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SOLUTION OF URGENT INTENSIFICATION PROBLEMS IN DAIRYING OF THE REGIONS OF LATVIA

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In Latvian rural regions, the dairying, being a widespread kind of economic activities and the most significant source of income of the rural household, determines that to social economic, technological and ecological aspects of this kind of production there must be paid a constant attention also by the scientists, in line with the professionals, entrepreneurs and politicians.

The paper contains long term research results on the topicalities of intensifying of dairying in Latvia in the context of comparatively high proportion of dairying in the economy of the country, the growing necessity of carrying out of different intensification undertakings in dairy-farming, the activities of dairy farms and their diverse competitiveness in Latvian rural regions.

The aim of the paper is to take a closer look at urgent intensification developments and processes in the dairying of Latvian rural regions.

The analysis of differences in intensity of milk yield in Latvian regions, on the basis of comparing them with corresponding indices in other countries of the EU, working under similar agro-climatic and economic conditions, showed that the results of undertakings of intensification were influenced negatively by the recession.

The research provided the possibility to to find out the common and distinctive factors, influencing the intensification arrangements carried out by the dairies, taking into account the advantages and rapid changes in the rural regions.

On the basis of the complex of factors related to intensification of production processes in dairy farms, there was possible to elaborate a functional model that may be adapted to certain peculiarities of the rural regions of Latvia. The paper, as examples, includes such kind of the functional model of Zemgale region.

Keywords: *intensification, dairying, regions, milk yield, productivity.*

Introduction

The dairying is a widespread kind of economic activity in Latvian rural regions and the most important source of income of the rural households of the country. It is an agricultural area with ancient traditions that has, in length of time, experienced essential changes under the impact of numerous factors, but has never lost its relevance in the economy of Latvia, and has been able to overcome difficulties and to gain success (LZA Ekonomikas institūta gada grāmata, 2007).

To the amount of the added value, the dairying contributes more than 20 percent. Its products provide with employment more than 4 thousand economic active inhabitants of the cities (Latvijas Statistikas gadagrāmata, 2011). Directly and indirectly, the dairying facilitates the increase of the GDP and the improvement of the foreign trade balance.

The dairying of Latvia is an area that has never been afraid to face different challenges, inter alia, also the intensification of production, being closely related to the globalisation. It is evidenced by the fact that, irrespective of the limitations of milk production, defined by the EU and the government of Latvia, many dairies put into practice intensification undertakings targeted to increase the milk yield under conditions of restricted resources, as well as to keep the achieved production level, using technologies, being more adequate to intensive economy. They succeeded because of the ability to adapt, flexibly, to the changing environment of entrepreneurship in rural areas and to social economic upsets created by financial crises and other challenges of a global nature (Sproģis A., … 2007).

As a new challenge, there is, in the framework of the Common Agriculture Policy, the abolition of the milk quotas in the 2015 that provides new opportunities for intensification of dairying activities and the combination of disposable resources of dairy farms with the opportunities created by the EU and the government of Latvia (Council Regulation…, 2008). It means that, also in the future, the attention of scientists, politicians, professional and potential entrepreneurs of the rural entrepreneurship may be paid to different social economic, technological and ecological aspects (Dūklavs J., 2008).

An important condition in intensification of dairying processes is related to the regional aspect. Although the dairies are, in Latvian rural regions, located comparably regularly, their competitiveness differs because the achieved intensification level in dairying varies from region to region, and every region possesses its specific advantages of natural competitiveness and possesses its characteristic intensification opportunities (Blakely E., 1994).

The intensification activities are oriented to the end result and may be revealed by the level of the use of production resources. In the dairying, to indispensable and principal resources there belongs the herd of dairy cows. The paper considers some topicalities related to the intensification of the productivity of dairy cows, taking into account the regional specifics.

The **aim** of the paper is to take a closer look at intensification processes in the in the dairying of Latvian rural regions.

To achieve the aim, the following tasks were fulfilled:

1) to describe the intensification in dairying;

2) to analyse some comparable aspects of intensification;

3) to evaluate the functional model of a region.

The following methods were used: monograph, synthesis and analysis, statistical analysis and others.

Key words: intensification, dairying, regions, milk yield, productivity.

Results and Discussions

The research was based on the assumption that the intensification of dairying processes means the increase in amount of milk produced by dairy farms, facilitating constantly the quantitative and qualitative adequacy of the used resources to the target of the production.

According to the productivity of different kinds of resources, in such areas as the improvement of the use of agricultural land, and the increase of the profitability in dairying, more and more important become the intensification undertakings, elaborated reasonably, implemented skilfully and aimed to increase the productivity of dairy cows, taking into consideration that the intensification arrangements of the use of land are related closely to the increase of the intensity in dairy farming.

Generally, the intensity in dairy farming has, in Latvian regions, increased, but remained still different and backward in comparison with the results achieved in other countries of the EU. The differences of the intensity in dairying of Latvian regions may be described by the milk yield (Table 1).

The changes in the intensity of productivity of dairy cows, having taken place in rural regions, may be recognized as positive. The higher level of productivity is achieved in Zemgale region, in which the intensity in dairy farming has increased from 4.11 to in 2004 to 5.83 t in 2013 or by 34.6 percent. However, the highest milk yield per cow, 5.96 t in the 2013, was achieved by dairy farms of Pierīga region. The productivity of the cows in this region has increased by 27.18 percent that turns out to be the second best result among the rural regions of Latvia. The lowest intensity level has taken place in Latgale region, in which the average of the milk yield per cow made, in the end of the period, 4.34 t. It means that the dairy farms of Latgale region are backward, by 1.01 t or 24.3 percent, from the average intensity of the country.

Simultaneously with quantitative changes in the productivity of the cows, it is important to have a look at the qualitative side of the intensification process, characterized by the qualitative indices of the productivity intensity of the cows (Table 2).

The highest relative intensity increase in dairy farming has taken place in Zemgale region, in 2005 – by 11 percent. In the period of a rapid economic growth, the highest increase was achieved by Kurzeme region, where, in 2008, the milk yield of dairy cows increased by 10 percent. It turns out that, under conditions of the recession, the intensity in dairy farming has, in some regions, increased. In the first year of the recession, the highest relative increase, among the rural regions, has taken place in the Kurzeme region – 6.7 percent. In other regions, the productivity of dairy cows increased in the interval from 1.1 percent to 3.9 percent, except the Zemgale region, in which the milk yield decreased by 2.4 percent.

The highest level of horizontal fluctuations has taken place in Pierīga region, in which the difference between the maximal and minimal increase of the productivity of the cows

Table 1. Quantitative changes in intensity of dairy farming in Latvian rural regions

Regions	*Changes in the productivity of cows (kg/SG)*						*13./04.*
	2004	**2006**	**2008**	**2010**	**2012**	**2013***	*%*
Pierīgas	4 689	4 881	5 879	6 061	5 953	5 961	*27,1*
Vidzemes	4 357	4 756	5 062	5 386	5 423	5 500	*26,2*
Kurzemes	4 274	4 398	5 054	5 255	5 693	5 754	*34,6*
Zemgales	4 109	4 646	5 431	5 197	5 609	5 829	*41,9*
Latgales	3 892	3 899	3 668	3 972	4 262	4 342	*11,6*
In rural regions	*4 223*	*4 469*	*4 903*	*5 085*	*5 310*	*5 399*	*27,8*

***Deciphering of abbreviations included in the table**: *Prognosis data, SG – dairy cows*

Source: elaborated by the authors on the basis of the data of the CSB of the Republic of Latvia.

Table 2. Dairying intensity of dairy farms in rural regions

Regions	*Intensity changes of the amount of produced milk in time intervals - %*						*HSA*
	2005.	**2007.**	**2009.**	**2011.**	**2012.**	**2013.***	
Pierīgas	7,3	1,7	2,4	-0,6	-1,2	0,1	*21,4*
Vidzemes	2,4	2,2	3,9	-0,8	1,5	1,4	*7,3*
Kurzemes	3,3	9,9	6,7	0,3	8,1	1,1	*12,5*
Zemgales	11,0	8,7	-2,4	5,5	2,3	3,9	*13,4*
Latgales	-1,7	2,2	1,1	2,1	5,1	1,9	*15,1*
In rural regions	*3,6*	*4,4*	*2,5*	*1,3*	*3,1*	*1,7*	*3,9*
VSA	*12,6*	*8,2*	*9,1*	*6,3*	*9,2*	*3,8*	*x*

***Deciphering of abbreviations included in the table**: *Prognosis data*
HSA – amplitude of horizontal fluctuations; VSA – amplitude of vertical fluctuations
Source: elaborated by the authors on the basis of the data of the CSB of the Republic of Latvia.

makes 21.4 percentage points. Comparatively high amplitude of fluctuations may be observed also in Latgale and Zemgale regions – 15.1 and 13.4 units, respectively. However, the most stable level of the productivity has been kept in Vidzeme region, in which the amplitude of fluctuations has not exceeded 7.3 percent.

Vertical fluctuations of relative changes in the productivity of the cows indicate to differences of the changes in productivity among the regions. The highest amplitude of fluctuations took place in the 2005 – 12.6 percentage points, the lowest in the 2013, when the difference between the highest and the lowest productivity increase made 3.8 units.

Comparatively high amplitudes of horizontal and vertical fluctuations indicate to essential differences in intensification undertakings related to the activity of dairying, and to the efficiency of these undertakings in the rural regions.

And there must be taken into account the sharp changes in the increase in demand and supply of dairying products in the period of a rapid growth of the economy, and the after-crisis period of the recession, followed by the fluctuations, in vast amplitude, in the purchase prices of milk and household income. It has made a negative impact on the amount of disposable return of the dairies, and on the amount of means to be separated for intensification of the activities of the dairies.

The nature and the tendencies of increase in the growth of the intensity of dairy farming may be characterized, in more clearer and precise way, with the help of graphic models of respective time-series (Figures 1 and 2).

As it is shown by the figure 1, the nature of the productivity of dairy cows in Vidzeme region differs essentially from the nature of changes in the similar index of Pierīga and Zemgale region. The dairies of Vidzeme region have comparatively stable intensity increase in the dairy farming, in which the implications of the period of the rapid growth and the following recession period are insignificant. And it may be explained by the fact that this region has the lowest horizontal amplitude of fluctuations, making less than 7.3 percent. To the stability of increase in the productivity of dairy cows in this region, there indicates also the trend function:

$$y = 131.66x + 4317.2 \quad \text{with } R^2 = 0.9339 \qquad (1)$$

The comparatively high value of the regression coefficient $R^2 = 0.9339$ indicates to a close relationship between the trend function and the changes in the productivity of dairy cows. It

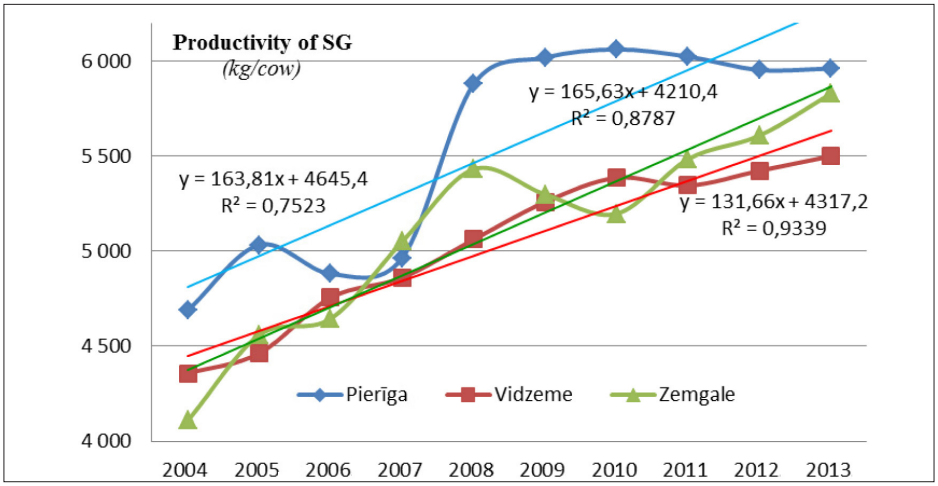

Figure 1. Dynamics and tendencies of the intensity in dairying of the Pierīga, Zemgale and Vidzeme regions
Deciphering of the abbreviation included in the figure: SG – dairy cows
Source: elaborated by the authors on the basis of the data of the CSB of the Republic of Latvia.

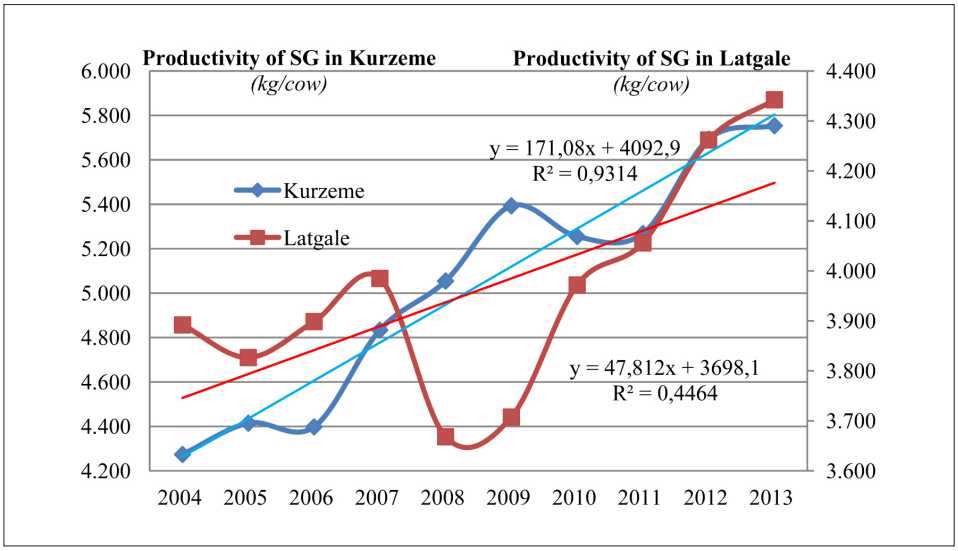

Figure 2. Dynamics and tendencies of the intensity in dairying of Latgale and Kurzeme regions
Source: elaborated by the authors on the basis of the data of the CSB of the Republic of Latvia.

means that the trend function may be used to prognosticate the efficiency of intensification of activities of the dairies in the Vidzeme, related to the increase of the productivity of the herd, for a middle-term period.

Considerable features of instability in the intensity of dairy farming take place in Pierīga region. In the 2006, being a favourable year to economic development, this region is characterised by a decrease in the productivity of dairy cows, notwithstanding that in Vidzeme and Zemgale regions, the milk yield per cow, during this period, increases. In the 2008, the intensity in dairy farming experienced a rapid increase in Pierīga region, making nearly 1000 kg and resulting in 5870 kg per cow. Such increase in milk yield cannot be explained only with physiological qualities of the cows. It may, possibly, be related to statistical and accounting specifics.

The intensity of dairy farming in Zemgale region is characterized by the following trend function:

$$y = 165.63x + 4210.4 \quad \text{with } R^2 = 0.8787 \qquad (2)$$

The inner and outer factors, influencing the activity of dairy farms of Zemgale region have not created such sharp changes in the productivity of dairy cows as it has taken place in the dairies of the Pierīga region. Therefore, it may be said that the trend function (2) characterises the changes in Zemgale region in a sufficiently high level. The comparatively high value of the regression coefficient $R^2 = 0.8787$ evidences that the dairies, in this region, are acting consequently in an area, using intensification measures to increase the productivity of the herd of dairy cows, and that the productivity of the cows in Zemgale region has approached to the highest level, achieved by the Pierīga region, and is dropping back from it only by 132 kg or 2.2 percent, although, in the beginning of the period, the backwardness made 580 kg or 12.4 percent.

The relatively high intensity level in dairy farming of Pierīga, Zemgale and Vidzeme regions indicates clearly to a necessity of a new innovative approach, related to a further increase of the productivity of dairy cows, to diminish the differences in the average level in comparison with the EU-27 and to approach to the productivity level achieved by the EU-15, elaborating and using appropriate intensification arrangements for a further increase of the productivity of dairy cows.

The graphic models of time-series of the productivity of the dairy cows related to Latgale and Kurzeme regions (Figure 2) show that the nature of the increase in intensity of the dairy farming in the Latgale region, is, expressively more instable in comparison with the changes in respective processes of Kurzeme and other rural regions.

It may be created by inaccessibility of the necessary resources used in the intensification processes, as well as by the efficiency of intensification.

The productivity of dairy cows in Latgale region is reflected by the trend function:

$$y = 47.812x + 3698.1 \quad \text{with } R^2 = 4464 \qquad (3)$$

The productivity of dairy cows in Latgale region is characterized by periodic fluctuations in its changes. Therefore the linear trend function shows a weak adequacy to the changes in respective processes. This instability in such a vast territory as a whole region is, undoubtedly, related to the reaction of the dairies to the instability of the environment of economic activity.

The nature of changes in the productivity of dairy cows in Kurzeme region, resulting from intensification undertakings of the dairies, is shown by the following function:

$$y = 171.087x + 4092.1 \quad \text{with } R^2 = 0.9314 \qquad (4)$$

In this region the nature of increase of intensity and the trend function of the dairy farming show a comparatively high adequacy and stability in the changes of the process. It means that the environment of economic activity in this region has been favourable to implementation of intensification undertakings into dairy farming and the introduced undertakings have been sufficiently effective to achieve the aims of the activity of dairies.

As the most important means of production, the disposable dairy cows determine the specialisation of economic activity. Therefore, it is understandable, why the intensification undertakings implemented by the dairies are oriented, generally, to the increase of the productivity of the cows, because it is a means favourable to increase of the welfare of the owners of dairy farms. It may be characterized by the changes of income per cow (Table 3).

In rural regions, there take place differences in the return per dairy cow that are tending to grow with all the resulting negative social economic consequences. The increase in the return is related mainly to the changes in the number of the dairy cows. In Zemgale region the return per cow has increased from 539 LVL/SG in the beginning of the period to 1.25 thousand LVL/SG, in the end of the period. During the whole period, the higher level of specific return takes place in Pierīga region, achieving in 2013 about 1.3 thousand LVL, but the lowest specific return per cow in the end of period is to be find in Latgale region, being backward from the income achieved in Pierīga region by 348 LVL or 1.4 times. It is important to mention that the return of dairy farms per cow is proportional to the increase of the productivity of the cows that may be explained with the respective intensification undertakings. An unfavourable impact on the stability of increase in the return of dairies has made the rapid growth of economy and the following recession. The irregularity of income influences negatively the intensification processes in the dairies of regions, hampering to providing of return from the used intensification resources, yearly. A rapid decrease in the return creates essential problems to the dairies, especially, in keeping of the return and costs in balance.

Getting into the united economic space of the EU, the dairy farms of Latvia have to compete with the milk producers in other countries of the EU, possessing much richer traditions of milk production under conditions of market economy and achievements of better results (Viekals U., 1998). If there becomes analysed the dairy farming of the countries of the EU, functioning under similar agro-climatic and economic conditions, then considerable differences are coming to the surface (Table 4).

The best results are achieved by the dairies of Denmark. In this country, the produced and delivered to processing amount of milk has increased from 11.05 t per cow to 14.1 t per cow or by 27.7 percent. It is interesting that the intensification activities carried out by the dairies of Finland have provided a two times higher increase in processed milk per cow, in comparison with the respective index in Sweden.

Among the Baltic States, better results have been achieved by the dairies of Estonia, in which the milk delivered for processing made, in the end of the period, 6.76t. It should be mentioned that, already in the second half of the previous century, many dairies of the countries of the EU paid,

Table 3. Changes in specific return per dairy cow in rural regions

Regions	*Changes in return per dairy cow in time intervals (LVL/SG)*						*13./04.*
	2004	**2006**	**2008**	**2010**	**2012**	**2013***	
Pierīgas	615	794	1 127	1 078	1 136	1 282	*2,09*
Vidzemes	571	774	970	958	1 035	1 183	*2,07*
Kurzemes	560	716	969	934	1 086	1 237	*2,21*
Zemgales	539	756	1 041	924	1 070	1 253	*2,33*
Latgales	510	635	703	706	813	934	*1,83*
Total	*553*	*727*	*940*	*904*	*1 013*	*1 161*	*2,10*

***Deciphering of abbreviations included in the table**: *Prognosis data*
Source: elaborated by the authors on the basis of the data of the CSB of the Republic of Latvia.

Table 4. Changes in the productivity of dairy cows, resulting from intensification, in the member states of the EU, included in the comparison

Regions	*Changes in the amount of produced milk in time intervals (t/SG)*						*13./04. %*
	2004	**2006**	**2008**	**2010**	**2012**	**2013***	
Dānija	11,05	11,68	12,54	13,82	14,07	14,12	*27,7*
Igaunija	4,60	5,56	6,04	6,25	6,76	6,92	*50,4*
Latvija	2,49	3,25	3,73	3,81	4,20	4,50	*80,6*
Lietuva	2,63	3,25	3,50	3,55	3,97	4,32	*64,6*
Somija	7,46	7,87	7,82	8,05	8,27	8,43	*12,9*
Zviedrija	8,05	8,14	8,08	8,20	8,40	8,57	*6,5*

***Deciphering of abbreviations included in the table**: *Prognosis data*
Source: elaborated by the authors on the basis of the data of the CSB of the Republic of Latvia.

actively and reasonably, a great attention to intensification undertakings in dairying, and, as a result, the milk yield per cow increased rapidly. But, the dairies of Latvia have, in the increase of the productivity of the cows, achieved more improved results only during the last decades.

To continue the process of intensification the productivity in dairying of Latvian regions, the search for new opportunities of implementation of intensification undertakings becomes a topicality, and the efficiency of intensification arrangements depends on the abilities of the dairy farmer to identify the inner and outer factors, related to the opportunities and threats, to take them into account in achievement of strategic and tactical targets. It requires from the dairy farmer a great flexibility and a deep knowledge. In reality, he stands before a complex and many-sided task (Eiropas Savienības …, 1995) and the necessity to take into account the specifics of dairying and its close relationship to other areas, as the intensification of dairying processes becomes influenced by a great many of inner and outer political, economic, social, technological and environmental factors (Jasko D., 2007). The dairy farmer has to form his attitude to intensive and extensive approach to the production (Liscova A., Špoģis K., 2008), taking into consideration that a high level of profitability may be achieved by the dairies of extensive, as well as of intensive nature (Bolton K., Vanderlin J., 2011), because the conditions of dairying vary from country to country and from region to region (Rivža B., 2000). He must be able to react in case, if the increase in demand of milk products overtakes the increase in supply in the world (Loren T.W., Kaiser H.M., 2011). And, above all, he should take into consideration the absolute limitation of the land in the framework of a country, as well as on the scale of the world (Dūklavs J., 2008). So, for example, he has to evaluate the impact of the chemical preparations that may pollute and even degrade the environment (Boxall A., 2012). Some chemicals can, through forage and medicaments get into milk (Saad N.M., Ibrahim T.A., Shehata A., Seddek A.S., 1990). And, above all he must be innovative in his attitude to the opportunities and activities (Ābeltiņa A., 2007).

The above mentioned inner and outer factors, influencing the intensification in dairying, may disclosed better by the model of the Figure 3.

On the basis of the Figure 3 and specifics of dairying in Latvian rural regions R. Zvirgzdiņa prepared a functional model that includes the important positive effects provided by intensification undertakings in the dairying of the regions. The model provides the possibility to find out the intensification level in dairying achieved by dairy farms in rural regions and the indices for the adequate evaluations, as well as the directions of intensification to be implemented in the future.

Besides, the functional model discloses other important basics of intensification increase in dairying, and the relation of intensification effects to the material interests and action target of rural farms, getting involved into dairying. The paper contains the description of adaption of the functional model to Zemgale region (Figure 4).

The model reflects the achieved intensification level of dairying activities in Zemgale region and the opportunities of increasing of efficiency in dairying, using modern intensification activities. The region is characterized by a comparatively high decrease in the herd of dairy cows – by 26 percent, despite the fact that the intensity in dairying has increased from 4.11 t to 5.83 t or by 34.6 percent.

The region has had also the lowest intensity level in the use of agricultural land by dairy farms, lowering gradually throughout the whole period. Because of shrinking in the number of dairy cows in this region, in the end of the period the prognostic number of the cows per 100 ha of the agricultural land will achieve 7.4 units, i.e. being backward, by 2 cows, of the average of rural regions. According the intensity of income, the dairy farms of Zemgale region have achieved the highest intensity increase level – 71.2 percent in comparison with the 2004. A further increase of intensity level

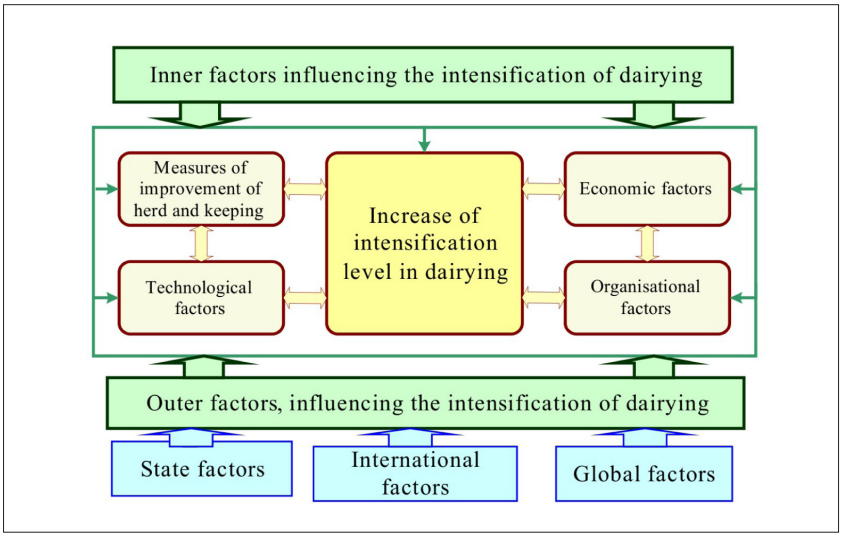

Figure 3. Inner and outer factors, influencing the intensification in the dairying
Source: elaborated by the authors.
Deciphering of abbreviation used in the figure: PESTE factors: political, economic, technical and scientific, as well as ecological factors; LB – forage.

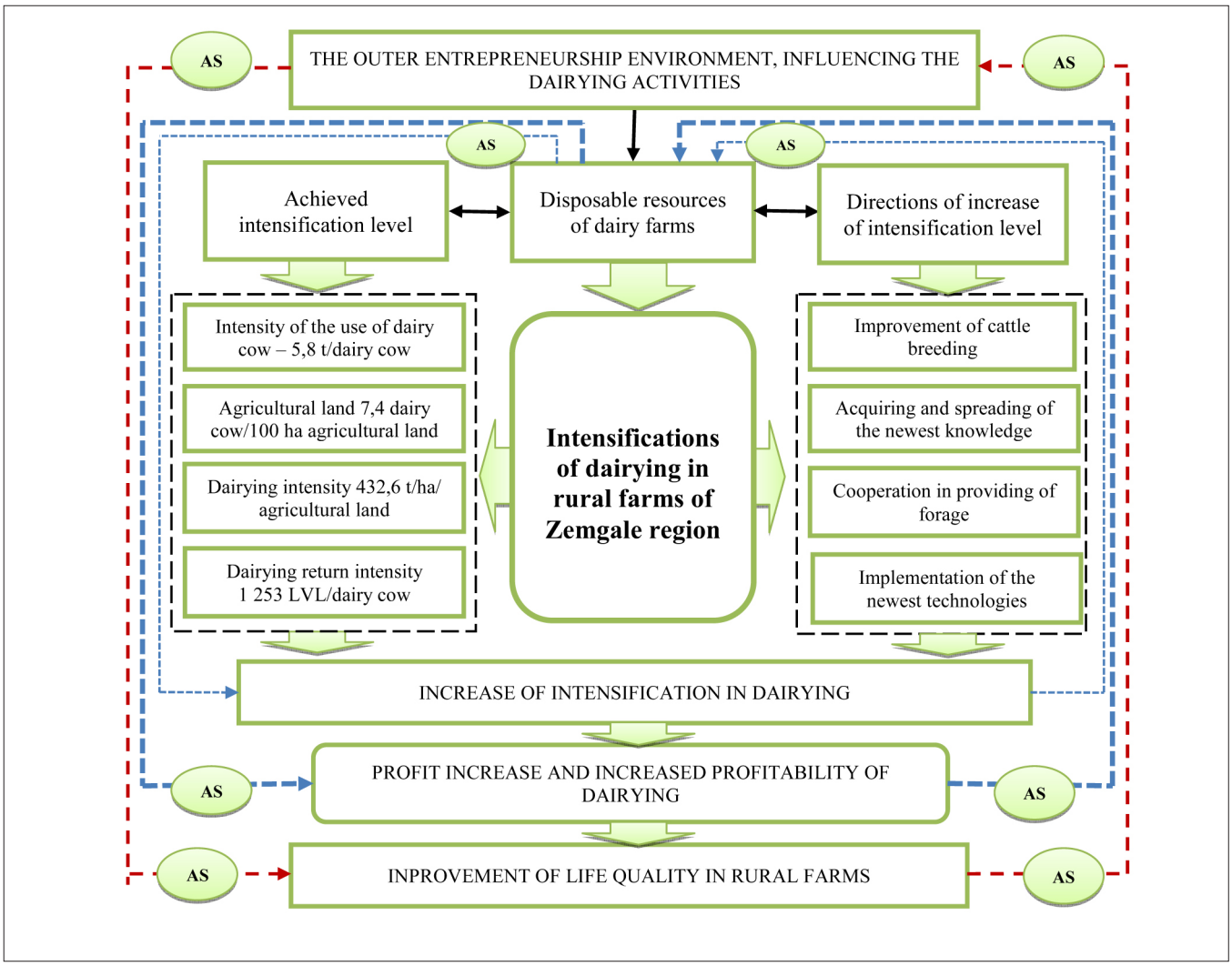

Figure 4. Model of intensification in dairying of Zemgale region AS - feedback
Source: elaborated by authors on the basis of research results.

in Zemgale region requires measures related to the increase of the potential of biological productivity of the herd through cattle breeding.

The achieved intensification level in the region and the future measures determine the necessity to pay, in the future, a special attention to obtaining of the knowledge on all levels – from the operators of machine milking to the managers of the dairies. For the dairy farms, acting in this region, becomes topical implementation of the newest technologies in the processes of dairying and a fuller quantitative and qualitative adequacy to the achieved and desired productivity of dairy cows. To provide the necessary forage basis, the dairy farms of the region should use more actively the opportunities of cooperation, as recommended also by the scientists (Lachmann W., Haupt R., Farmer K., 2005).

The prepared functional model underlines the close relationship between the improvement of the production in dairying and the circumstance that in the regional development much depends on activities of the local government (Keišs S., Kazinovskis A., 2001) and the authority of the intermediaries between the local and central government. The model may contribute to the solution of administrative territorial problems.

Conclusions

- The topicalities of intensification in dairying of Latvian regions are on agenda of decision making in related political, social economic technological and environment protection areas.
- The results of intensification undertakings are influenced negatively by the instability created by economic growth and the following recession, increasing the polarization between the regions.
- The highest instability takes place in Latgale region and is the consequences of the instability of the environment of economic activities.

The policy makers in agriculture have to take into consideration that a rapid decrease in the number of cows create losses not only to respective dairies, but also to the whole society that decreases potential possibilities of the region to keep the previous milk production level and together with it the potential working places and the income in balance.

Literature

Ābeltiņa A. (2007). The role of innovation in economic development. Ekonomika ir vadyba: aktualijos ir perspektyvos. Šiauliu: Nr. 2(9). 5–9 lpp.

Blakely E. (1994). Planning Local Economics Development. California 91320: Sage Publications Inc., 342 p.

Bolton K., Vanderlin J. (2011). Milk Production Costs in 2009 on Selected Wisonsin Dairy Farms. Wisconsin. Retrieved January 15,2014, from: http://cdp.wisc.edu/milk%20production%20costs.htm

Boruks A., Krūzmētra M., Rivža B., Rivža P., Stokmane I. (2001). Dabas un sociāli ekonomisko apstākļu mijiedarbība un ietekme uz Latvijas lauku attīstību. Jelgava: LLU, 169 lpp.

Boxall A., (2012). New and Emerging Water Pollutatnts Arising from Agriculture. OECD Publishing, 2012. Retrieved January 20,2014, from: www.oecd.org/tad/sustainableagriculture

Casson M., (2003). The Entrepreneur. An Economic Theor,. 2nd Edition. Cheltenham: United Kingdom, 271 p.

Council Regulation (EC) No 146/2008 of 14 February 2008. „Amending Regulation (EC) No 178/2003 „Established common rules for direct support schemes under the common agricultural policy and establishing certain support schemes for farmers" and Regulation (EC) No 1698/2005 „On support rural development by the European Agricultural Fund for Rural Development".

Drīksna I. (2002). Piensaimniecības un piena produktu ražošanas problēmas un to risinājums Latvijā. LU Zinātniskie raksti, 647.sēj., Rīga: LU, 146 –154 lpp.

Dūklavs J. (2008). Latvija pievienojas deklarācijai par Kopējās lauksamniecības politikas nākotni. „Nozare". Retrieved February 22,2014, from: www.nozare.info/latvija-pievienojas-deklaracijai-par-kopejas-lauksaimniecibas-politikas-nakotni-3/

Eiropas Savienības Kopējā lauksaimniecības politika – kādu to veidosim Latvijā? (2005) Rīga: Latvijas Valsts agrārās ekonomikas institūts, 94 lpp.

Hofs K. (2002). Biznesa ekonomika. Rīgas: Jāņa Rozes grāmatnīca, 48–55 lpp.

Jasjko D. (2007). Piensaimniecības nozares attīstības analīze un konkurētspējas novērtējums Latvijā un Eiropas Savienības tirgū: gala pārskats. Rīga: Rīgas Starptautiskā ekonomikas un biznesa administrācijas augstskola, 92 lpp. Retrieved January 10,2014, from: http://llu.lv/getfile.php?hash=f9cbc16236cd5bae13520fba8b94ead9

Keišs S., Kozinovskis A. (2001). Reģionālā administratīvi teritoriālā iedalījuma reformas problēmas Latvijā. Rīga: Pašvaldību lietu pārvalde, 93 lpp.

Keišs S., Tilta E. (2004). Reģionālās attīstības un uzņēmējdarbības izaugsmes mijiedarbības Latvijā. Uzņēmējdarbības iespējas, problēmas un to risinājumi globalizācijas apstākļos. Rīga: Biznesa augstskola Turība, 188–195. lpp.

Lachmann W., Haupt R., Farmer K. (2005). Globalisierung der Wirtschaft. Münster: LIT VERLAG, 158 p.

Latvijas statistikas gadagrāmata 2011. (2011). Rīga: LR CSP, 489 lpp.

Laurs A., Priekulis J. (2001). Mūsdienīga piena ražošana. Rīga: LLU Ulbrokas zinātnes centrs, 344 lpp.

Liscova A., Špoģis K. (2008). Ilgtermiņa ekonomiskās darbības lauksaimnieciskās ražošanas resursu struktūras attīstība Zemgales plānošanas reģionā. Economics Science for rural Developoment. Jelgava: LLU, Nr.15, 103–114 lpp.

Loren T. W., Kaiser H.M. (1988). Negative Milk Supply Response Under Constrained Profit Maximizing Behavior. Retrieved February 17,2014, from: http://ageconsearch.umn.edu/bitstream/28844/1/17020111.pdf

LZA Ekonomikas institūta gada grāmata, (2007). Rīga: Latvijas Zinātņu akadēmijas Ekonomikas institūts,115–119.lpp.

Mohammad A. M. (2006). General overview of common agricultural policy (CAP) of the European Union. National Agricultural Policy Center.

Pennel R. (1997). The Common Agricultural Policy. Disadvantaged Farmers and Problem Regions, The Development of Farm Workforce. Oxford: Cleardon Press, 439 p.

Priekulis J. (2000). Racionāla tehnoloģija un mehanizācija piena lopkopībā. Jelgava: LLU, 147 lpp.

Rivža B., Boruks A., Krūzmētra M., Rivža P., Stokmane I. (2000). Dabas un sociāli ekonomisko apstākļu mijiedarbība un ietekme uz Latvijas lauku attīstību. Jelgava: LLU, 169 lpp.

Saad N. M., Ibrahim T. A., Shehata A., Seddek A. S. (1990). Estimation of some industrial pollutants in milk and milk products. Assiut Veterinary Medical Journal 1990 Vol. 23 No. 46. ISSN 1012–5973.

Sproģis A., Sproģis J., Sproģe I. (2007). Latvijas lauksaimniecība gadu gaitā. Tautsaimniecības attīstības problēmas Latvijā. Rīga: LU, Nr.5, 59–117 lpp.

Viekals U. (1998). Piena konkurētspējas paaugstināšanas iespējas. Zinātniskā konference „Latvijas tautsaimniecība: stāvoklis, problēmas, risinājumi" konferences materiāli. Jelgava: LLU, 93–94 lpp.

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