Economics of agriculture
SI – 2
UDK: 631.1.017.3:636:658.5.012.7

SENSITIVE ANALYSIS OF LIVESTOCK BREEDING PRODUCTION ON FAMILY FARMS[1]

Jonel Subić[2], Lana Ivanović[3], Marko Jeločnik[4]

Abstract

In process of transition of national economy into market economy, agricultural husbandries are adjusting their business activities to suit new economic conditions. So, their goals have shifted significantly: from self-sufficiency towards increased production for market and realization of principles of own profitability.

As very complex process, live stock breeding production requires from agriculturalist constant decisions making related to maintaining, or increasing of gained profit on farm. Making of right and timely decisions, is closely related to the possession of appropriate knowledge and skills, necessary information, as well as with proper perceiving and solving of appeared problems.

In livestock breeding production the significant source of risks is permanent growth of production costs, parallel with products' prices fall. Hence, it is important to consider the risk of certain productions, where sensitive analysis could provide relevant information.

In paperwork are analyzed economic effects of different livestock breeding productions in terms of yields, prices and costs change. On that way is possible to notice which factors affect the most on economic effects within production, as well as which production is more risky.

***Key words**: sensitive analysis, livestock breeding, agricultural husbandries.*

---

1 Paper work is a part of the project researches 149007 Multifunctional agriculture and rural development in function of accession of Republic of Serbia in European Union and 159004 D Accession of Serbian economy into EU – planning and financing of regional and rural development and companies' development policies, financed by the Ministry of Science and Technological Development of Republic of Serbia.

2 Jonel Subic, Ph.d., Assistant Professor, Research Associate, Institute of Agricultural Economics, 15 Volgina Street, 11060 Belgrade, Serbia, phone: +381 (0)11 297 2854, e-mail: jonel_s@mail.iep.gb.ac.rs

3 Lana Ivanovic, M.A., Research Assistant, Institute of Agricultural Economics, 11060 Belgrade, 15 Volgina Street, phone: +381 (0)11 297 28 52, e-mail: lana_i@mail.iep.bg.ac.rs

4 Marko Jelocnik, M.A., Research Assistant, Institute of Agricultural Economics, 11060 Belgrade, 15 Volgina Street, phone: +381 (0)11 297 28 52, e-mail: marko_j@mail.iep.bg.ac.rs

Introduction

Livestock breeding already has, and should have in near future, an important role in the structure of national agricultural production potential. In addition to this goes high presence of forage crops, pastures and meadows in the structure of plant production, and traditional agriculture orientation in Central Serbia to cattle breeding.

Independently of limiting market factors, potentials for livestock breeding development are in great portion determined by natural conditions, surface and structure of utilized agricultural land, by form of agricultural production organization, economic and social structure of local population, as well as by achieved level of economic development. Observing natural resources, Republic of Serbia could be described as a rich territory, with significant opportunities for further growth and development of livestock breeding production.

Climatic and soil conditions on the Republic territory are suitable for intensive and cost-effective production of reproductive and fattening animals, what includes milk production (total production in 2009. was around 1.478 million liters of cow's milk)[5] and meat production (total meat production in 2009. was around 457.108 t. From that sum, around 100.199 t were beef meat[6], 252.188 t were pork meat[7], 24.517 t were sheep meat and 80.204 t were poultry meat). In 2009 there was 1.002.000 heads of cattle (548.000 cows, 36.000 in-calf heifers and 199.000 bullocks in process of fattening). In same year, total number of pigs was 3.631.000 heads (474.000 heads of fattened pigs – weight 51-80 kg, 283.000 heads of fattened pigs – weight 81-110 kg and 185.000 heads of fattened pigs – weight over 110 kg).

Focusing on feed, one of the levers for strengthening of livestock breeding production, besides developed maize production (during 2009. production was around 6.396.262 t and harvested area was around 1.208.640 ha) and forage crops production (in 2009. total production was around 2.343.948 t and harvested area was around 350.484 ha), surfaces under meadows (in 2009. harvested area was around 613.630 ha, and total yield was 1.126.239 t) and pastures (in 2009. harvested area was 810.916 ha and total yield achieved 471.043 t) were also available.

Having in mind before all tradition in production, available fodder base, purchasing capacities, consumer centers, export opportunities, existing capacities for cattle breeding and many commercial farms directed to investment, potentials for further development of livestock breeding production still have not been exhausted.

5 Milked cow's milk spent for human alimentation or processing.

6 Except this, it was produced 5.000 t of raw beef fat.

7 Except this, it was produced 30.000 t of raw pork fat.

Working material and method

In paper were presented calculations under variable costs for different livestock breeding productions, related to reproductive and fattening animals. Accordingly, calculations of production costs were made per one animal for reproduction, and one fattening animal. So, calculations are related to the production of cow's milk (*Simmental type of cattle*) and bullock and pig fattening. Also, contribution margin for afore mentioned lines of livestock breeding production was determined.

Creation of analytical calculation based on variable costs is starting with establishment of achieved production value on market, which is gained as sum of products market price multiply with their quantity. Then, from that value are subtracted variable costs of production. In agricultural production, character of variable costs has: costs of material (seeds, manure and mineral fertilizers, pesticides, feed, etc.), variable costs of machine usage (fuel and lubricant) and variable part of general expenses.

Labor costs, depending on activities organization in company or husbandry, could be observed as fixed or variable cost, so they can be included, or excluded during the determination of contribution margin value. Result of analytical calculation based on variable costs is *contribution margin (gross financial results)*.

Contribution margin is defined as difference between total production value (value of main product increased for the value of by-products and incentives) and proportional variable costs. Contribution margin shows how much financial assets are left for fixed costs covering and realizing of positive financial result, after covering of variable costs.

Calculation based on variable costs enables direct comparing of financial performance of two different lines or phases of production at equal fixed costs, as well as comparison of two or more different intensities of same line or stage of production.

By usage of *sensitive analysis* it was followed for how much contribution margin is decreased due to reduction of yield (or reduction of selling price), or due to growth of variable costs. In this way, was determined what parameter affects more on reduction of contribution margin, or change of which parameter brings to higher risk in livestock breeding production (concretely in milk production and process of bullocks and pigs fattening).

In order to facilitate comparisons of valuable indicators of production, costs and production value are expressed except in *RSD/UM* (or, *RSD/head of animal*) also in official EU currency *EUR/UM (*or, *EUR/head*). For *reproductive animals* base for calculation is one head in period of one year. In *bullocks and pigs fattening*, base for creation of calculation are heads after process of fattening (depending on fattening process duration).

Results and discussion

According to established methodology, calculations based on variable costs in livestock breeding production are related to: *cow's milk (Simmental breed of cattle*), *bullocks and pig fattening*.

In the structure of calculation model for cow's milk production, variable costs are consisted of next elements *(Table 1.)*: feed (concentrate, corn silage, hay and grazing); veterinary services; straw and other expenses.

Table 1 – Calculation based on variable costs in cow's milk production

Description	Quantum	UM	Coefficient	Price *(RSD/UM)*	Total *(RSD/ head)*	Total *(EUR/head)*
Production value (I)					**164.182,50**	**1.732,30**
Milk	4.500,00	l		27,00	121.500,00	1.281,96
Calf	150	kg	0,73	230,00	25.185,00	265,73
Extracted cow	650	kg	0,17	95,00	10.497,50	110,75
Incentives	5.000,00	l		1,40	7.000,00	73,86
Variable costs (II)					**99.625,00**	**1.051,23**
Feed					85.625,00	903,52
Veterinary services					8.000,00	84,41
Straw					4.000,00	42,20
Other expenses					2.000,00	21,10
Contribution margin (III=I-II)					**64.557,50**	**681,07**

Source: Subić, J., Ivanović, L., Jeločnik, M. (2009.): Contribution margin in agricultural production (field research). IAE, Belgrade.

In following tables are shown contribution margin fall in cow's milk production (due to yield or price falling, or growth of production costs).

Table 2 - Contribution margin fall in cow's milk production, due to yield or price falling

Fall of yield or fall of cow's milk price (%)	Fall of contribution margin in cow's milk production	
	(%)	*(RSD/head)*
5,00	9,51	57.782,50
10,00	19,03	51.707,50
15,00	28,54	45.632,50
20,00	38,05	39.557,50
25,00	47,57	33.482,50
30,00	57,08	27.407,50
35,00	66,59	21.332,50
40,00	76,11	15.257,50
45,00	85,62	9.182,50
50,00	95,13	3.107,50
55,00	-	-

Source: According authors calculations

Table 3 - Contribution margin fall in cow's milk production, due to growth of production costs

Growth of cow's milk production costs *(%)*	Fall of contribution margin in cow's milk production	
	(%)	*(RSD/head)*
5,00	7,80	58.876,25
10,00	15,60	53.895,00
15,00	23,40	48.913,75
20,00	31,20	43.932,50
25,00	39,00	38.951,25
30,00	46,80	33.970,00
35,00	54,60	28.988,75
40,00	62,40	24.007,50
45,00	70,21	19.026,25
50,00	78,01	14.045,00
55,00	85,81	9.063,75
60,00	93,61	4.082,50
65,00	-	-

Source: According authors calculations

From the tables presented above, it can be seen that contribution margin in cow's milk production is more sensitive on the yield and price fall, than on growth of

production costs.[8]

In the structure of calculation model for bullocks fattening, variable costs are consisted of next elements *(Table 4.)*: calf; feed (alfalfa hay, mixture for heads up to 250 kg and mixture for heads over 250 kg); veterinary services and other expenses.

Table 4 - Calculation based on variable costs in bullocks fattening

Description	Quantum	UM	Price *(RSD/ UM)*	Total *(RSD/ head)*	Total *(EUR/head)*
Production value (I)				**72.000,00**	**759,65**
Fattened head	450	kg	160	72.000,00	759,65
Incentives				0,00	0,00
Variable costs (II)				**54.837,60**	**578,58**
Calf	150	kg	260	39.000,00	411,48
Feed				13.098,40	138,20
Veterinary services				969,6	10,23
Other expenses				977,6	18,67
(III=I-II) Contribution margin				**17.162,40**	**181,08**

Source: Subić, J., Ivanović, L., Jeločnik, M. (2009.): Contribution margin in agricultural production (field research). IAE, Belgrade.

In following tables is presented fall of contribution margin in bullocks fattening (*due to due to yield or price falling or growth of production costs*).

Table 5 - Contribution margin fall in bullocks fattening, due to yield or price falling

Fall of yield or fall of fattened head price *(%)*	Fall of contribution margin in bullocks fattening	
	(%)	*(RSD/head)*
5,00	20,98	13.562,40
10,00	41,95	9.962,40
15,00	62,93	6.362,40
20,00	83,90	2.762,40
25,00		-

Source: According authors calculations

8 Dashes in tables indicate negative contribution margin (case in which achieved production value is lower than sum of variable costs).

Table 6 - Contribution margin fall in bullocks fattening, due to growth of production costs

Growth of production costs of fattened head *(%)*	**Fall of contribution margin in bullocks fattening**	
	(%)	***(RSD/head)***
5,00	15,98	14.420,52
10,00	31,95	11.678,64
15,00	47,93	8.936,76
20,00	63,9	6.194,88
25,00	79,88	3.453,00
30,00	95,86	711,12
35,00		-

Source: According authors calculations

From the tables presented above, it can be seen that contribution margin in bullocks fattening is also more sensitive on the yield and price fall, than on growth of production costs.

I n the structure of calculation model for pigs fattening, variable costs are consisted of next elements *(Table 7.)*: piglet; feed (concentrate I for heads from 25 to 60 kg; concentrate II for heads from 60 to 110 kg); veterinary services and other expenses.

Table 7 - Calculation based on variable costs in pigs fattening

Description	**Quantum**	**UM**	**Price *(RSD/ UM)***	**Total *(RSD/head)***	**Total *(EUR/head)***
Production value (I)				**18.123,60**	**191,22**
Fattened head	110,00	kg	164,76	18.123,60	191,22
Incentives				0,00	0,00
Variable costs (II)				**13.509,77**	**142,54**
Piglet	25,00	kg	218,07	5.451,75	57,52
Feed				7.234,20	76,33
Veterinary services				484,60	5,11
Other expenses				339,22	3,58
(III=I-II) Contribution margin				**4.613,83**	**48,68**

Source: Subić, J., Ivanović, L., Jeločnik, M. (2009.): Contribution margin in agricultural production (field research). IAE, Belgrade.

In following tables is presented fall of contribution margin in pigs fattening (*due to due to yield or price falling or growth of production costs*).

***Table 8** - Contribution margin fall in pigs fattening, due to yield or price falling*

Fall of yield or fall of fattened head price *(%)*	Fall of contribution margin in pigs fattening	
	(%)	*(RSD/head)*
5,00	19,64	3.707,65
10,00	39,28	2.801,47
15,00	58,92	1.895,29
20,00	78,56	989,11
25,00	98,20	82,93
30,00		-

Source: According authors calculations

Table 9 - Contribution margin fall in pigs fattening, due to growth of production costs

Growth of production costs of fattened head *(%)*	Fall of contribution margin in pigs fattening	
	(%)	*(RSD/head)*
5,00	14,64	3.938,34
10,00	29,28	3.262,85
15,00	43,92	2.587,36
20,00	58,56	1.911,87
25,00	73,20	1.236,38
30,00	87,84	560,89
35,00		-

Source: According authors calculations

From the tables presented above, it can be seen that contribution margin not only in different cattle production lines, but also in pigs fattening is more sensitive on the yield and price fall, than on growth of production costs.

Conclusion

Summarizing the results that were obtained during the creation of calculations of production costs of certain livestock breeding products (*cow's milk - Simmental breed of cattle* and *heads of fattened bullocks and pigs*), following conclusions can be done:

- In all observed lines of livestock breeding production, contribution margin is more sensitive on yield or price fall, than on costs growth;
- The most risky production is bullocks fattening. After that comes pigs fattening, while at the end is cow's milk production with lowest production risk;
- Lower risk in production of cow's milk is partly result of incentives and their positive effect on increase of total production value;
- High risk in bullocks fattening is dominantly consequence of the incentives absence.

Taking into account the structure of livestock breeding production, husbandry needs and current market conditions, production lines that are less risky has to be chosen, in other words those one whose contribution margin is more flexible on parameters change. In that context, for each livestock breeding production line on family farm, it is necessary to create particular calculation of planned or accomplished production value and costs, in order to extract most profitable production.

Obtained contribution margin is for covering of all fixed costs, and remaining part represents profit realized in given production. Realized profit from the production lines differs among producers and it is conditioned by the sum of fixed costs that burdens business activity of each individual farm. Therefore, in order to achieve much more profit, in the livestock breeding production structure of some family farm should be included those production lines that are obtaining higher contribution margin.

Literature

1. Andrić, J. (1998): *Costs and calculations in agricultural production* (II edition). Savremena Administracija, Belgrade.
2. Ćejvanović, F., Cvijanović, D., Grgić, Z., Hodžić, K., Subić, J. (2010): Cost and calculation theory in agriculture – addition – Catalogue of agricultural calculations, IAE Belgrade.
3. Cicea, C., Subic, J., Cvijanovic, D. (2008): *Beyond Agriculture and Rural Development: Investments, Efficiency, Econometrics*, IAE Belgrade.
4. Ivanovic S., Subic, J., Sredojevic, Z. (2007): *Financing of family farms in Serbia and its influence on business results.* Book is the result of the conference Values and Challenges in designing the European rural structures – research network experience, organized by IAE Bucharest under CEXX Program - Promovarea convergenței regionale – modernizarea potențialului ştiințific în domeniul dezvoltării rurale, in cooperation with ERDN. Rural areas and development – vol. 5. IAE, Bucharest.
5. Subić, J., Ivanović, L., Jeločnik, M. (2009): *Contribution margin in agricultural production (field research),* IAE, Belgrade.
6. Subić, J., Jeločnik, M., Ivanović, L. (2010): *Risk analysis in live stock breeding production by using of sensitive analysis,* Proceedings of II International scientific conference – Modern problems of national economic development, Stavropol, Russian Federation, pp. 45-54.
7. Vasiljević, Z., Subić, J. (2010): *Costs managing in Serbian agro-economy – factor of competitiveness growth*. Proceedings – Serbian agro-economy and European integrations - (un)conformity to mutual appliance of interim trade agreement. DAES, Belgrade, pp. 77-94