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## **COMPARATIVE ANALYSIS OF SUBSIDIES ON INVESTMENT IN LATVIAN FARMS**

### *ANALIZA PORÓWNAWCZA DOPLĄTY DO INWESTYCJI W ŁOTEWSKICH GOSPODARSTWACH ROLNYCH*

**Key words: farms, investment subsidies, Latvia**

*Słowa kluczowe: gospodarstwa rolne, dopłaty do inwestycji, Łotwa*

**Synopsis.** The research is devoted to comparative analysis of investment subsidies in Latvian farms, grouped by economic size. The main tendencies, peculiarities and differences of investment funding between selected groups of farms are revealed. To assess the statistical significance of the correlation between subsidies (in absolute and relative measures) and various quantitative indicators featuring the activities of farms, a statistical hypothesis testing was undertaken.

### **Introduction**

Recently, the issue of subsidies in general and agricultural subsidies in particular, has assumed considerable significance and attracted a lot of attention of policy makers, scientists, analysts and farmers. The rationale of subsidizing agriculture in developing countries stems from their role in either stimulating agricultural development or protecting the meagre incomes of some vulnerable cultivators, who may not have the risk bearing capacity. In developed countries, however, subsidies to farmers are generally extended to keep them „in parity” with non-farming communities.

The demands of a modern globalised market for agricultural products render the imperative need for investments that aim to improve the competitive profile of agricultural farms. The EU Common Agricultural Policy includes a whole range of policy measures for agricultural holdings, which aim, through subsidy schemes, to facilitate producers to invest in updated capital equipment (mainly modern mechanical equipment), and thus to improve both their effectiveness and productivity level [Aggelopoulos et al. 2008].

The objective of this research is to perform the comparative analysis of investment subsidies in Latvian farms, grouped by economic size, from 2002 to 2008. In order to achieve this objective the methods of monographic and ratio analysis, statistical data processing, statistical grouping, literature study as well as inductive – deductive research were used. Consequently conclusions are formulated concerning the most peculiar aspects of Latvian farms’ activities. The main source of quantitative information for author’s calculations is SUDAT (Saimniecību uzskaites datu tīkls), which is a database of EU FADN national liaison agency in Latvia.

### **Investments as a precondition of sustainable agricultural development**

According to Karpik [2006] the measures of the state support of agriculture could be divided into 2 groups: indirect support (preferential crediting, taxation, other indirect subsidies) and direct support (grants, favorable loans etc.). Other researchers [Gulati, Shrama 1995, Poszkus 2006] report on different ways of agriculture subsidizing. First, the government may pay much higher support prices for agricultural products than what farmers can get under free market environment. Second, vital inputs (like irrigation water, electricity, fuel, investments in assets etc.) used in the agricultural sector can be subsidized. Of these two alternatives, subsidies on inputs are normally preferred because it is believed that benefits of government expenditure can be derived by the farmers only in proportion to their use of inputs. At the same time it is argued that incentives like subsidies are short-term measures and they are not meant to be substitutes for long-term measures, which alone ensures the viability of the new agro-technology [Gulati, Shrama 1998].

Subsidies on inputs are generally advanced on the assumption that these are temporary measures and would be withdrawn once the objectives have been achieved. But the past experience clearly shows that politically it becomes increasingly difficult to reduce or abandon subsidies. Therefore increasing investment in agriculture appears to be a better bargain than short-sighted measures such as subsidies. Investments in basic structure correct for regional imbalances and promote greater equity at farm level, while subsidies tend to accentuate inequality [Gulati, Shrama 1995].

According to the classical economic theory, the investments in the economy are related to the level of income; below the particular level of income – which would be the subsistence level – investments would either disappear or be negative. Although some studies support alternative theory that the level of investments is more influenced by production requirements or by the need for income and consumption in the future rather than that the capacity to save is related to the past (or current) income (and consumption) [Shukla 1968].

The subsidies in agriculture are generally rationalized in the overall economic context that they play a crucial role in stimulating development of any country through increased agricultural production, employment and investment. It is noted in The World Bank's annual World Development Report [Dokład o mirowom... 2008] that the growth of agriculture hardly depends on investments in infrastructure. Another research [Evenson, Pray, Rosegrant 1999] reveals that investments in agriculture result in growth of total factor productivity. Even more investments in irrigation systems<sup>1</sup> (which improve the environment for agro-technology) and other input factors generate growth over and above the contribution that they make as conventional inputs. Contrary measures, i. e. cutting investments in primary agricultural production, often leads to decline in crop production, a decrease in animal yields and inability to maintain the renovation of production assets [Chrastinová 1999]. At the same time the problem of insufficient financing of agriculture is complicated by the erroneous distribution of funding [Dokład o mirowom... 2008]. It results in granting resources to the most prosperous farms, which are able to provide the co-financing of subsidised projects.

As the agricultural sector is usually considered to be one with the highest credit risk degree and uncertainty due to the high dependence of production results on changeable climate, an important role in stimulation of investments is played by the state support [Kanariw 2006]. The importance of investment subsidies as gratis financial support has been increasing because the internal finance resources of farms are shrinking due to limited profit and diminishing amount of annual depreciation caused by high obsolescence of means of production [Sigidow 2005]. Although sometimes obtaining loans and applying for subsidies are intertwined because farmers' interest in bank credits is related to the absorption of EU funds supporting investment and development of farms [Kata 2009]. In some countries (for example, Poland) the most widespread phenomenon concerns the possession and use of own machines and devices. This is undoubtedly a result of a small offer of companies providing machine service, but also the mentality of the farmers, who do not accept a common use of machines [Mickiewicz 2008]. Although the effect of this phenomenon is negative – a surplus of machines in the Polish farms, it could be one of the factors increasing the significance of investment subsidies.

Kobus claimed that after the accession in 2004 the EU funds became available for farmers in new Member States which allowed a significant increase of investments in agriculture and a certain economic boom in the rural areas [Kobus 2008]. Historically in the 1990-ties subsidies on investment played a crucial role in the modernization and diversification of Czech farms because rural banking and cooperative credit system was undeveloped. Although subsidies were aimed to support the purchase of machinery, equipment and buildings, not land. [Silar et. al. 1999] P. Mickiewicz made similar conclusion on importance of investment subsidies for farms in Poland giving an opportunity to introduce modern technical solutions and achieve considerable improvement in production process [Mickiewicz 2008].

### **Diversity of investment subsidies in Latvian farms**

In Latvia the national subsidies are intended for farm investments and the plantation of permanent crops. Investments to achieve the EU standards, modernization of farms and structural funds are financed by both national and EU subsidies [Lauku 2009]. Previously performed research revealed that since 2001 subsidies on investment in Latvian farms generally had increased 16,8 times, thus verifying the stable growth of their significance as a source of funding. It was stressed that subsidies were especially important for small Latvian farms due to limited use of borrowed capital for financing investments and insufficient profit ratios [Jakušonoka 2008].

<sup>1</sup> In some countries the profitability of irrigation projects approximates 15-20%. [Dokład o minowym... 2008].

It would be rewarding to examine carefully the actual trend of investment subsidies in farms of different economic size in Latvian agrarian sector. In Latvia the specific part of investment subsidies in total amount of subsidies received during some years and for different size farms was differing (Tab. 1).

This shows that the process of renewal of fixed assets did not have simultaneous character all over Latvian agricultural sector, but only in certain groups of holdings. After Latvia joined the European Union the availability

of investment subsidies has increased. This is evidenced by a wider range of subsidised farms. For instance, since 2005 the opportunity of getting subsidies was actively used also by the smallest holdings (under 4 ESU). Still large-scale projects in particular were realised by the biggest farms, which part of investment subsidies in total subsidies amount exceeded one half (54%) in 2005. In the following years, as the started projects were closed, those gradually were dropping down and in 2008 made only 8%. During the last years of the analysed period production assets, subsidized with national and EU support payments (which specific weight varies from 14 to 23%), were most actively upgraded in middle-size and rather big farms of economic size from 8 to 250 ESU.

Specific part of investment subsidies in farm gross investments characterizes what part of investments comes from national and EU budget, thus reducing the amount of internal (depreciation and earnings) and external (loans) resources needed for renewal and extension of production funds [Lauku saimniecības... 2009]. The research performed in other EU countries shows that there are various farm clusters, which differ significantly both on the specific weight of public financing (i. e. subsidies) in investments and structure of investments (for example, purchase of machinery, other mechanical equipment and livestock, the construction of farm buildings, the performance of land improvement work etc.) [Aggelopoulos et al. 2008].

Before Latvia joined the EU big specific weight of investment subsidies had generally been observed in holdings from 16 to 250 ESU (Tab. 2). The EU support gave opportunity to farms under 16 ESU also to use investment subsidies. As in Latvia farm opportunity to attract external finan-

**Table 1. Specific weight of subsidies on investment in total subsidies of Latvian farms, grouped by ESU, 2002-2008**

No	Ave- rage	2≤4	4≤8	8≤16	16≤40	40≤100	100≤250	> 250	(8)/(2)	Cv [%]
	1	2	3	4	5	6	7	8	9	10
1	0.14	0.01	0.17	0.05	0.11	0.22	0.21	0.14	15.3	59
2	0.31	0.02	0.15	0.31	0.36	0.42	0.40	0.40	22.7	50
3	0.09	0.00	0.00	0.07	0.06	0.25	0.21	0.19	-	14
4	0.35	0.16	0.37	0.27	0.46	0.32	0.34	0.54	3.3	35
5	0.17	0.14	0.20	0.20	0.14	0.12	0.15	0.23	1.7	26
6	0.16	0.11	0.20	0.23	0.19	0.13	0.13	0.10	0.9	31
7	0.15	0.11	0.13	0.18	0.21	0.21	0.15	0.08	0.8	32
9	0.19	0.08	0.17	0.19	0.22	0.24	0.23	0.24		
8	1.1	11.7	0.7	3.4	1.9	0.9	0.7	0.6		
10	49	86	62	52	65	44	46	70		

Source: own study.

**Table 2. Specific weight of subsidies on investment in gross investments of Latvian farms, grouped by ESU, 2002-2008**

Years	Average	2≤4	4≤8	8≤16	16≤40	40≤100	100≤250	> 250	(8)/(2)	Cv [%]	
	1	2	3	4	5	6	7	8	9	10	
2002	1	0.11	0.06	0.17	0.08	0.12	0.17	0.14	0.04	0.8	45
2003	2	0.22	0.04	0.10	0.16	0.30	0.31	0.31	0.18	4.5	50
2004	3	0.10	0.00	0.01	0.07	0.09	0.26	0.20	0.04	-	100
2005	4	0.27	0.34	0.53	0.29	0.48	0.30	0.22	0.10	0.3	54
2006	5	0.19	0.37	0.40	0.35	0.17	0.15	0.15	0.07	0.2	69
2007	6	0.14	0.26	0.30	0.26	0.19	0.10	0.10	0.04	0.1	72
2008	7	0.15	0.28	0.20	0.24	0.21	0.19	0.10	0.04	0.1	54
Average	8	0.17	0.19	0.24	0.21	0.22	0.21	0.17	0.07		
(7)/(1)	9	1.3	4.8	1.2	3.1	1.7	1.1	0.8	0.9		
Cv [%]	10	36	81	73	50	58	38	44	71		

Source: own study.

**Table 3. Subsidies on investment per 1 ha of utilised agricultural area on Latvian farms, grouped by ESU, 2002-2008 (LVL)**

Years	Average	2≤4	4≤8	8≤16	16≤40	40≤100	100≤250	> 250	(8)/(2)	Cv [%]	
	1	2	3	4	5	6	7	8	9	10	
2002	1	4	0	5	1	3	8	11	8	68.9	112
2003	2	13	0	4	13	20	32	32	29	85.5	99
2004	3	9	0	0	7	6	31	23	17	-	132
2005	4	51	20	57	35	80	43	48	100	5.1	53
2006	5	26	18	33	35	22	18	26	42	2.3	35
2007	6	24	16	30	36	29	20	21	18	1.1	30
2008	7	26	16	20	30	38	37	27	17	1.1	35
Average	8	22	10	21	22	28	27	27	33		
(7)/(1)	9	7.3	139.9	4.4	24.5	11.0	4.4	2.4	2.1		
Cv [%]	10	72	93	96	66	91	45	42	96		

Source: own study.

Sometimes investment subsidies have a negative impact on sustainable agriculture development. When the prices of inputs don't reflect their scarcity value, there are very little incentives for farmers to adopt methods which could make more efficient use of scarce resources. A rise in subsidies where prices do not reflect the scarcity value will accentuate these inefficiencies [Gulati, Shrama 1998]. For example, in Latvia large subsidies on buildings and techniques used for production intensification could make bio-technology and organic farming relatively less attractive and thereby could slow down the potential growth of the latter.

Comparison and estimation of investments expressed in absolute figures is inappropriate – a bigger farm will definitely have bigger ones. But, relating them to some other values, for example, such production factors as utilized agricultural area and labour force (expressed in nominal annual work units<sup>2</sup>), it is possible to get interrelated values. Such method of subsidies analysis grew popular in scientific research both in Latvia [Lauku saimniecības... 2009], and in other states (for instance), [Makutėnienė, Makutėnas 2006]. Alike the trends observed in Lithuanian agricultural sector [Makutėnienė, Makutėnas 2006], investment subsidies received by Latvian farms per 1 ha UAA in 2002-2003 rapidly grew up (Tab. 3).

**Table 4. Subsidies on investment per 1 annual work unit on Latvian farms, grouped by ESU, 2002-2008 (LVL)**

Years	Average	2≤4	4≤8	8≤16	16≤40	40≤100	100≤250	> 250	(8)/(2)	Cv [%]	
	1	2	3	4	5	6	7	8	9	10	
2002	1	84	2	118	42	149	371	276	127	72.4	153
2003	2	309	5	96	378	958	1333	871	470	97.6	157
2004	3	226	0	8	218	333	1492	776	289	-	234
2005	4	1293	287	1340	1156	3661	2355	1896	1338	4.7	83
2006	5	701	294	764	1126	1121	821	986	815	2.8	41
2007	6	663	219	677	1093	1424	1174	998	444	2.0	65
2008	7	743	278	421	969	1686	2057	1361	478	1.7	93
Average	8	574	155	489	712	1333	1372	1024	566		
(7)/(1)	9	8.8	158.0	3.6	22.0	11.3	5.6	4.9	3.8		
Cv [%]	10	71	94	97	67	87	50	49	71		

Source: own study.

cing is often rather limited (i. e. insufficient equity, unsatisfactory business plan, high credit risks etc.) [Bratka, Prauliņš 2008], they try to use at maximum the support granted to agricultural sector in the form of investment subsidies. As the total amount of investment projects implemented by big farms was essentially larger comparing to small ones, the specific part of investment subsidies in the total received subsidies did not exceed 10%.

Still this growth concerned only farms over 8 ESU. If before and inclusive 2004 the largest investment subsidies per 1 ha UAA were in farms over 40 ESU, then in 2005 these were in holdings from 16 to 40 ESU and over 100 ESU. Starting with 2006 intensiveness of usage of investment subsidies most of all grew for small farms under 40 ESU, where investment subsidies were for 27-46% bigger, than for Latvian agricultural sector on the average. Although in small farms the renewal and exten-

<sup>2</sup> Annual work unit (AWU) corresponds to the work performed by one person who is occupied on an agricultural holding on a full-time basis (1800 hours are taken to be the minimum annual working hours: equivalent to 225 working days of eight hours each) [www.epp.eurostat.ec.europa.eu/statistics\_explained/index.php/Annual\_work\_unit] (AWU) [10.04.2010].

sion process for production assets took place later than in big holdings, but with similar intensiveness. Therefore Latvia's membership in the EU reduced disproportion in the agricultural sector and enhanced availability of financing granted to small agricultural producers for modernization of their production technology.

In economic analysis annual work unit is considered as a universal indicator, used for comparison of farms of different size, specialization and location. The research shows that the biggest investment subsidies per 1 AWU were concentrated in middle-size and rather big Latvian farms (Tab. 4). Before 2005 their size range was from 16 to 250 ESU, after 2005 the lower threshold plummeted to 8 ESU. Average value analysis enables the authors to come to the conclusion that from the year 2002 to the year 2008 investment subsidies most actively were used in farm holdings from 16 to 250 ESU.

There is always a lag between investment in infrastructure and realization of the potential created. Therefore some potential benefits (or losses) from the past investments (or decline in investments) in Latvian farms will be essentially realized in the future.

### Assessment of correlation statistical significance

To assess the statistical significance of the correlation between investment subsidies (in absolute and relative measures) and various quantitative indicators featuring the activities of farms, this article undertook a statistical hypothesis testing [Arhipova, Balina 2006]. Two hypotheses were formulated:

$$H_0: r = 0,$$

$$H_1: r \neq 0.$$

$H_0$  assumes there is no linear correlation, but  $H_1$  – there is a linear correlation between variables within the general population. In order to test the significance of a correlation coefficient a t-value, which is distributed according to a Student t-distribution with degrees of freedom  $df = N - 2$ , is used (formula 1). The correlation coefficient is considered to be statistically significant if the computed t value is greater than the critical value of a t-distribution with a level of significance of  $\alpha$ .

$$t = \frac{r - \rho}{[(1 - r^2) / (N - 2)]^{1/2}} \quad (1)$$

$r$  – correlation coefficient within the sample,

$\rho$  – correlation coefficient within the general population,

$N$  – size of the sample.

With a probability of  $P = 95\%$  (or level of significance = 0,05) hypothesis  $H_0$  can be rejected (computed t value is greater than the critical value  $t_{0,05;5} = 2,57$ ). Therefore there is a significant linear correlation between subsidies on investment and such parameters as the economic size of a farm (ESU), consumed labour (AWU), utilized agricultural area (UAA), long-term assets used in production, total production subsidies and net value added (NVA) created by a farm (Tab. 5). Although if the probability is increased to  $P = 99\%$  (level of significance = 0,01),  $H_0$  is impossible to reject (computed t value is less than the critical value  $t_{0,01;5} = 4,03$ ) and linear correlation is insignificant between subsidies on investment and economic size of the farm in 2002, 2004, and 2008, consumed labour, long-term assets and NVA in 2004, and 2008. So the main conclusion is that an increase in the quantitative indicators of agricultural production is predominantly accompanied by the growth of subsidies on investments. At the same time it doesn't reveal whether the higher quantitative indicators mean the higher proportion of subsidies in investment funding.

**Table 5. Significance test (t value) of correlation between subsidies on investment and various factors on Latvian farms, 2002-2008**

Years	ESU	AWU	UAA [ha]	Long-term assets	Total prod. subsidies	NVA
2002	3.99	5.05	9.60	3.64	7.97	4.28
2003	5.94	7.38	29.29	5.87	72.82	6.42
2004	2.94	3.36	7.92	3.20	10.54	3.57
2005	27.45	22.86	7.45	21.66	6.50	26.95
2006	29.39	35.24	10.65	24.61	8.83	67.11
2007	7.43	7.16	24.37	7.60	17.80	9.55
2008	3.85	3.49	6.42	3.48	5.13	3.69

Source: own study.

**Table 6. Significance test (t value) of correlation between proportion of subsidies on investment in gross investments and various factors on Latvian farms, 2002-2008**

Years	ESU	AWU	UAA [ha]	Long-term assets	Total production subsidies	Proportion of NVA in production revenues
2002	-1.27	-1.18	-0.76	-1.31	-0.93	1.03
2003	0.10	0.17	0.61	0.11	0.66	1.90
2004	-0.19	-0.11	0.54	-0.12	0.73	-0.23
2005	-2.48	-2.44	-3.14	-2.42	-3.16	2.12
2006	-2.04	-1.98	-2.79	-1.96	-2.78	5.17
2007	-2.46	-2.35	-3.42	-2.43	-3.19	0.92
2008	-4.62	-4.28	-7.06	-4.23	-6.05	0.93

Source: own study.

proportion of NVA in production revenues. With the latest one it is significant in 2006.

We can come to the conclusion that there is mostly no statistically significant relationship between the specific weight of subsidies in gross investments and quantitative indicators featuring the different aspects of farm production activities. Thus the effectiveness of subsidies attraction and the involvement of state support into modernization and renovation of funds don't correlate with quantitative indicators. Perhaps it depends on farmers' initiative, business environment, and other qualitative aspects which should be developed and analyzed in deep in further publications.

## Conclusions

Specific part of investment subsidies in farm gross investments characterizes what part of investments comes from national and EU budget, thus reducing the amount of internal (depreciation and earnings) and external (loans) resources needed for renewal and extension of production funds. Latvia's accession to the EU gave opportunity to extend the range of farms which were granted investment subsidies. This support was especially important for small agricultural holdings due to their limited use of borrowed capital for financing investments and insufficient profit ratios. Although in small farms the modernization of production assets took place later than in big holdings, but with similar intensiveness. An increase in the quantitative indicators of agricultural production was predominantly accompanied by the growth of investment subsidies. At the same time there was mostly no statistically significant relationship between the specific weight of subsidies in gross investments and quantitative indicators featuring the different aspects of farm production activities. Thus the effectiveness of support attraction and the involvement into modernization and renewal of funds did not correlate with quantitative indicators.

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Results of significance test (t value) of correlation between proportion of subsidies on investment in gross investments and various factors are summarized in Table 6. With the probability of  $P = 95\%$  hypothesis  $H_0$  can be rejected and the correlation acknowledged as significant just with a few parameters in some years. Namely, with UAA and total production subsidies in 2005-2008, with the economic size of a farm, labour consumed and long-term assets in 2008 as well as the proportion of NVA in production revenues in 2006. If the probability is increased to 99%, the correlation could be assessed as significant with all parameters in 2008 except for the pro-

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### Streszczenie

*W pracy dokonano analizy porównawczej dopłat do inwestycji w gospodarstwach rolnych na Łotwie. Wskazano na ich znaczenie w tworzeniu warunków do rozwoju rolnictwa na Łotwie.*

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