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THE DEVELOPMENT OF ANIMAL HUSBANDRY IN THE VOJVODINA REGION

SUMMARY

This paper analyzes quantitative changes in production capacities and the in-kind results of animal husbandry in the Vojvodina region for the period extending from 2001 to 2010. Based on the analysis, forecasts and comparisons of livestock production parameters with those of the previous decade extending from 1991 to 2000, an assessment of the state and projections on the development of individual lines and branches of animal husbandry have been provided. Positive changes are present in the primary herds of sheep and poultry, while pigs' capacity is reduced and cattle are virtually stagnant. The average annual milk production and breeding of fattening pigs has grown, while the production of fattening cattle and eggs has decreased. In the first decade of the twenty-first century, compared to the last decade of the twentieth century, changes in animal husbandry's production capacity and performance in Vojvodina have, in general, not been favourable. Despite this negative trend, with a stimulating and consistent agricultural policy, Vojvodina could offer all of the conditions required for the rapid development of animal husbandry.

Keywords: Animal husbandry, Vojvodina, development

INTRODUCTION

This paper analyzes the development, status and trends impacting the future development of animal husbandry in Vojvodina. The subject of this research is capacities for animal husbandry, as well as the yields and total production recorded in the period extending from 2001 to 2010. The research has included the most economically important species of animals and production lines for Vojvodina's agriculture: cattle, pigs, sheep and poultry.

On the basis of quantitative (statistical) analysis of production changes in animal husbandry in Vojvodina and by comparing the same in the previous decade (1991-2000), the primary research goal is to provide a relative score on the state of, and trends in, Vojvodina's animal husbandry. Based on the results of quantitative and comparative analysis, conclusions can be drawn about production, economic conditions, the results of this branch of agriculture and its competitive position.

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In her master thesis, Tešić-Miličić Maja (2010) conducted a quantitative analysis of resources, yield and total production of vegetables and animal husbandry in the Vojvodina region from 1991 to 2009. The results of her analysis are compared with the so-called golden age of Vojvodina's agriculture, 1981 to 1990.

Based on an analysis of the previous 50-year period (1956-2005), Mutavdžić Beba (2009) managed, by using regression and ARIMA models, to predict the movement of certain production parameters in animal husbandry in Vojvodina in the period ranging from 2006 to 2010. The models anticipated the decrease of the number of cattle to the level of 205,000 animals, with a decline in beef production and a further increase in milk production; the number of pigs oscillating around 1.25 million; the reduction of the number of sheep to a level of about 122,000 animals and an increase in the number of poultry to the level of 6.6 million.

Novković et al. (2008) conducted a comparative analysis of the capacity and animal husbandry results in Vojvodina and Hungary. The analysis included all economically important animal husbandry performed in the period extending from 2000 to 2008. They also performed the analysis of the concentration of certain types of livestock.

MATERIAL AND METHODS

Quantitative analysis of animal husbandry in Vojvodina included changes in capacity, yields and total production. The cattle were analyzed based on the following features:

- The number of cows and in-calf heifers,
- Total number of beef cattle,
- Total production of milk and
- Total production of beef.

In the area of swine breeding, the following changes or trends were analyzed:

- The number of sows and pregnant gilts,
- Annual production of fattening pigs and
- Annual production of pork.

The analysis of sheep breeding included the following features:

- The number of breeding sheep and
- Annual production of sheep meat.

In poultry production, the following factors were considered:

- Total number of poultry,
- The total production of eggs and
- Annual production of poultry meat.

The annual data set for the period ranging from 2001 to 2010 has been statistically analyzed. Data were analyzed using standard statistical tools and instruments: the average value of occurrence (\bar{X}), (), minimum, maximum, coefficient of variation (Cv) and the rate of change (r). The rate of change was calculated directly from the absolute values of the time series, using the following expression:

$$r = (G - 1); \quad G = \left(\frac{Y_n}{Y_1} \right)^{\frac{1}{n-1}}$$

where: r is the annual rate of change, G is a constant relative change of phenomenon, Y_1 is the absolute value of the first member of the time series, Y_n , is the absolute value of the last member of the time series and n is the number of members of series — that is, the number of years (Čobanović et al. 1995).

The research used data from the annual and periodical publications of the Statistical Office of the Republic of Serbia.

RESULTS AND DISCUSSION

The research results included the trend of change of capacity and the overall results of the primary production of livestock production and primary processing of animal products of economically important livestock species (cattle, pigs, sheep, poultry) in Vojvodina. The results of the analysis in the observed period (2001-2010) were compared with those of the previous period (1991-2000).

Analysis of changes of capacities for animal husbandry

The analysis of changes of capacities for animal husbandry included the breeding stock, that is, cattle intended for reproduction, of the most important species of domestic animals in the period from 2001 to 2010. The analysis included the following basic categories of herds of domestic animals: cows and pregnant heifers, sows and pregnant gilts, breeding sheep and poultry. Due to a lack of data on the basic flock, research on poultry included only the total annual number of poultry.

The results of this statistical analysis are shown in Table 1.

A basic herd of cattle in Vojvodina in the 2001 to 2010 period had an average number of around 107,000 animals. Variations in that number were minimal, as confirmed by the low coefficient of variation (3.72%). A minimum number of 101,000 cows and in-calf heifers was recorded last year, 2010, and a maximum of 120,000 animals was recorded for the 2007 to 2008 year. There is a trend of stagnation in the number of breeding animals in cattle breeding, with the symbolic rate of decline of that number -0.32% per annum, which is caused by a minimum number of animals in the last year of the observed period (2010).

The average annual number of sows and pregnant gilts was around 170,000. The minimum number of 152,000 animals was recorded in 2010, with a maximum of 190,000 recorded in 2003. Variations in the capacities are

significantly higher than those in cattle breeding (8.49%), a consequence of the presence of the "pig cycle" and the possibility of rapid changes caused by the reproduction characteristics of this type of livestock. In the observed period, the average annual rate of decline of swine breeding stock amounted to -2.16% as a result of the minimal capacity found in the last year of observation, which does not have to seriously endanger the capacity and reproductive ability of pig breeding in Vojvodina.

Table 1. Analysis of the capacity for animal husbandry in the Vojvodina region (2001-10)

Description	Average number	Interval of variation		Coefficient of variation C_v (%)	Rate of Change r (%)
		Minimum	Maximum		
Cows & in-calf heifers	106,800	101,000	114,000	3.72	-0.32
Sows & pregnant gilts	171,100	152,000	190,000	8.49	-2.16
Breeding sheep	135,500	91,000	177,000	25.08	7.03
Poultry	7,689,700	5,737,000	13,682,000	34.05	6.04

The average number of breeding sheep was about 135,000 animals. It ranged in interval from 91,000 in 2002 up to 177,000 animals in the last year (2010). A number of breeding sheep had been procured from abroad during this period, improving both the quality and basic sheep breeding herd. The number of breeding sheep in this period grew at a very high average annual rate of 7.03%.

The main reason for these positive changes were the measures of the Executive Council of the Autonomous Province of Vojvodina, which, by means of granting favourable loans, enabled the purchase of a large number of quality breeding sheep and rams from abroad, thus significantly boosting the production and capacity of sheep breeding. This purchase of foundation stock from foreign countries influenced the coefficient of variation of breeding sheep in this period, which was very high (25%), as well.

The total number of poultry annually averaged around 7.7 million. The minimum number of 5.7 million poultry was recorded in 2004, while a maximum as high as nearly 13.7 million was recorded in the last year of the observed period, 2010.

The number of poultry almost more than doubled in the observed period of ten years from about 6.5 million at the beginning (2001) to about 13.7 million at the end (2010). In doing so, they presented high coefficients of variation of 34.05% and a high positive rate of change of 6.04% per year.

Based on the analyzed animal husbandry in Vojvodina, that is, its capacity in the 2001 to 2010 period, it can be concluded that there were relatively stable capacities in cattle breeding, a slight decrease in the capacity of pig breeding and an intense capacity growth in poultry and sheep breeding. It is interesting that

these developments came largely due to changes in the last year of the period, the year of economic crisis, 2010, when the maximums in poultry and sheep breeding were realized, along with minimums in the number of cows and in-calf heifers, as well as sows and pregnant gilts.

Analysis of changes in animal husbandry

The results of the analysis of animal husbandry were divided into the two groups of animal products given below.

1. The primary livestock products:

- Beef cattle,
- Fattening pigs,
- Cow's milk and
- Chicken eggs

2. The primary processing products of animal husbandry:

- Beef,
- Pork,
- Sheep meat and
- Poultry meat

The results of the analysis of the primary products of animal husbandry are shown in Table 2.

During the analyzed period in Vojvodina, production averaged about 80,600 head of beef cattle. This number ranged from 86,000 in 2008 up to 73,000 in the last year, 2010. During this period, the coefficient of variation was relatively low, amounting to 5.4%. The growth rate of beef cattle production was negative and amounted to an average of - 1.01% per year. Annual production of cattle for the last ten years in Vojvodina decreased by 7,000 cattle, or about 10%.

The average production of fattening pigs was about 680,000 head per year. The production of fattening pigs ranged from 584,000 animals in 2005 up to 810,000 animals in 2010, the last year of the observed period. During the last ten years, the annual production of fattening pigs in Vojvodina increased by 142,000 pigs, or more than 20%. Unlike with the basic herd of pigs, a favourable trend was present in pig production and the average annual growth was significant at 2.16% per year.

Average annual milk production in the 2001 to 2010 period was about 340 million litres, ranging from 292 million in 2002 to 397 million litres in 2006. Milk production from the beginning to the end of the period increased by 49 million litres, or almost 17 percent. Annual milk production in Vojvodina in the period was relatively stable with a coefficient of variation of 11%. Milk production in this period recorded moderate growth at an average rate of 1.73% per year.

The average annual production of chicken eggs was about 425 million pieces. It ranged from 507 million pieces in 2005 to 292 million pieces in 2010. The minimum egg production in the last year caused a tendency to decrease at a rate of -2.77% per year. The annual number of eggs produced in the period of ten years was reduced by 9 million, or a symbolic 2.7 percent.

Table 2 Analysis of the results of primary animal husbandry production in Vojvodina (2001-10)

Description	Average number	Interval of variation		Coefficient of variation C_v (%)	Rate of Change r (%)
		Minimum	Maximum		
In-calf heifers	80.600	73.000	86.000	5,40	-1,01
Fattening Pigs	680.100	584.000	810.000	12,87	2,16
Milk ¹	339,9	292	397	11,07	1,73
Eggs ²	425,3	325	507	16,21	-2,77

¹(millions litres), ²(millions pieces)

Indicators of the results of the primary processing of animal husbandry products are given in Table 3.

The production of beef in Vojvodina annually averaged 23.7 thousand tonnes. Comparing these data with the average number of beef cattle, it can be calculated that the average beef bull yielded 294 kilograms of meat, which is a relatively low quantity and evidence of the high percentage of calves of low weight that are killed.

The annual production of beef was in the range of 21,000 tonnes in 2001 and up to 27,000 tonnes in 2008. During the last decade, beef production in Vojvodina increased by 5 thousand tonnes, or nearly one-quarter. The coefficient of variation was 9.75%, evidence of the relative stability of this production. Beef production in this period recorded significant growth at an average rate of 2.4% per year.

Table 3. Meat processing analysis in Vojvodina (2001-10)

Description	Average number	Interval of variation		Coefficient of variation C_v (%)	Rate of Change r (%)
		Minimum	Maximum		
Beef meat	23,700	21,000	27,000	9.75	2.40
Pork meat	108,900	93,000	141,000	14.70	2.24
Sheep meat	2,200	1,000	3,000	41.77	12.98
Chicken meat	38,500	30,000	52,000	7.08	5.18

Pork meat has been produced at an average amount of 109,000 tonnes per year. Production ranged from 93,000 tonnes in 2004 to 141,000 tonnes in 2007. Pork meat production in the last ten years in Vojvodina increased by 21,000 tonnes, or over 22%.

When the average annual pork meat production in the 2001 to 2010 period is divided by the average production of fattening pigs in the same period, the result is the data that, on average, one fattened pig provided 160 kilograms of meat. This is 13 kg. more than in the previous period and the later period saw increased pork production, not from slaughtered beef cattle but from slaughtered breeding pigs (sows), which is also reflected in a decline of the number of sows and gilts during this period. The great weight of pork meat is increased with the weight of imported pork sides. The coefficient of variation for pork meat in this period is relatively significant, amounting to 14.7 percent.

Sheep meat is produced at an average annual amount of only 2,200 tonnes. Interval variation is very large, ranging from 1,000 tonnes in the first year to 3,000 tonnes in the last year of the period. That means that in this period, the annual production of sheep meat tripled. The coefficient of variation was extremely high (43.7%) as a result of the rapid growth in sheep meat production.

There was strong growth in sheep meat production at an average rate of 13% per year. However, production of sheep meat in the last four years of the period was remarkably stable at around 3,000 tonnes per year. Average annual poultry meat production amounted to 38.5 thousand tonnes per year. Minimum production of 30,000 tonnes was in 2003, and a maximum of 52,000 tonnes was in the last year of the period (2010). For the past ten years, the annual production of poultry meat increased by 19,000 tonnes, or by one-third. The coefficient of variation was low and amounted to only 7%. Poultry meat production in this period recorded a significant growth rate of 5.18% per annum, the highest compared to other types of meat.

Comparative analysis of animal husbandry resources

A comparative analysis of the animal husbandry resources is given in Table 4.

The average number of cows and in-calf heifers in the period ranging from 2001 to 2010 increased by 3,100 animals, or by 3% compared to the average recorded for the period ranging from 1991 to 2000. The average number of basic herds of swine, sows and pregnant gilts fell by almost 48,000 animals, that is, 22%. Such a huge drop in the capacity for pig breeding is the result of the poor economic position of this branch of animal husbandry, the market uncertainty of selling fattening pigs and inadequate government measures to protect pig breeding.

Despite rapid growth in the last analyzed period, the average number of breeding sheep in Vojvodina is 38,000 less than the number recorded in the previous decade, with 22% less cattle, as well. However, increasing trends,

market conditions and the repopulation of basic herds with "fresh blood" from abroad should eliminate this significant difference in the near future.

The average number of poultry also reflected the symbolic decrease of 3.5%. The average annual number of poultry decreased by almost 280,000 individuals. Poultry breeding as well as pig breeding can be reproduced relatively quickly; it is only necessary to create favourable economic and market conditions, with the necessary assistance and protection by the State, through appropriate agricultural policy.

Table 4. Comparative analysis of animal husbandry resources in Vojvodina (2001-10/1991-00)

Description	Number of animals		Difference (2-3)	Index (2:3) (%)
	2001-2010	1991-2000		
Cows & in-calf heifers	106,800	103,700	3,100	103.0
Sows & pregnant gilts	171,100	219,000	- 47,900	78.1
Breeding sheep	135,500	173,600	- 38,100	78.1
Poultry	7,689,700	7,972,000	- 282,300	96.5

Comparative analysis of primary animal husbandry products

A comparative analysis of primary animal husbandry products is shown in Table 5.

The highly variable results of animal husbandry production compared with the previous period can be seen in the table. An increase in cattle production has been noticeable as well as both an increase in the production of beef cattle and an increase in milk production. On the other hand, the results reflect a certain decrease in the production of pig breeding and poultry breeding.

Table 5. Comparative analysis of primary animal husbandry products in Vojvodina (2001-10/1991-00)

Description	Number of animals		Difference (2-3)	Index (2:3) (%)
	2001-2010	1991-2000		
Fattening Cattle	80,600	65.600	15,000	122.9
Fattening Pigs	680,100	736.500	- 56,400	92.3
Milk ¹	339.9	298,7	41.2	113.8
Eggs ²	425.3	497,7	- 72.4	85.5

¹(millions litres), ²(millions pieces)

The average annual production of beef cattle in the last reporting period increased by more than 15,000 animals comparing to the previous ten-year period. Relatively speaking, the annual production was higher by almost 23%. Similar positive results have been recorded by the other line of production in cattle – milk production. The average milk production has been increased by 41 million litres, or by 13.8%. These indicators confirm that beef production has been developing uniformly, both towards beef production and towards cow milk production.

The average annual production of fattening pigs in Vojvodina in the last ten years has decreased by 56,000 animals, compared to the previous decade. Pig production fell by almost 8%. Reduced production of fattening pigs is a direct consequence of the decrease in the number of female breeding animals (sows and pregnant gilts), which defines the basic capacity for pig breeding. In fact, the intensity of pig production (number of pigs per sow) had no major impact on reducing the total annual production of fattening pigs.

The average production of chicken eggs in the last ten years has been reduced by over 72 million pieces compared to the previous period of 1991 to 2000. This is a direct consequence of reducing the number of poultry in Vojvodina, and leaving the "hard line" – the production of eggs – in favour of the "light line" in poultry –broiler production. The relative decline of production chicken eggs was significant at 14.5%.

In general, the decline in animal husbandry products (pig, sheep and poultry breeding) is mainly caused by a decrease in the number of breeding animals of certain species of domestic animals, not a decline in the intensity of the production of certain animal husbandry production lines.

Comparative analysis of products of primary processing of animal husbandry

The results of the comparative analysis of the primary processing products used in animal husbandry are shown in Table 6.

On the basis of data in the table, mostly unfavourable production results can be observed, even in this group of animal products. There is growth in beef production, stagnation in pork production and a decline in the production of sheep meat and poultry meat.

The average annual production of beef has been increased by more than 1.8 thousand tonnes in comparison to the previous reference period. Relatively speaking, the annual production of beef in the last decade has been bigger by 8.2% than the previous one.

Interestingly, average annual pork production recorded a significantly greater decline than is reflected in the basic herd and in the fattening of pigs. Total pork production decreased by a significant average of almost 90 tonnes per year. As a relative indicator, the decrease in processing pork is alarming at 45%. This can only be explained by the reduced slaughter and processing of live

fattening pigs, frozen carcasses from abroad, and by a reduction in the number of breeding animals (sows and pregnant gilts).

Table 6. Comparative analysis of processing of animal products in Vojvodina (2001-10/1991-00)

Description	Processing (t)		Difference (2-3)	Index (2:3) (%)
	2001-2010	1991-2000		
Beef meat	23,700	21,900	1,800	108.2
Pork meat	108,900	198,100	- 89,200	55.0
Sheep meat	2,200	2,500	- 300	88.0
Poultry meat	38,500	39,800	- 1,300	96.7

The average production of sheep meat decreased by 300 tonnes or 12%. The relative decline in sheep meat production does not correspond with the decrease in the number of breeding sheep in the same period, which is much higher, amounting to 22%. The reason for this phenomenon is that a certain number of breeding sheep has been diverted to meat production and away from reproduction.

Average annual poultry meat production decreased by 1.3 thousand tonnes compared to the 1991 to 2000 period. In relative terms, this decrease amounts to 3.3%, which is considerably less than the fall in chicken egg production (14.5%). This means that poultry production results are considerably weaker in the hard line (egg production) than in the light line (broilers production.)

Discussion on results of the research and

Quantitative analysis of animal husbandry in Vojvodina in the first decade of the twenty-first century has shown that a crisis in animal husbandry occurred during the previous decade, the last of the twentieth century, which was characterized by very unfavourable economic ambience (the war in former Yugoslavia Republics and Kosovo, the UN embargo on Serbia, a large number of refugees and internally displaced persons, hyper-inflation, a NATO bombing, etc.) that has not been halted despite far more favourable economic and social conditions in this period. This means that the agricultural policy of Serbia and the specific incentives of Vojvodina were not adequate to, at least, halt, if not reverse, the previous decade's negative animal husbandry trends.

CONCLUSION

On the basis of the results of quantitative analysis of animal husbandry indicators in Vojvodina in the 2001 to 2010 period, we can conclude the following:

- The basic herd of cattle (cows and pregnant heifers) has a symbolic tendency of decline (-0.32%), sows and pregnant gilts showed a slight decrease (-2.16%), while breeding sheep and poultry show an upward trend, with an average annual rate of 7 and 6%;

- In the total production of primary animal husbandry products, fattening pigs show a positive trend of (2%) as well as cow's milk (1.7%), while beef cattle and chicken eggs have a negative rate of change of -1, that is, -2.8%;

- Production/processing of all types of meat exhibits a positive tendency. These positive trends range from 2.2% annual growth rate of pork, 2.4% annual growth rate of beef, then to over a 5.2% growth rate for poultry meat and a 13% growth rate for sheep meat;

The comparative analysis of animal husbandry in Vojvodina between the last two decades – 2001 to 2010 and 1991 to 2000 – showed the following:

- Only the average number of cows and pregnant heifers is larger in the second decade at 3% more than the previous decade, while in all other species of animals, breeding stock is reduced: in poultry by 3.5% in pigs and in sheep by a more significant 22%;

- Average annual production in the last decade compared to the penultimate is higher in cattle breeding (for beef cattle by 23% and for milk by 13.8%), while the production of fattening pigs and eggs is less by 7.7, that is, 14.5%;

- The average annual quantity of processed animal husbandry products in Vojvodina is increasing only in beef processing (8.2%) compared to the previous decade, while the processing of other types of meat is less, as follows: 3.3% of poultry meat, 12% of sheep meat and even 45% of pork.

Animal husbandry in Vojvodina has great potential which is not even remotely exploited. Weak production trends, which are not linear move in a zigzag (up and down) fashion and are due primarily to insufficient support and a lack of favourable conditions created by the state of Serbia and the province of Vojvodina for animal husbandry development, as well as inconsistent agricultural policies in general, especially in animal husbandry.

If the favourable production-economic environment is provided, animal husbandry in Vojvodina could and should be the leading branch of agriculture and highly competitive in the global market. Animal husbandry development would significantly contribute to the overall agricultural intensification and development of the slaughter industry and the feed industry.

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RAZVOJ STOČARSTVA U VOJVODINI

SAŽETAK

U radu su analizirane kvantitativne promene u kapacitetima i naturalnim rezultatima stočarske proizvodnje u Vojvodini u periodu 2001-2010. godina. Na osnovu analize, predviđanja i poređenja proizvodnih parametara stočarstva sa analognim u prethodnom desetogodišnjem periodu, 1991-2000, date su ocene stanja i perspektive razvoja pojedinih linija i grana stočarstva.

Pozitivne promene prisutne su u osnovnom stadu ovaca i živine, dok svinje smanjuju kapacitete, a goveda praktično stagniraju. Prosečna godišnja proizvodnja mleka i tovnih svinja beleži rast, dok proizvodnje tovnih junadi i jaja beleže pad.

U prvoj dekadi XXI veka, u odnosu na poslednju dekadu XX veka, promene proizvodnih kapaciteta i proizvodnih rezultata u stočarstvu u Vojvodini, generalno, nisu povoljne.

I pored negativnih tendencija, uz stimulativnu i doslednu agrarnu politiku, stočarstvo u Vojvodini ima sve uslove za brz razvoj.

Ključne reči: Stočarstvo, Vojvodina, razvoj