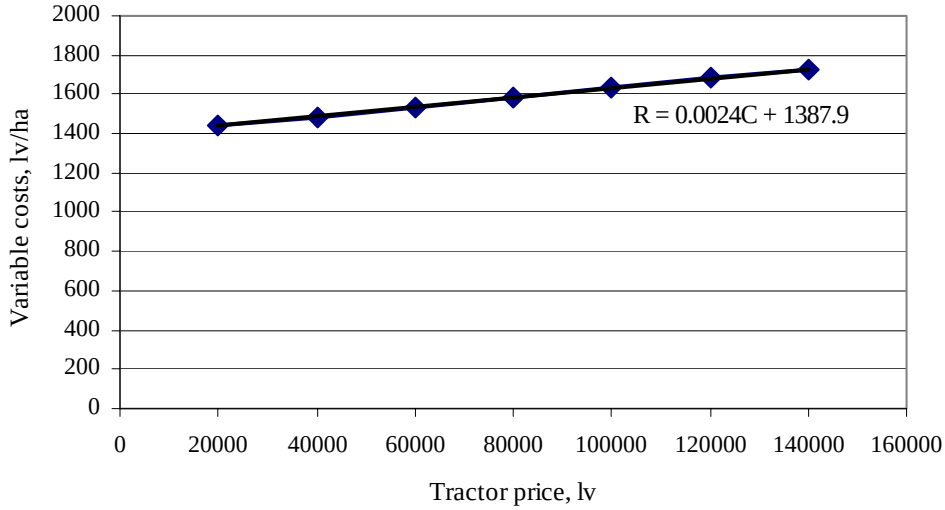

Fig. 7. Effect of price of the basic power means on the variable costs

the extent of its effect on the costs decreased.

The effect of plantation area and average distance to it was similar (Figure 3). Here also, the effect was strongest in the areas up to 30-40 da and the costs also decreased with increase of the area, but in contrast to the previous case, the extent of effect decreased with increase of the areas. The effect remained constant after the indicated limit.

Here also, it is evident from the graph that irrespective of the plantation area the average distance had a constant linear pattern of effect. This connection was approximated by the linear relationship $G = -0.84S + 27.62$ at $R^2 = 0.997$. With increase of the distance, its extent of effect on the costs increased.

Two sections at the ends of the analyzed interval of the surface shown in Figure 3 are presented in Figure 4. The shown graphs and obtained equations determined the range of variation of the variable costs depending on the distance to the plantation.

In order to analyze the effect of regional conditions on the variable costs, several regions with different soil resistance were selected as representative. The obtained results showed that the soil resistance practically exertåd no influence on the variable costs irrespective of the plantation area. That was due to the relatively small share of participation of the operations dependent on the value of soil resistance in the variable costs.

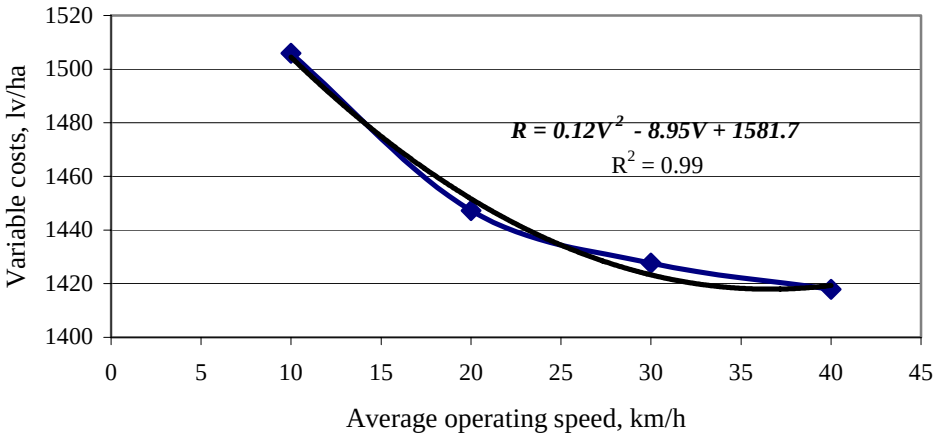

Fig. 8. Effect of average operating speed on the variable costs during transport operations in grape cultivation and harvesting

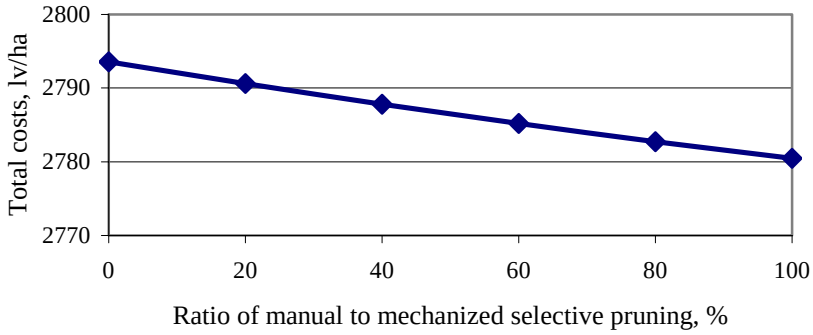

Fig. 9. Variation of total costs depending on the ratio of manual to mechanized selective pruning

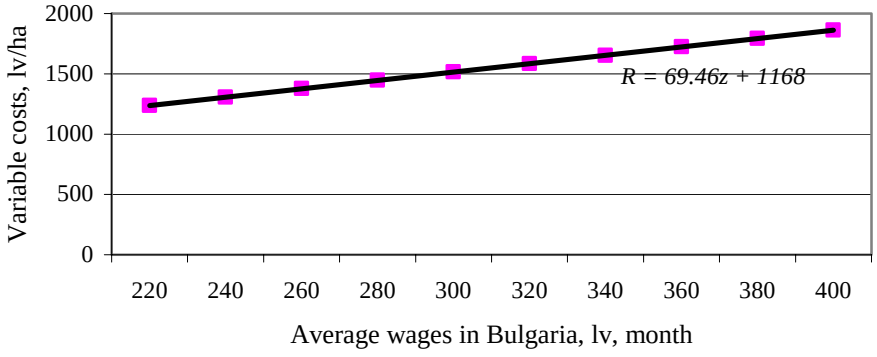

Fig. 10. Variation of variable costs depending on the average wages in Bulgaria

The effect of consumption rate of working liquid on the variable costs is shown in Figure 5. The relation of the variable costs ***(R)*** to the consumption rate of working liquid ***(q)*** was expressed by the relation ***R = 1.19q + 1393.5.*** The extent of effect of the consumption rate of working liquid on the variable costs was not influenced by the plantation area.

The relation of the variable costs to average price

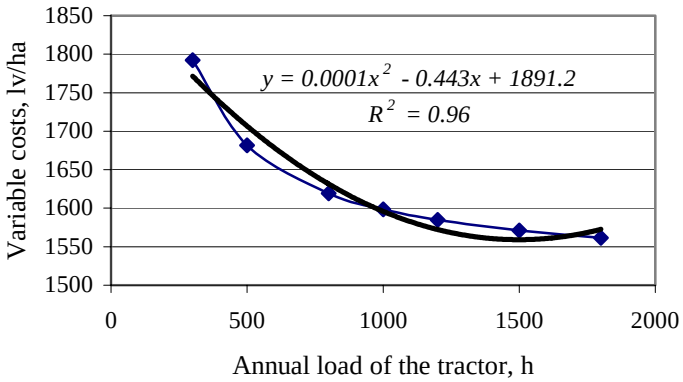

Fig. 11. Variation of variable costs depending on the annual load of the tractor

of FLM (C_{FLM}) was expressed by the linear relation **$R = 214.4C_{FLM} + 1098.6$.** The extent of effect of the specific soil resistance on complex consumption of FLM did not exceed 4.7 %. The effect of plantation size was considerably stronger, particularly in small-sized areas (Figure 6). This effect was insignificant for plantations in larger areas.

Figure 7 presents the effect of the price of the main power means on the variable costs. The functional relation between tractor price (C) and variable costs is also given. In the range of values, the extent of effect of the price of the main power means on the variable costs reached to 20 %. It was a major element of the cots.

The effect of average operating speed (V) during transport manipulations related to cultivation and harvesting of the produce was considerably slighter (Figure 8). This effect did not exceed 6%.The price of package (buckets and sacks) had an insignificant influence on the costs of grape production. This influence did not exceed 0.65% with 50 % price increase.

The effect of the technology for conducting selective pruning on the total costs is given in Figure 9. Passage from complete manual to mechanized selective pruning would provoke a minimum increase of the total costs by 0.3%. The insignificant increase of the total costs would be at the expense of more comfortable working conditions for pruning workers and decrease of prerequisites for occupational diseases.

The used technology for taking out the harvested grapes in sacks and trailers or in bulk also exerted certain, but relatively small influence (1.5%) on the total costs.Figure 10 shows the effect of average wages in our country on the variable costs. The functional relation was linear and its type is shown in the figure.

The effect of annual load (h) of the main power machine on the variable costs was considerable. It is evident from the graph in Figure 11 that at a load of less than 1000 h per year the effect increased considerably. Therefore with a view of the more efficient use of the tractor, a load of over 1000 h per year must be provided.

Conclusions

An approach and methods for technological and technical analysis of grape production have been developed. Relations allowing rapid assessment of different variants have been suggested on the basis of the systemic analysis.

The analysis showed that the costs related to plant protection had the greatest share in the total costs (40%), followed by the costs related to grape harvesting (17%), fertilizing (14.5%) and selective pruning (11%). The fertilizer costs were 1/6 of the total costs and those of preparations – 1/3.

It was found that the analyzed factors definitely influenced the costs of grape production in plantations up to 300 – 400 da. Their effect decreased considerably in larger areas. For the different factors that effect differed from parts of one percent to 20%.

Within the range of the possible price of the used power means, its effect on the variable costs reached the greatest value among the analyzed factors – up to 20%. The effect of its annual load was also considerable.

The functional relations obtained in this study and analyses allow using them to elaborate programme modules for functional multi-criterion analysis of agricultural production.

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Received April, 2, 2008; accepted for printing September, 23, 2008.