

PROFITABILITY AND RISK OF CROP AND ANIMAL PRODUCTION IN SLOVAK FARMS



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Contens

- Introduction
- Material and Methods
- Structure of Slovak Agriculture
- Impact of integration and globalization on the performance of farms in Slovakia
- Conclusion

Intruduction

Agriculture is a sector facing particularly large risks, resulting mainly from natural factors outside the control of farmers.

The paper focuses **on profitability** and **risk of crop and animal production** based on an analysis of farms operating in Slovak Republic in two periods: 2004-2008 and 2010-2014.

The paper shows how farms with large UAA contribute in different extent to rural development and employment based on the production focus

Material

- The data used for the analysis are from the database of Ministry of Agriculture and Rural Development of the Slovak Republic, over the period **2004 – 2014**.
- In the analyses we used more than **874 farms** (cooperatives, companies) in each researched year. In the sample were used only “legal entities”, **which cover 80%** of agricultural land in Slovakia.
- For our analysis, data were selected according to the production orientation to the subset **of crop farms** and **animal farms**. The selecting criterion was **the share** of animal production based **on sales**

METHODS

The modified Markowitz portfolio theory approach was used to estimate the total risk of eight portfolios:

One for all farms and **seven based on share** of animal production ranging from 0 to 100%.

We considered **return on equity** ROE to be equivalent to the return on stocks, generally used in the case of quoted companies. **Measuring volatility** of return in the Markowitz portfolio theory is based on the average return over the observed period for each investment

Average return on equity EROE_i

$$ROE_i = \frac{\text{Earnings After Taxes}}{\text{Shareholders Equity}} \quad EROE_i = \sum_{i=1}^t ROE_i \cdot d_i$$

Where ROE_i is return on equity of farm "i", d_i is a weight of ROE_i over the observed period (5 years, d_i = 0.20).

Expected portfolio return = EROE_p, where w_i is an individual weight of i-farm (farm's equity) in a portfolio (total equity of all farms) and n is number of farms.

$$EROE_p = \sum_{i=1}^n EROE_i \cdot w_i$$

The portfolio risk (σ_p)

The portfolio risk (σ_p) is determined by three variables: weight of the individual investment in portfolio (w_i), standard deviation of the individual investment - individual risk (σ_i), and covariance, relation between the ROE_i and ROE_j (σ_{ij})

$$\sigma_{ij} = \frac{1}{n} \sum_{i=1}^n (ROE_i - EROE_i)(ROE_j - EROE_j)$$

$$\Sigma = \begin{bmatrix} \sigma_{11} & \sigma_{12} & \sigma_{13} & \dots & \sigma_{1k} \\ \sigma_{21} & \sigma_{22} & \sigma_{23} & \dots & \sigma_{2k} \\ \sigma_{31} & \sigma_{32} & \sigma_{33} & \dots & \sigma_{3k} \\ \dots & & & & \\ \sigma_{k1} & \sigma_{k2} & \sigma_{k3} & \dots & \sigma_{kk} \end{bmatrix}$$

$$\sigma_p = \sqrt{\sum_{i=1}^n w_i^2 \cdot \sigma_i^2 + \sum_{i=1}^n \sum_{j=1}^n w_i \cdot w_j \cdot \sigma_{ij}}$$

Structure of Slovak Agriculture

Table 1. UAA per farm as a percentage of total area

Years	Category of the Utilized Agricultural Area						
	0-5 ha	5-10 ha	10-50 ha	50-100 ha	100-250 ha	250-500 ha	over 500 ha
2010	0.99	0.94	3.43	2.91	6.8	7.91	77.74
2011	0.99	0.95	3.75	2.95	6.42	8.20	76.75
2012	0.99	0.98	3.97	2.94	6.60	8.28	76.24
2013	1,01	1,04	4,23	2,97	7,04	8,21	75,49
2014	1,04	1,09	4,52	3,1	7,07	8,55	74,64

Source: Data of the Agricultural Paying Agency of Slovakia (2015).

Nowadays, the majority of UAA (**74.64%** in 2014) is cultivated by large farms with **over 500 hectares**, while the UAA per farm in the EU is much lower.

Size structure of Slovak farms

<i>Legal form</i>	<i>Number of farms</i>		<i>Index</i>	<i>UAA 2014</i>			
	<i>2010</i>	<i>2014</i>	<i>Change (%)</i>	<i>Land (ha)</i>	<i>Share on all land(%)</i>	<i>Land per farm</i>	<i>Share on all farms (%)</i>
<i>Joint stock company</i>	109	119	9,17%	13272,01	0,7%	1 113,21	0,67
<i>Cooperative</i>	579	566	-2,25%	691 054,33	36,7%	1 220,94	3,2
<i>Small family farm</i>	9020	9 785	8,48%	53 291,14	2,8%	5,45	55,26
<i>Ltd.</i>	1310	1 968	50,23%	687 429,45	36,5%	349,3	11,11
<i>Farmers</i>	4774	5 046	5,70%	303 866,73	16,1%	60,22	28,5
<i>Other</i>	146	160	9,59%	12,383	0,0%	<i>n.a.</i>	0,97
<i>Total</i>	15938	17 708	11,11%	1 883 220,05	100,0%	<i>n.a.</i>	100

Impact of integration and globalization on the performance of farms in Slovakia

- **More** hectares means **more** financial support
- Farmers are since 2004 continually **decreasing the animal production** in favour of crop production.
- EU subsidies are decoupled from production which means they are not production linked. Farmers **are not motivated** to produce and the intensity of support is increasing.
- **Subsidies** per sales and per hectare **increased** after adopting CAP

Characteristics of Slovak farms

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Subsidies per ha	123	184	205	238	267	289	323	298	280	271	272
Hectares per employee	24,6	26,8	27,9	29,0	30,7	31,7	34,6	37,4	40,2	40,7	35,2
Share of animal production	57,8 %	54,6 %	53,9 %	52,8 %	49,4 %	50,5 %	46,7 %	44,0 %	40,2 %	39,6 %	41,0 %
Number of farms	1285	1410	1364	1364	1317	1382	1304	1412	1480	1483	1490
Income per hectare	21,7	-1,0	8,2	41,4	31,4	-68,0	-7,8	52,2	21,9	-13,0	40,8
Income per employee	534	-26	229	1201	962	-2154	-271	1955	880	-529	1435
Subsidies on total sales (%)	18,1 %	25,4 %	27,9 %	31,1 %	32,6 %	34,5 %	50,8 %	43,8 %	34,3 %	31,1 %	32,2 %

- **more** financial support
- **decreasing the animal production**
- **Subsidies** per sales and per hectare **increased**

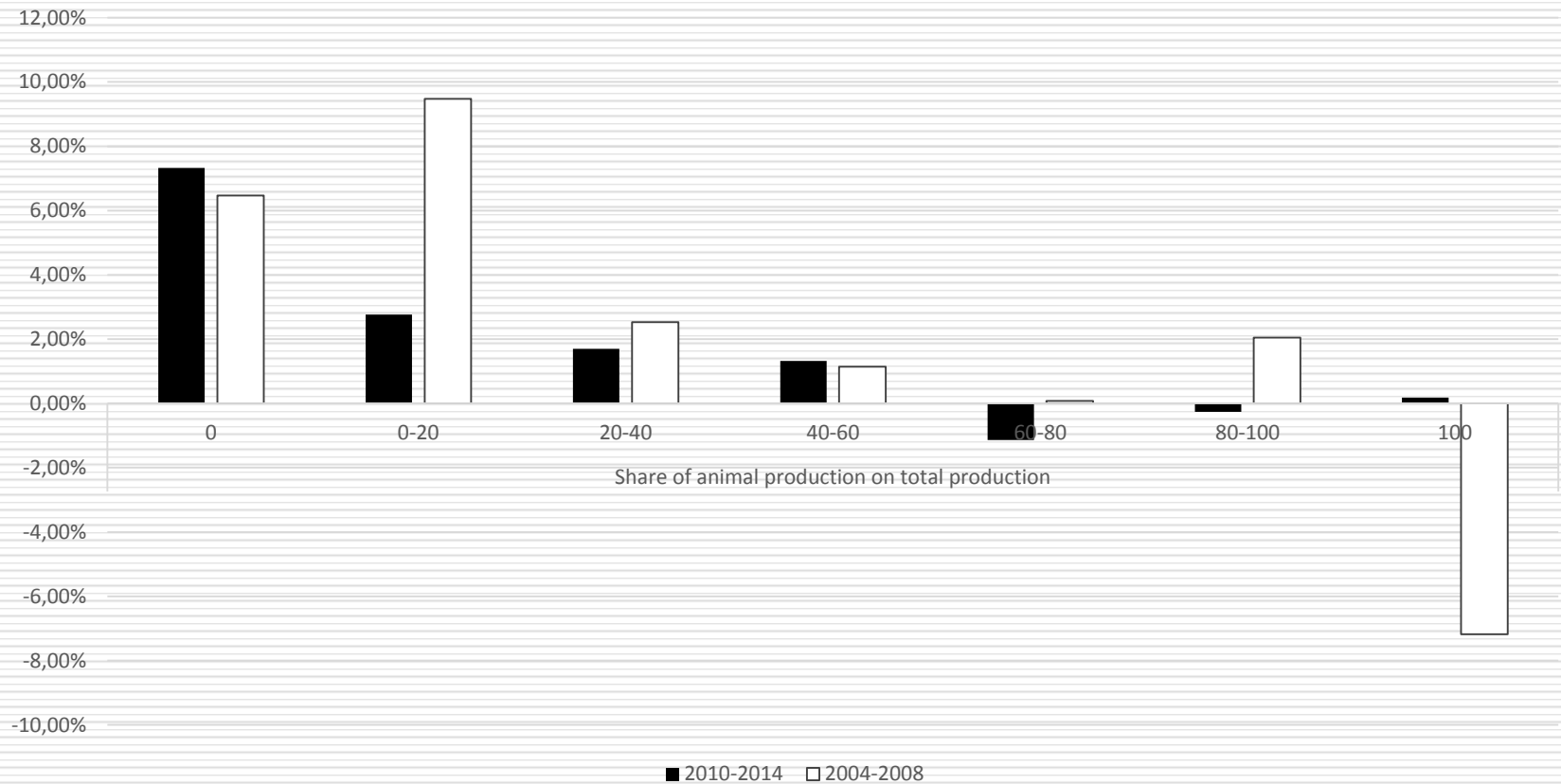
Situation in agriculture in period 2004-2008

2004-2008	All farms	Share of animal production on total production						
		0	0-20	20-40	40-60	60-80	80-100	100
Average profitability (ROE)	1,83%	6,47%	9,48%	2,53%	1,14%	0,08%	2,05%	-7,18%
Risk	1,21%	4,21%	5,70%	1,47%	1,80%	1,10%	0,39%	9,51%
Share on number of farms	100,00%	15,22%	10,41%	13,84%	17,96%	17,62%	21,17%	3,78%
Number of farms	874	133	91	121	157	154	185	33
Subsidies per ha	240,69	203,76	206,2	209,19	220,95	255,82	298,73	315,23
Hectares per employee	28,7	31,04	50,3	31,08	25,78	26,63	27,8	21,8
Income per hectare	26,36	83,54	53,99	31,49	17,81	8,89	28,83	-86,08
Income per employee	756,45	2593,14	2715,78	978,93	459,13	236,71	801,33	- 1876,83
Subsidies on total sales (%)	0,3	0,22	0,4	0,25	0,24	0,32	0,49	0,23
Sales per employee	22665,47	29032,3	26045,8	25767,6	23846,0	21010,5	17017,2	30294,4

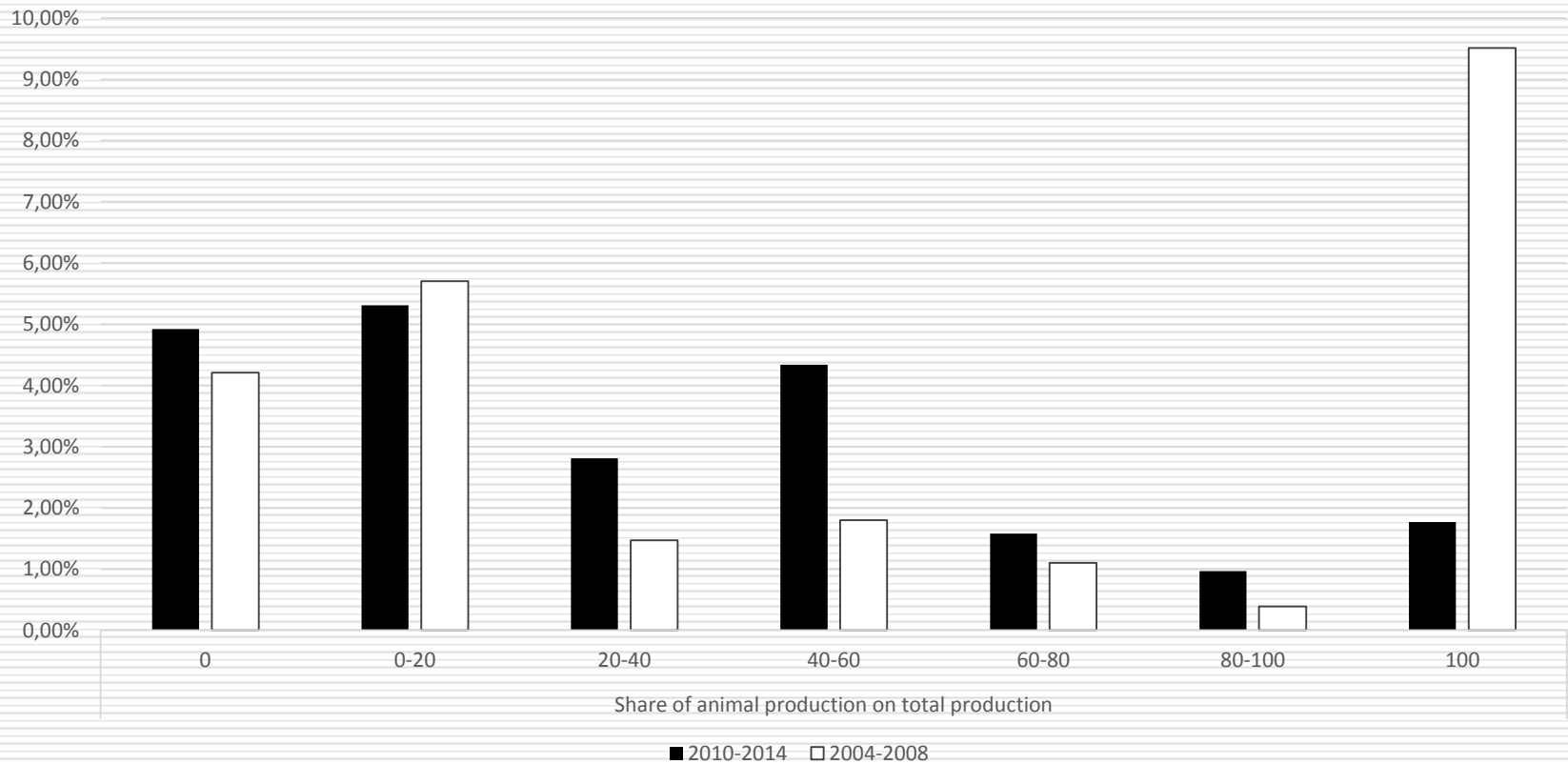
Situation in agriculture in period 2010-2014

2010-2014	All farms	Share of animal production on total production						
		0	0-20	20-40	40-60	60-80	80-100	100
Average profitability (ROE)	1,60%	7,33%	2,76%	1,70%	1,32%	-1,14%	-0,26%	0,18%
Risk	1,95%	4,92%	5,31%	2,81%	4,34%	1,58%	0,97%	1,77%
Share on number of farms	100,00%	21,04%	16,70%	14,10%	13,45%	11,71%	16,49%	6,51%
Number of farms	922	194	154	130	124	108	152	60
Subsidies per ha	288,86	220,36	247,17	270,3	293,26	323,62	364,72	371,1
Hectares per employee	39,75	58,7	55,26	39,06	33,36	35,24	34,27	31,76
Income per hectare	26,24	120,47	40,22	33,56	-6,4	-10,69	5,11	10,43
Income per employee	1043,2	7071,07	2222,36	1310,83	-213,43	-376,62	174,96	331,4
Subsidies on total sales (%)	0,34	0,22	0,35	0,29	0,32	0,42	0,5	0,46
Sales per employee	33309,5	59526,2	38559,9	36307,5	30267,1	27150,0	24994,6	25413,7

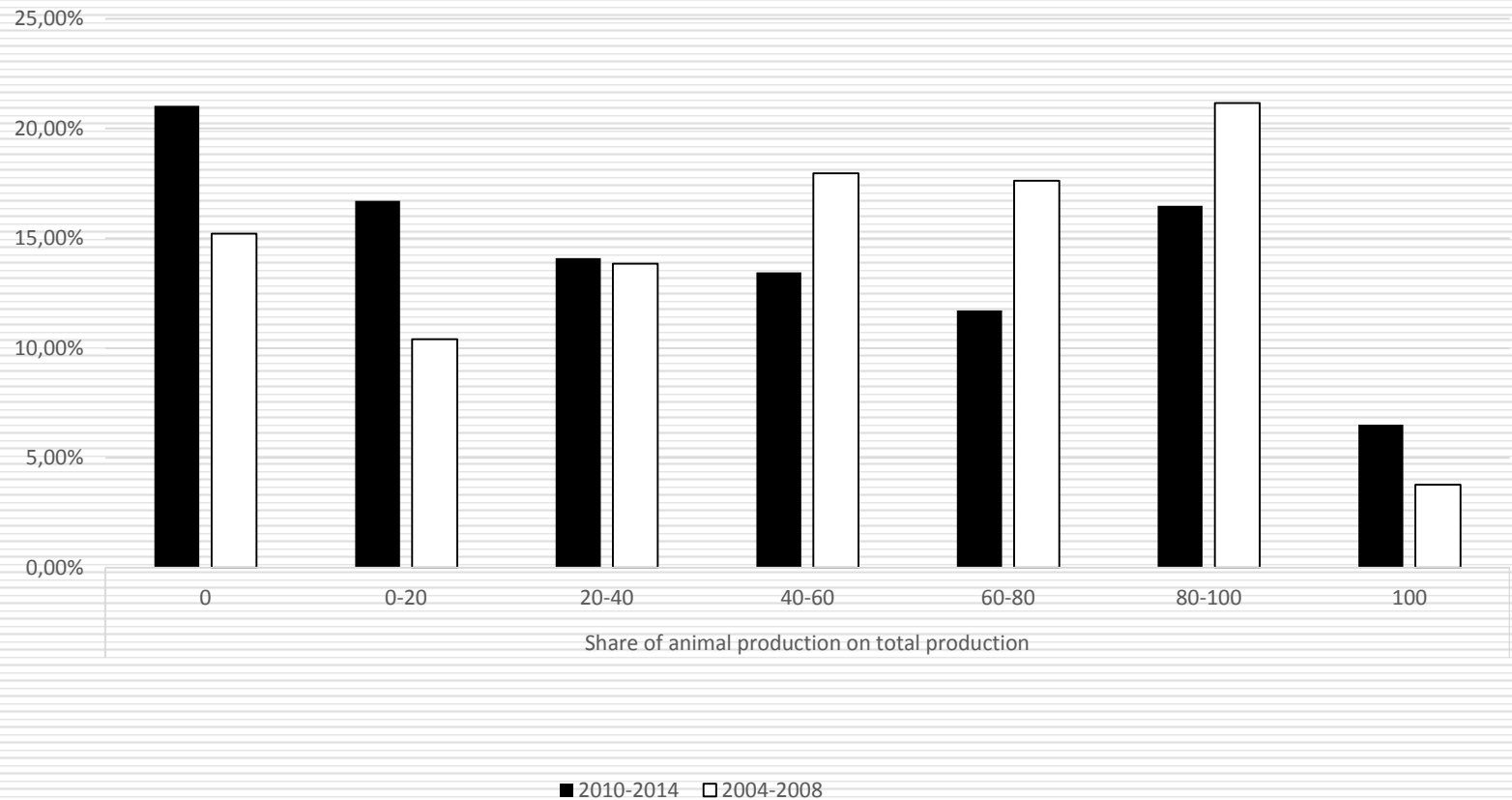
Average profitability of farms based on the share of animal production on total production



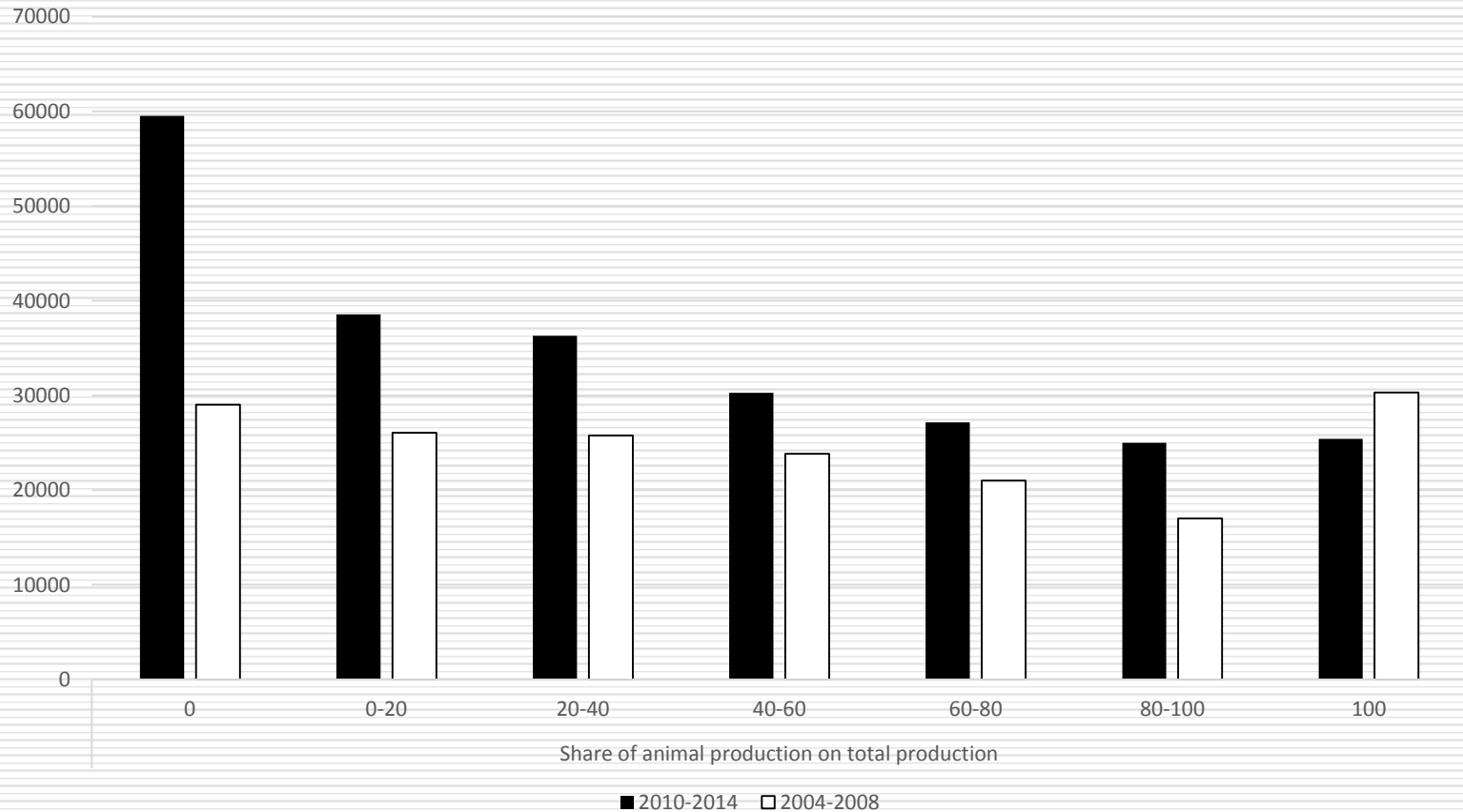
Risk of farms based on the share of animal production on total production



Share of farms based on the share of animal production on total number of farms



Sales per employee based on the share of animal production on total production



CONCLUSION

- In 2004 Slovakia joined the EU. The agricultural market became **a part of the EU agricultural market.**
- Farms in Slovakia **are large** when compared to EU average.
- We observed the **structural changes in production** and farms based on the integration and globalization.
- Based on the results we conclude the **productivity** of farms **did increase.**

CONCLUSION

- Crop farms are **more** productive than animal farms.
- Profitability of farms **differs** based on the share of animal production.
- The most profitable farms have „**0**“ **share** of animal production.
- Mixed farms with share of animal production from 60-80% are **generating loss**.
- In the long run, **crop farms are profitable** and profit from crop production is used to cover the losses from animal production in mixed farms.

CONCLUSION

- The **most** profitable farms are the **most** risky. Generally the **animal** production is considered to **be less risky** when compared to crop production.

Partial results of „VEGA“ projects:

This paper has been prepared within the projects:

- *1/0912/14 "Common Agricultural Policy from 2014 to 2020 and its impact on the financial situation of farms in Slovak Republic"*
- *1/0796/14 „Transmission mechanism of CAP instruments and their impact on the financial situation of farms"*

Thanks for Attention

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