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ANALYSIS OF THE EFFICIENCY OF PORK PRODUCTION IN GRODNO REGION

Abstract. Models of pork production profitability in years 2002–2004 have been constructed and analyzed. The links between the producers of pork and zones of raw material deliveries in Grodno region have been analyzed. Dependence of the profitability of pig–breeding production on parameters most influencing it in Grodno region has been established. Some directions of raising the efficiency of the branch have been suggested.

Key words: pigs, efficiency, profitability, influence, models, analysis

Pig-breeding, both for the republic and for the Grodno region is an important branch which in conditions of market economy should become basic means of allowing not only to suspend a slump in meat production, but also to create substantially necessary food stocks for the export purposes and also to raise its economic efficiency. The Grodno region as a leader in the branch has an important role in solving the problem of producing good qualitaty and cheap products.

The purpose of the reported research was to analyse the mutual relations between the meat-packing plants and their supply zones in the districts of Grodno region and also the influence of dynamic changes in some factors on the level of profitability in pork production.

Let us group the districts in Grodno region according to the level of profitability of pork production.

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Table 1. Profitability of pork production in the districts of Grodno region, %.

| District | Year | | | | | 2004 / 2000, + - | 2004 / 2003, + - |
	2000	2001	2002	2003	2004		
Slonim	18.30	9.26	9.84	9.62	26.68	8.38	17.06
Grodno	28.58	30.58	35.16	25.44	22.60	-5.98	-2.84
Corelychi	35.48	22.86	20.89	16.57	19.25	-16.23	2.68
Berestovitsa	8.96	16.48	22.21	15.99	18.79	9.83	2.80
Dyatlovo	12.55	4.68	4.59	11.13	4.62	-7.93	-6.51
Total I group	**18.42**	**15.84**	**16.23**	**14.55**	**17.63**	**-0.79**	**3.08**
Novogrudok	-20.61	1.61	24.01	8.13	18.69	39.30	10.56
Schutchin	-9.22	-16.59	-3.20	-5.95	15.37	24.59	21.32
Ostrovets	-11.92	3.44	6.95	11.39	9.65	21.57	-1.74
Voronovo	-28.16	0.74	-1.37	-0.95	7.11	35.27	8.06
Oshmiany	1.02	-6.33	-1.87	-8.84	4.70	3.68	13.54
Mosty	21.45	-1.91	4.83	7.94	4.06	-17.39	-3.88
Total II group	**-7.21**	**-3.22**	**3.79**	**1.83**	**9.56**	**16.77**	**7.73**
Svisloch	-7.16	-14.39	-16.61	-13.70	-3.61	3.55	10.09
Zelva	-11.00	-5.93	-22.35	-18.16	-4.31	6.69	13.85
Volkovysk	-17.55	-5.54	-3.12	-10.01	-4.59	12.96	5.42
Ivie	-0.17	-16.86	-22.11	-24.26	-13.99	-13.82	10.27
Lida	-34.47	-27.05	-33.45	-32.64	-20.66	13.81	11.98
Smorgon	-5.10	——	——	-34.60	-25.71	-20.61	8.89
Total III group	**-12.67**	**-13.25**	**-18.62**	**-20.31**	**-11.68**	**0.99**	**8.63**
Sum total	**276**	**3.94**	**8.44**	**7.77**	**13.31**	**10.55**	**5.54**

From the data of table 1 it is visible that all districts of the Grodno region can be broken into 3 groups: profitable, unprofitable and 'unstable'. The most efficient pork producing agricultural enterprises in the Grodno region in 2000 through 2004 were located in the Grodno, Corelychi, Slonim, Berestovitsa and Dyatlovo districts. In considered years this production in these districts was never unprofitable, and in 2004 the level of profitability was respectively 22.6 %, 19.25 %, 26.68 %, 18.79 % and 4.62 %. As a whole the pork production in Grodno region in the analysed period became more efficient, to what a growth of the profitability level from 2.76 % up to 13.31 % testifies.

The analysis of the raw material supply zones for the meat-packing plants in Grodno region has shown that districts, where the pork production for last years is stably profitable, delivered to the Grodno and Slonim meat-packing plants, like the Grodno and Berestovitsa districts to the Grodno meat-packing plant, and the Slonim, Dyatlovo and Corelychi districts to Slonim.

It is known that the production efficiency influences the profitability as an internal (the purchase price of meat, live weight) and external factor (the costs of delivery of raw material to meat-packing plants). We shall consider purchase of raw material by meat-packing plants on the example of the Grodno region.

Table 2. Categories of pigs purchased by the meat-packing plants in Grodno region in 2005.

Meat-packing plant	Category										Total	
	I		II		III		IV		out of standard			
	live weight, t	%	live weight, t	%	live weight, t	%	live weight, t	%	live weight, t	%	live weight, t	%
Volkovysk	649	4.4	8672	58.4	5477	36.9	21	0.1	43	0.3	**14862**	**100**
Grodno	725	5.9	7977	65.4	3257	26.7	193	1.6	51	0.4	**12203**	**100**
Lida	17	0.6	1918	70.1	709	25.9	36	1.3	55	2.0	**2735**	**100**
Slonim	2	0.1	5178	58.7	3312	37.5	319	3.6	2	0.1	**8813**	**100**
Oshmiany	171	5	2048	59.8	1144	33.4	60	1.8	----	----	**3432**	**100**
Grodno region	**1564**	**4**	**25793**	**61.4**	**13899**	**33.1**	**629**	**1.5**	**151**	**0.4**	**42036**	**100**

Meat-packing plants in the Grodno region produced 1564 t of pork of the Ist category and 25793 t of the IInd category in 2005, that means 3.7 % and 61.4 % respectively. I and II categories in the Grodno and Slonim meat-packing plants had a share of 71,3 % and 58,8 % in the structure of processed meat while their share in regional output was 29 % and 21 % respectively.
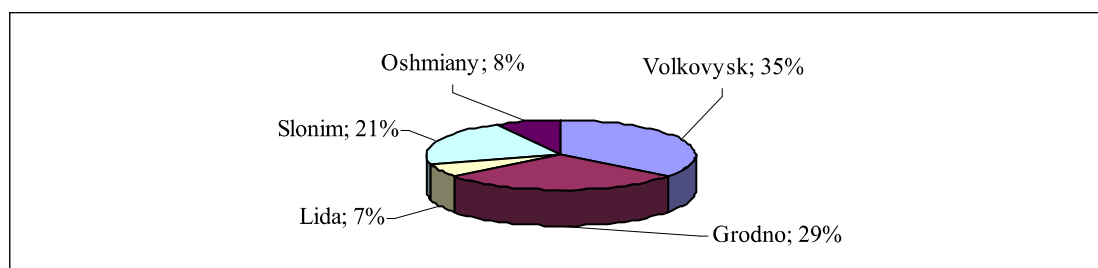

Figure 1. Distribution of pork production between the meat-packing plants in Grodno region.

Profitability of production is determined by the input prices, quality and by the sale price of the produce. The average sale prices of 1 ton of pork in the three groups of districts were: I group 2.32 million roubles, II group 2,33 million roubles and III group 3.45 million roubles. The average sale price is highest in the IIIrd group. Thus, it is visible that the average prices of realization do not speak yet about the production efficiency as a whole.

The lowest purchase price of 1 ton of realized production were in the Slonim, Grodno and Corelychi districts: 1.83 million roubles, 1.88 million roubles and 1.92 million roubles respectively.

The analysis of raw material supply zones of meat-packing plants in the Grodno region has shown that:

   1) There are 3 groups of plants from which the third group is unprofitable and requires radical administrative decisions.

2) In spite of the presence of state standards for the establishment of the price for raw material there are serious distinctions in their definition in various meat-packing plants.

3) There exists an essential difference between the average sale price and the purchase price in the districts of the Ist group that may testify of a different quality of raw material.

4) Meat-packing plants pursuing a policy of price control are not interested in their increase that affects the profit for suppliers of raw material.

In a production system the agricultural enterprises are always in the least favourable position. It is important to define what to the greatest degree influences the efficiency of pig production and due to which factors it really may achieve an increase of profitability.

According to the statistical reports a grouping of farms based on a production parameter has been done, a regression model of profitability set up and a comparative analysis of changes between 2002 and 2004 executed.

Production parameter (Y) in model is the level of profitability of pig production and as factors the following variables have been taken:

x_1 - the purchase price of 1 ton live weight of pigs, million roubles,

x_2 - daily average gain in weight, g/day,

x_3 – forage consumption per 1 head, quintals of fodder units/head of animals,

x_4 - labour input in production man-hours/ton of live weight.

For revealing the connections between the production factors and the abovementioned production parameter and for a qualitative consideration of the character and the form of these connections a grouping of enterprises based on a level of profitability (table 3) is used.

Table 3 proves that a growth of the level of profitability is caused by a decrease in the purchase costs of a gain in the live weight, by an optimisation of the feeding level and also by a decrease in labour inputs of production. The group 1 is composed of the greatest number of enterprises (27) with an average unprofitability of –27.48 %. In group 5 with an average profitability of 35.18 % there are only 8.

For confirmation of the revealed connections and the analysis of the occurred changes in the analysed years a correlation analysis has been performed.

41

Table 3. Grouping of pig-breeding enterprises in Grodno region on a level of profitability (unprofitability) in 2004.

Group number	Range of the level of profitability in group, %	Number of enterprises	Average level of profitability (unprofitability), %	Price of 1 ton live weight of pigs, million roubles	Daily average weight gain, g	Fodder use, fodder units/head in the herd	Labour input in production, man-hours/ton
1	less than -15	27	-27.48	2.85	360	14.00	45.63
2	-15 -- 0	18	-7.86	2.32	389	10.80	18.83
3	0 -- 15	15	7.29	1.98	413	11.59	13.51
4	15 -- 30	13	23.39	1.88	466	10.75	11.51
5	more than 30	8	35.18	1.57	480	10.20	10.03
Total		81	-3.23	2.37	375	12.77	29.62

The following models have been estimated:

$$2002 \text{ г}: \tilde{Y}_0 = 54{,}4907 - 25{,}305x_1 + 0{,}0179x_2 - 0{,}9966x_3 - 0{,}2254x_4;$$
$$2004 \text{ г}: \tilde{y}_1 = 32{,}4399 - 18{,}2718x_1 + 0{,}0794x_2 - 1{,}5555x_3 - 0{,}0772x_4.$$

Pairs of correlation coefficients testify that the closest connection exists between the purchase price of 1 ton live weight of pigs and the level of profitability (in 2002 $r_{YX1} = -0.84$, in 2004 $r_{YX1} = -0.79$). Then closely the connection between the labour input and 1 quintal of live weight gain ($r_{YX4} = -0.67$ and $r_{YX4} = -0.65$ respectively) follows. Positive connection exists also between the level of profitability and the daily average gain of live weight (in 2002 $r_{YX2} = 0.53$, in 2004 $r_{YX2} = 0.50$). Weaker connection is observed between a level of profitability and the forage consumption per 1 head. With an increase in the purchase price of 1 ton live weight, the forage consumption per 1 head and also in the labour input in production the efficiency of pig production is reduced. Thus, in the analysed years there were essential changes.

Table 4. Model characteristics of profitability (unprofitability) of pig production.

Variable	Average value of variables		β coefficient		Coefficient of elasticity		Coefficient of partial determination	
	2002	2004	2002	2004	2002	2004	2002	2004
x_1	1.932	2.368	- 0.682	- 0.559	7.074	13.375	0.571	0.433
x_2	358.132	374.395	0.060	0.313	- 0.925	- 9.195	0.031	0.153
x_3	11.645	12.771	- 0.102	- 0.241	1.679	6.141	0.028	0.097
x_4	32.372	29.619	- 0.168	- 0.062	1.055	0.706	0.111	0.040
y	- 6.912	- 3.235	----	----	----	----	----	----
R^2	----	----	----	----	----	----	0.742	0.724

From table 4 it is visible that the influence of the two factors increased and the influence of expenses of labour and the purchase price decreased in the analysed period.

Change of profitability due to size of factors shows, how this parameter behaves due to the change of average values of the factors influencing it. Change of the production

parameter due to the size of factors can be determined by multiplication of the change in size of a given factor during the analysed years by the regression coefficient corresponding to it taken for 2002. The changes due to the efficiency of the used production factors can be determined by multiplication of the change in the regression coefficient by the average values of factors corresponding to them taken for 2004.

The average level of unprofitability of pig production in 2004 in comparison with 2002 increased due to the change of the sizes of factors by 11,24 %.

Table 5. Post–regression analysis of the causes of change in the unprofitability of pig production

Variable (factor)	Change in 2004 in comparison with 2002		
	Total change, %	Due to size of factors, %	Due to efficiency of use of factors,%
x_1	5.621	- 11.033	16.654
x_2	23.166	0.291	22.875
x_3	8.260	- 1.122	- 7.138
x_4	5.010	0.621	4.389
constant	-22.051	----	- 22.051
Total	3.486	- 11.243	14.729

It is possible to speak about a positive tendency of decrease in the loss parameter as a whole of 3.486 percent point. And, the security against the unfavourable changes in factors x_1 and x_3 included in the model is insufficient. However, as a whole the efficiency of use of the factors that had led to a growth in efficiency of 14.729 % (table 5) improved.

The greatest influence on a decrease in the unprofitability had an increase in the daily average gain of live weight of pigs. The increase in the purchase price of 1 ton of live weight of pigs led to a growth in the ratio of losses to expenses (index of profitability) of 11.03 %. This factor has a dominating influence on the economic efficiency of production.

An increase in the competitiveness of pig production, taking into consideration the analysed model for 2004, is possible by equalling the values of factors in the model to their average values in the Grodno region. The level of profitability (unprofitability) of expenses can be increased (or unprofitability lowered):

1) for enterprises of I group the loss/expenses ratio lowered from −27.48 % to −16.39 %;

2) for enterprises of II group to leave from unprofitability and achieve a positive level of profitability of 2.69 %;

3) for enterprises of III group to increase the level of profitability up to 9.98 %.

Competitiveness of production is determined on one hand by input prices and product quality, on the other by the market conditions and demand from the population. For an effective development the pig-breeding branch taking advantage of all available reserves of increase of the branch profitability and also adjusting of the volume of pork production to the opportunities of sale in the internal and external markets are basic.

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