Factors influencing the economics of the pork meat production

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Abstract: The research of the influence of the relevant factors and their interrelations on the economics of the pork meat production on a farm has been carried out with the help of the method of production functions (factor – product and factor – factor). The influence of the weight of an animal on the daily growth tells us that the growth is increased with the increase of the entry weight to 19 kg and with the exit weight of the fattened animal of 100 kg . The growth is decreased over these weights. The relationship between the daily growth and the feed costs by a feeding day shows us the tendency of the increase of a daily growth with the increase of the feed costs. With the increase of labour inputs to 2.6 hours/100 kg of the live weight and the increased profit to 29 monetary units, first, the daily growth is decreased, and, then, it begins to grow. Labour productivity grows with the increase of the capacity usage to 87%, and, then, it decreases. The influence of the feedlot capacity usage on the productivity measured by the correlation coefficient is 0.756 at the risk level of 1%. With the increase of the feedlot capacity usage, the economics of production is increased and the cost price is decreased. The economics of the production of pork meat is increased with a decreasing rate with the increase of the daily growth. The manifold influence of the examined factors on the economics movement is low ($R = -0.355$). The partial influence of the costs to the economy is 90.3% that of the direct costs is 80.3%, from which the feed costs have an influence of 51.7%. The influence of the indirect costs on the economics is low, but with their increase, the economics is decreased. It has been noticed that the economics changes can be explained with 66.8% by the change of the relationship of the selling and purchasing price of pigs and the purchasing price of feed concentrate. By the relationship of the price of the fattened animals and the feed concentrate lower than 1 : 5, the economic result is below 1, and above the previously mentioned parity, the economics is increased as well as the economic effects of production.

Key words: pork meat, production function, factor–product, factor–factor, economics of production, labour productivity, economic effects

The economics of agricultural production considerably depends on the development of cattle-breeding as a natural capacity of transforming plant products into high-quality cattle products. Cattle-raising production influences the food quality, the development of food production industry, the export of high-quality and healthy safe products, and the development of agricultural economics.

The demand for pork meat in the world market and the level of competitiveness request the examination of all factors and problems following this sort of production with the aim of it being dynamic. We expect the greater economic result in the production of pork meat and poultry and better results in the foreign trade. The emphasis is put on finding an optimal combination of all factors in order to overcome the cycles in this production and to realize the maximal economic effects.

Production functions precisely define the factor–product and factor–factor relationships and enable the managers to control the factors affecting the economy of pork meat production and the measures which should be taken to reach certain goals. Before entering the production itself, it is important for farmers to know what to expect from the aspect of the cost price and economic profitability as well as which factors influence the economics of the pork meat production.

There are several factors affecting the production results, so it is necessary for them to be in optimal relationships in order to achive the maximal production and economic results. Therefore, the relevant

factors are examined, then their interrelation, the correlation and influence on the achieved production and the economic effects (Heady 1964). The convenient ecological conditions for the development of the production demand the optimal usage of the disposable resources with the aim of maximal production of the high-quality, healthy safe and certified pork meat on the farms. In that way, the consumers' needs both on the local and world markets are satisfied and our environment is preserved. The researches have been done on a pigs farm. There are examined the conditions and possibilities of the development of the pork meat production. The influence of the relevant factors on the economics of the pork meat production is being researched.

THE METHOD OF RESEARCH

The working method is defined according to the tasks and goals of the research related to the influence of the factors on the economics of pork meat production on a farm. The applied method was the method of production function (Heady 1964; Dubic 1963; Miric 1968; Babovic 1980b).

The survey was conducted on the farm agricultural enterprise "Mitrosrem" from Sremska Mitrovica (Serbia) for the period 1997–2006. The design capacity is 10 thousand fattening pigs, and the average use is 69%. The farm is represented by the production of piglets and fattening pigs. The farm is represented within the Dutch company "Provamin" producing the concentrated solutions to technological stages of fattening pigs.

The costs of production, labour and capital inputs were calculated according to the standard calculations and the current prices during the period of research (Babovic et al. 2008).

The total costs included direct costs with 90% in the structure, the largest share of the total costs are the costs of feeds 45%, then, the cost of pigs 30%, labour costs 7%, depreciation 5% and veterinary care costs 2%.

The structure of cost is identical to the projected costs and that of the producers in neighbouring countries. Accounting data for all costs and the resulting changes in the internal data are kept for the farm. Production and technological parameters are standard for the farm and are in line with the projected ones.

The research was carried out during the period from 1997 to 2006. The technological indicators are the following: the average entry weight per 1 pig 17 kg, the entry weight + the situation at the beginning 30 kg, the weight at the moment of selling 98 kg, the length of fattening 146 days, the usage of the farm capacity 69%. In the research, there are used the sources of the zootechnical registry of the condition, growth, feeding, entry situation, exit situation, death-rate and coercive butchering. There is used the documentation about the movement and all changes in the production and expenses, the registry, the accountancy and the planned records on the farm. There is also used the project investment documentation and statistical indicators.

The research on the relations factor–product and factor–factor was carried out by the method of production functions. On the grounds of the production functions, there were examined the factors having an influence on the productivity and economics of the pork meat production (Miric 1968; Babovic 2008a).

In the procedure of the calculation of tendencies, the following functions are examined:

$$Y = a + bx \quad (1)$$

$$Y = a + bx + cx^2 \quad (2)$$

$$Y = a + bx + cx^2 + dx^3 \quad (3)$$

The form of the function was chosen according to the F-test, the residual error and the correlation coefficient, and the importance of regression coefficients was judged according to the t-test.

For the best adapted functions, there were calculated the total U, average P and the marginal G values of the function as well as the flexibility E. The average production was given according to the results values and the examined factors ($P = Y_i/X_i$), where Y_i represents the total production and X_i represents the volume of the used changeable factors. The marginal production was given according to the first function deduction ($G = dy_i/dx_i$) and it represents the relation of the change in the total volume of production which responds to the change in costs. The flexibility coefficient was calculated from the relationship between the marginal and average production ($E = G/P$). There was used the parity method, where the records are shown in amounts of the final product (Babovic 2008a). The mathematical and statistical calculation was done at the Agricultural Faculty in Belgrade. The linear functions of the text are numbered from 1.1 to 1.3, the square from 2.1 to 2.10.

THE RESULTS OF RESEARCH

There are the influences of the weight of the animal, feeding costs, working hours and the personal incomes on the daily growth.

By examining the influence of the weight of the animal at the beginning of fattening and at the end of fattening on the daily growth, there is given the following function:

$$Y = 0.277 + 0.0199x - 0.00063x^2 \quad (2.1)$$

according to which the daily growth increases with the increased entry weight of the animal being fattened of 19 kg and its exit weight of 100 kg . The daily growth is decreased over the previously mentioned weights. The correlation relation between these phenomena is of the middle strength $r = 0.50$, so the changes of the daily growth can be explained by the changes of the weight of the animal both at the beginning and end of fattening with 25%. The relationships and tendencies show that the fattening characteristics are increased with the increase of the weight of the animal at the beginning of fattening, respectively at the end of fattening, to certain weights from 19 to 100 kg. So, production managers can enlarge the pork meat production by the proper feeding (Figure 1).

The influence of the animal weight entering the process of fattening to the amount of the daily growth during fattening is shown by the following function:

$$Y = 0.422 + 0.016x - 0.0005x^2 \quad (2.2)$$

and according to it, the daily growth increases with the increased entry weight of the animal being fattened of 16 kg . By this weight, the marginal line of the production is 0, and the value of the total production has reached the highest level of growth of 0.550 kg and it begins to decrease. Following the weight of the fattened animals to the line of the daily growth being increased has a special importance from the aspect of technology and economy of production. Pork meat producers should know the production characteristics of pigs because of the successful organization of production, the optimal usage of biological characteristics and the rational usage of the production factors with the aim of profitable business.

The relationship between the daily growth and feeding costs per 1 feeding day shows the trend of the daily growth increased with the feed costs being increased too. By examining these relationships, there is given the following function:

$$Y = 0.445 + 0.0245x^2 \quad (2.3)$$

with the determination coefficient of 14.9%. We can conclude that the increased daily growth with the influence of the increased food expenditure had no significance, although the positive tendencies were present.

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In order to research the possibilities of improving the results, there was studied the influence of the working hours costs and the incomes from 100 kg of the liveweight on the daily growth:

$$Y = 0.740 - 0.0145x + 0.0003X_1^2 - 0.0098X_2^2 \quad (2.4)$$

The results tell us that the daily growth decreases with the increased working time costs to 2.6 hours per 100 kg of the liveweight, and with the increased incomes to 29 monetary units per 100 kg of the liveweight, and then it begins to grow.

The flexibility coefficient of the daily growth being influenced by the changes of the working time costs is negative, and its being influenced by the profit level is also negative to 24 monetary units per 100 kg of the liveweight, and then it gets positive. Our conclusion is that the higher profit level affects

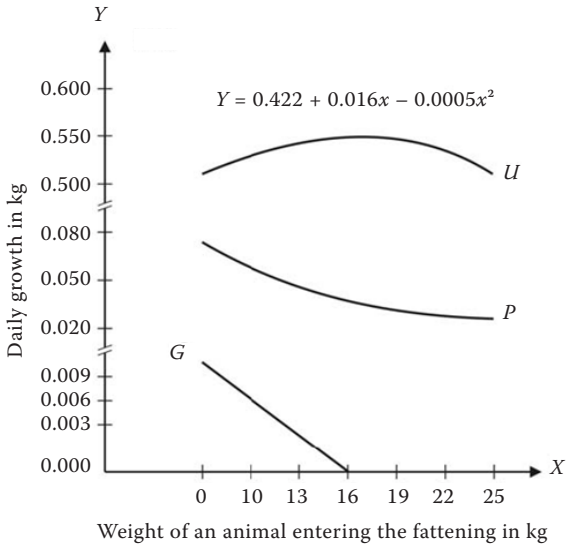

Figure 1. The relationship between the total, average and marginal production of the daily growth being influenced by the change of the weight of the animal entering the process of fattening

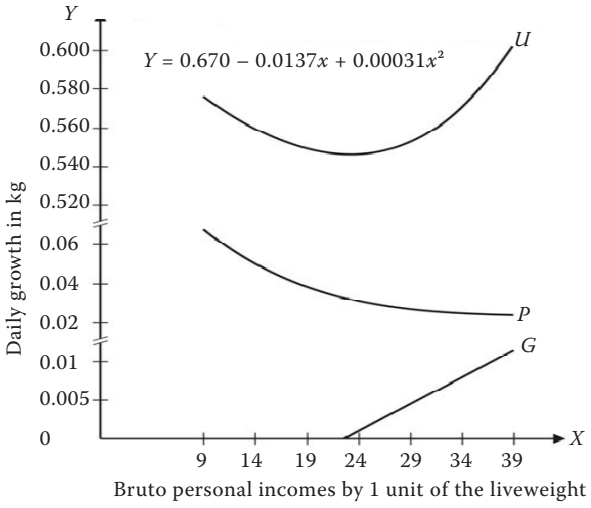

Figure 2. The relationship between the total, average and marginal production of the daily growth being influenced by the change of the profit to 100 kg of the liveweight

both the work of the employees and the growth itself in a stimulating way.

By examining the relationship between the daily growth and the incomes per 100 kg of the liveweight, there is given the following function:

$$Y = 0.670 - 0.0137x + 0.00031x^2 \quad (2.5)$$

according to which the daily growth decreases with the increased incomes to 24 monetary units, and then it grows (Figure 2).

By such a relationship, the marginal production is 0, and the value of the total production drops to the lower level. Subsequently, with the growth of incomes per 100 kg of the liveweight, the values of the total and marginal production are increased and the value

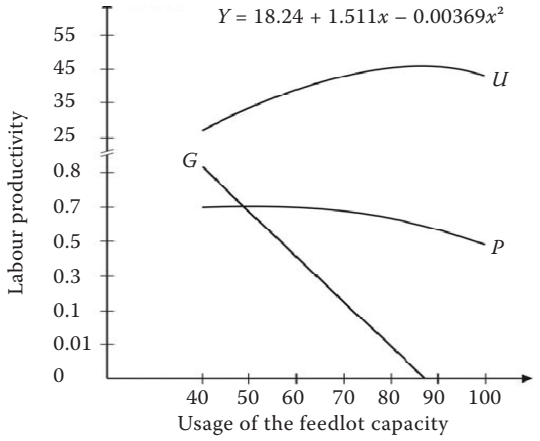

Figure 3. The relationship between the total, average and marginal labour productivity depending on the usage of the feedlot capacity

of the average production is decreased. The flexibility coefficient increases.

The factors having an influence on the labour productivity

There was examined the influence of the capacity usage, the feed costs per 1 feeding day and the daily growth on the labour productivity:

$$Y = 18.24 + 1.511x - 0.00369x^2 \quad (2.6)$$

The influence of the usage of the feedlot capacity on the labour productivity is expressed through the simple correlation coefficient of 0.756 with the risk of 1% (Figure 3).

Labour productivity grows with the increased usage of the capacity to 87% by which it comes to its maximum of 47 kg of the liveweight per 1 working hour, and after that it decreases, which indicates that the other factors too, through the usage of the capacity, influence the labour productivity. Bad stabling conditions and water supplies per head have an influence on the stagnation in productivity over 87%, so animals come out of the process of fattening with a lower weight, the coercive butchering is greater and labour productivity is much lower. It has been proved by the method of a critical point.

The factors having an influence on the economics of production

There are many factors influencing the economics of production and which are apparent when we are talking about total costs and own material and labour costs. Total costs represent the amount of material costs as well as the means of work and people's labour costs in production. The amount of costs is conditioned by the production intensity.

The changes obvious in the economics of livestock production being influenced by the concentrated feeds costs per 1 feeding day, the daily growth and the total costs are illustrated by the following function:

$$Y = 138.89 - 37.62X_1 + 130.07X_2^2 \cdot \\ + 0.0000103X_3^2 \quad (2.7)$$

Under the influence of the amount of the daily growth, the economics is increased with the decreasing rate. The influence of the concentrated feeds costs to the economic results is negative per 1 feeding day. The total costs have not significantly influenced

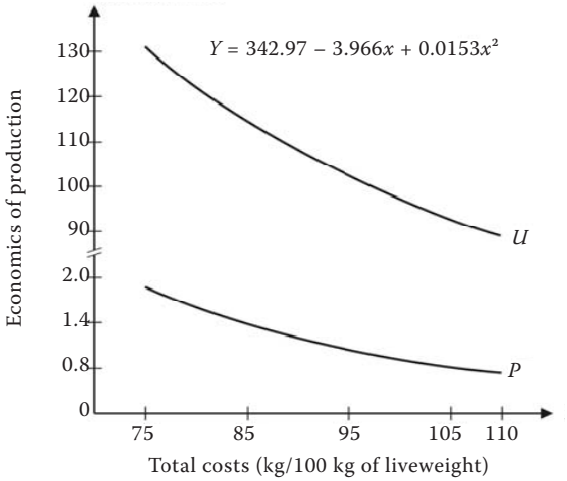

Figure 4. The dynamics of the economics of production depending on the total costs

the economic results increase, which means the intensity limit has not been reached. The influence of the growth and the concentrated feeds costs per 1 feeding day to the economics flexibility is mutually conditioned. The manifold correlation coefficient of 0.355 indicates the weak influence of these factors to the economics of production, although, under the influence of these factors, the economics of production increases (Figure 4).

The dynamics of the economics of production depending on the total costs

According to the production functions, there was examined the single effect of the total costs on the economics of production. It was proved that the total costs influenced the economics of production by 90.3%. With the certainty of 99%, there was given the following function:

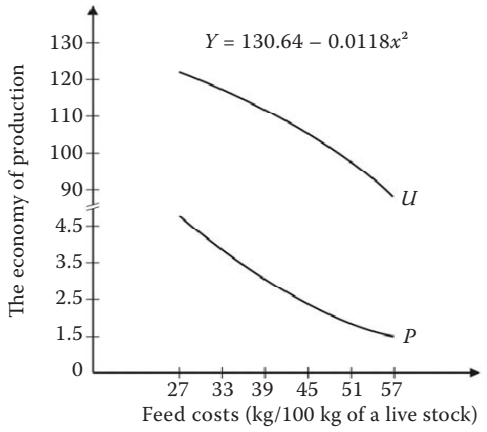

Figure 5. The economics movement depending on the feed costs

$$Y = 342.97 - 3.966x + 0.0153x^2 \quad (2.8)$$

the values of which reflect the economic development. On the basis of the movement of both the total and average economic results, one can conclude that the economics of production, in the business of pigs fattening, is conditioned by other factors too, and that the optimal level of the intensity of production is not reached. The economics dependence on the direct costs changes is expressed by the simple correlation coefficient of 0,896 with the risk level of 0.1%. With the direct costs increase, the economics decreases which is proved by the following function:

$$Y = 202.3 - 1.109x \quad (1.1)$$

which means that there is an economics decrease of 1.1 with the direct costs increase per one measure unit of one.

The feed costs had with 51.7% the greatest influence on the economic result among the other direct costs and it is illustrated by the following function:

$$Y = 130.64 - 0.0118x^2 \quad (2.9)$$

the square member of which, with the feed costs change, expresses decreasing of the economics of production. The equation gives the value with the certainty of 99.9% (Figure 5).

The economics development depending on the feed costs

According to the relationship between the total and the average economics, we can notice that the feed costs increase influences the economics decrease. This conclusion is proved by the limit economics movement which is negative and, with the feed costs increase, it is gradually increased in a negative direction as well as the flexibility coefficient which, with the feed costs increase, is closing to the value of 1. The influence of the indirect costs on the economics is shown by the following function:

$$Y = 120.41 - 1.380X \quad (1.2)$$

and it proves that, with the certainty of 95%, one can claim that, with the indirect costs increase of 1, the economics decreases by 1.38.

The influence of the relationship between the selling and purchasing price of pigs $x1$ and the relationship between the selling price of pigs and the purchasing price of the concentrated feeds $x2$ on the economics of the livestock Y, there is established the high cor-

relation dependence of 0.820. The calculation has been given by the regression equation:

$$Y = 13.513 + 65.54X_1 - 18.04x^2 + 18.85X_2 - 0.903X_2^2 \quad (2.10)$$

and it shows that, with the increase of the relationship between prices, the economics of livestock in the business of fattening of pigs is increased too.

By the relationship between the selling and purchasing price of pigs, the flexibility is lower than 0.5, and with the increase of the relationship between these prices, it decreases. We find the same situation when we are talking about the relationship between the prices of pigs and the concentrated feeds (Figure 6).

The influence of the relationship between the selling price of pigs and the purchasing price of the concentrated feeds on the economics of production of livestock is shown by the following function:

$$Y = 55.3 + 9.478x \quad (1.3)$$

where the economics increases with the better parity of prices.

The value of the marginal economics is below the average economics. By market relationships, the price of fattening pigs and the concentrate lower than (1 : 5), the economy is under the value of one, and over this relationship, the economy is increased. During the researching period the parity of prices of fattening pigs towards the price of concentrated feeds was destimulating. It follows that the pork meat production can be stabilized under the conditions of the parity relationship between the prices of fattening pigs and the concentrated feeds, which enables the purchase of more than 5 kg of the concentrated feeds for the value of 1 kg of the liveweight of fattening pigs.

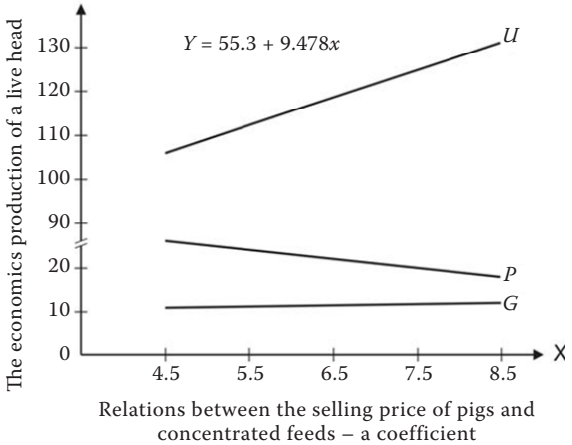

Figure 6. The economy movement and the relationship between the selling price of pigs and the purchasing price of concentrate

CONCLUSION

Production functions precisely define the factor–product and factor–factor relationships and enable managers to have the control of the factors affecting the economics of the pork meat production and of the measures which should be taken to reach certain goals.

The influence of the weight of one animal on the daily growth tells us that the growth increases with the increased entry weight of 19 kg and the exit weight of a fattened animal of 100 kg. The growth decreases over these weights, which is in accordance with the technology of fattening where the best concentrated feeds conversion is achieved. The influence of the concentrated feeds costs and the daily growth on production results is mutually conditioned.

The influence of the working time costs and the amount of incomes per 100 kg of the liveweight on the daily growth tell us that the daily growth decreases with the increased work inputs of 2.6 hours/100 kg and the incomes of 29 monetary units/100 kg, and then, it begins to grow.

The flexibility of the daily growth comparing with the working time inputs is low and negative, and comparing with the personal incomes, it is negative to 24 monetary units/100 kg, and then, it begins to grow, which shows us that the increased personal incomes are very stimulating for the producers.

The influence of the capacity usage on the productivity, economics and cost price shows that with the increased usage of the capacity of the feedlot, the economics is increased too, and the cost price decreases. The labour productivity grows with the increased capacity usage of 87%, and then it decreases. Decreasing of the extent of the capacity usage has the consequence of a proportional decrease of the volume of production and costs.

The economics of the pork meat production increases with the decreasing rate with the increased daily growth. The influence of the concentrated feed costs per 1 feeding day on the economics is negative. The manifold influence of the examined factors on the economics movement is low and its value is $\boldsymbol{R = -0.355}$. The partial influence of the costs on the economics is explained by 80.3%. When we are talking about direct costs, the feed costs have with 51.7% the greatest influence on the economics of production. The economics decreases with the increased feed costs, what is also shown by the negative marginal economics and the

coefficient of its flexibility being negative and close to the value of –1. The influence of indirect costs on the economics is low, but, with their increase by one, the economics is decreased by 1.38.

Through the research, it has been proved that the economic changes in the production can be explained by the change of the relationship between the selling and purchasing prices of pigs and the purchasing price of the concentrated feeds by 66.8%. By the relationships between the prices of the fattened pigs and the concentrated feeds lower than 1 : 5, the economics is below the value of one, and over these relationships, the economics is increased, and with it, the economics of pork meat production is increased too.

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