Analysis of Development of Investments in the Agricultural Sector of the Czech Republic

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Abstract

The aim of this article is to analyse the investment activities realized in the agricultural sector of the Czech Republic during the period of 1998-2009. The study focuses on the development of the volume of investments in agriculture, their composition and economic efficiency. The analysis is based on data from the Aggregate Agricultural Account drawn up by the Czech Statistical Office (Český statistický úřad, ČSÚ). Investment activity is studied on the basis of such indicators as the gross fixed capital formation, net fixed capital formation, gross investment rate, requirements for investments. The impact of selected factors influencing the gross fixed capital formation and its composition is evaluated.

Key words

investment activities, agricultural sector, gross fixed capital formation, requirements for investments

Anotace

Cílem příspěvku je provést analýzu investiční aktivity v zemědělství ČR v období let 1998-2009. Hodnocen je vývoj objemu investic v zemědělství, jejich struktura a jejich ekonomická efektivnost. Pro analýzu jsou využity údaje Souhrnného zemědělského účtu, zpracovávaného ČSÚ. Investiční aktivita je sledována na základě ukazatelů tvorba hrubého fixního kapitálu, čistá tvorba fixního kapitálu, hrubá míra investic, investiční náročnost. Je posouzen vliv vybraných faktorů, ovlivňujících tvorbu hrubého fixního kapitálu a jeho strukturu.

Klíčová slova

investiční aktivita, zemědělství, tvorba hrubého fixního kapitálu, investiční náročnost

Introduction and Literature Review

An important factor of the development of every national economy sector is the level of its investment activity. Investment activities – investments – realized in a specific period create conditions for achieving required future outcomes. According to the theory of economics, the basic factors influencing investment activity in a specific period include the interest rate, the volume of available financial resources, employment rate, technological progress, business expectations and other.

When following the issues concerning investments on the macroeconomic level, authors of scientific articles assess relationships between the gross domestic product growth and gross fixed capital formation (Sedláček 2006, Kadeřábková et al. 2008). The authors verify the basic hypothesis that when GDP grows, gross fixed capital formation grows too.

Furthermore, the above mentioned studies monitor the influence of the interest rate value and the influence of available financial resources on the development of gross fixed capital formation.

The study by Dubská (2006) also deals with the development of fixed capital and its proportion to the level of gross domestic product. The author observes that the share that investments to fixed assets have in gross domestic product is an important indicator of future development of economy, although not all their types contribute to future economic growth in the same manner.

From among foreign studies, the study by Zwolak (2008) deals with investment issues on the macroeconomic level. Contrary to the previous studies, the author shows the dependency of gross, final and market production on gross value of fixed capital. He uses a number of ratio indicators and mathematical functions. The study shows that the influence of fixed capital productivity decreased and the efficiency of the Polish agriculture production fell down in 2002-2005. Zwolak identifies the relatively stable age structure of fixed capital and low average annual rate of investment growth (8.74 %) to be the reasons for this.

The aim of this article is to analyse the investment activities realized in the agricultural sector of the Czech Republic during the period of 1998-2009.

Material and methods

The subject of the analysis is the development of the investments in agriculture, their structure and economic efficiency during 1998-2009. The analysis is based on data from the Aggregate Agricultural Account drawn up by the Czech Statistical Office. For the present, the data collected in 2009 are preliminary. In this study, investments are expressed by means of the gross fixed capital formation (hereinafter only GFCF) indicator. GFCF shows the value of both tangible and intangible fixed assets acquisition, either purchased (including the acquisition by means of financial leasing) or received gratuitously or produced at one's own expense, decreased by the value of any sold or gratuitously passed over assets. The tangible fixed assets include new investments in buildings, constructions, machinery and equipment, to acquire cultivated assets (as regards the agricultural sector this means acquisition of permanent crops, i.e. hop gardens, vineyards, orchards), and also costs of large-scale repairs, improvements of fixed assets, changes in inventory - animals, large-scale improvements of lands (as regards the agricultural sector this means the costs of soil amelioration, i.e. the land improvements by means of drainage and irrigation, land adjustments).

Investment activities in the agricultural sector are studied from several points of view. The subjects of the analysis are as follows:

i) The development of the value of investments (the horizontal, trend analysis); the volume of GFCF is established in monetary units in individual years and the development of this volume is studied in a determined period.

ii) The gross investment rate = GFCF / gross value added

Gross value added is defined as production in the current price without intermediate consumption in the current price. The term production means final production of the sector and the term intermediate consumption means the aggregate of all consumed inputs.

When gross investment rate grows in time, it means that the investment activity is higher. Contrarily, when gross investment rate decreases, it means that the level of activity is lower.

iii) Net fixed capital formation = GFCF – fixed capital consumption.

Fixed capital consumption is defined as fixed actives wear and tear in a specific period (depreciations).

When the net formation is positive, then it theoretically means that other resources, own or another's (credits, subsidies), were used apart from the value of depreciations to finance investments. When it is negative, the financing resources were not sufficient; they even did not cover the renewal of a worn-out value of fixed capital either.

iv) The material structure of investments and its changes; the percentage of individual types of investments in individual years in a monitored period is expressed.

The data source is the Aggregate Agricultural Account for 1998-2009, drawn up by the Czech Statistical Office, the Report on the Agriculture in the Czech Republic for 1998 to 2007, and the ARAD database of the Czech National Bank (ČNB) for 2000 - 2009.

The tendencies in development of indicators are described in words, by means of basis indexes, and in some cases the development is characterized by means of linear regression - only the regression coefficient and the correlation index are applied.

Results of the Analysis of the 1998-2009 Period

The production in the agricultural sector expressed in current as well as fixed prices shows a slightly growing trend throughout the whole period. The

growth (see Chart 1) is faster in current prices (annual increase amounting to CZK 837.7 million) than in fixed prices (CZK 452.9 million), the reason behind this is that the growth of production prices is faster than the growth of produced quantity of production. Generally, the development may be evaluated as positive. However, the comparison of the production level and development in fixed and current prices draws attention to the negative influence of the current prices of the production in the several years that are the subject-matter of the study. In case the value in fixed prices is higher than the value in current prices, then the current prices did not reach the level of the fixed prices of 2000. This is the situation that occurred in the 6 years of the studied period, while the state of 2009 was the 2nd worst - the current price-fixed price ratio reached only 0.92. After 2004, the price ration achieved the level higher than 1 within four years, however, it must be stated that farming enterprises still are not successful in improving their

agricultural production in any considerable manner. This is a negative phenomenon, limiting the possibilities of a faster growth of investments in the area of financial sources formation.

The gross value added in AAA is formed as a difference between production and intermediate consumption. It is the source covering other costs and the source of the profit made in the agricultural production (crop and animal farming), agricultural services and related non-agricultural sectors. It is divided to two parts important for investing – depreciations (fixed capital consumption) and net value added. However, the GVA in the studied period shows a decreasing trend caused by the growth of the intermediate consumption faster than the production growth. While the intermediary consumption in fixed prices was nearly stagnating, current prices were growing. The impact of the intermediary consumption prices is shown in Table 1.
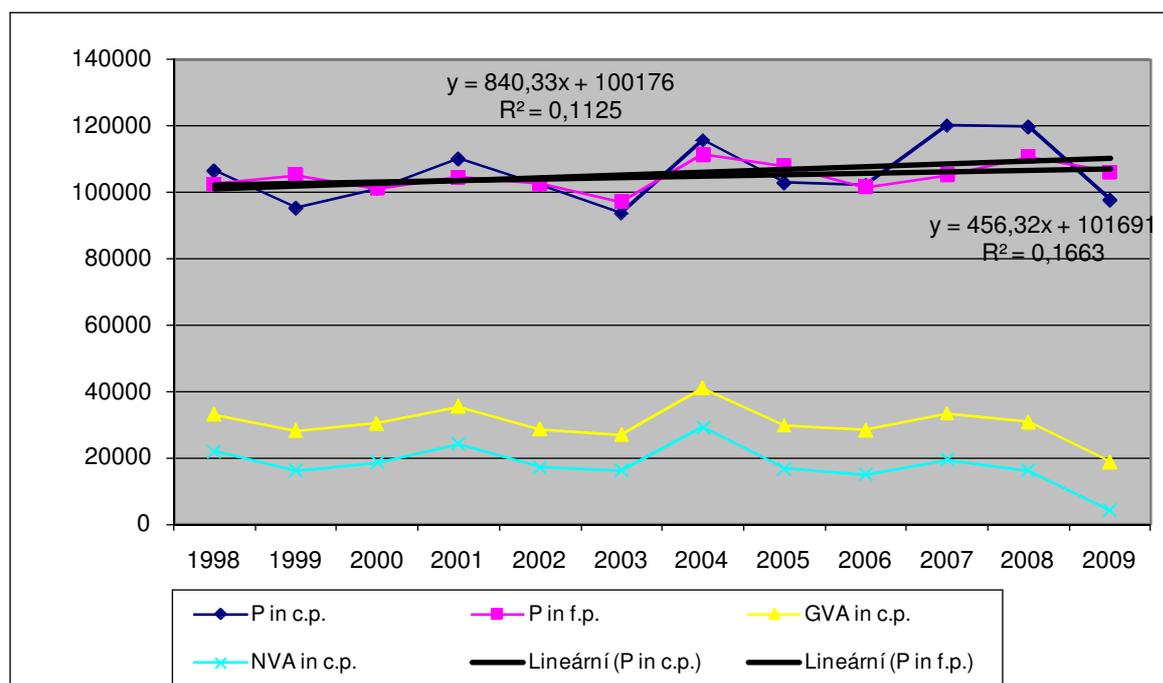
Source: drawn up by the author according to the ČSÚ, Time series, Agriculture, Aggregate Agricultural Account, Note: fixed prices of 2000

Chart 1: Development of the production and gross value added in agriculture during 1998-2009, CZK in millions.

The ration of c.p.of intermediary consumption to f.p. of intermediary consumption	1998	1999	2000	2001	2002	2003
	1.008	0.944	1.000	1.049	1.060	1.030
	2004	2005	2006	2007	2008	2009
	1.043	1.036	1.051	1.163	1.220	1.128

Source: ČSÚ, AAA and the author's own calculation

Table 1: Development of current prices of the intermediary consumption in agriculture during 1998-2009, fixed prices =1.

year /indicator	GFC formation in c.p.	GVA in c.p.	GVA contribution to P in c.p., %	Gross investment rate GFCF/GVA %	FC consumption c.p.	Net FC formation	FC consumption/GFCF ratio, %	GFCF/P ratio in f.p.
1998	13 664	33 150	31,1	41,2	11 167	2 497	81,7	14
1999	7 432	28 261	29,7	26,3	12 022	-4 589	161,7	7,4
2000	8 691	30 425	30,1	28,6	11 829	-3 138	136,1	8,6
2001	10 441	35 544	32,3	29,4	11 231	-790	107,6	9,6
2002	10 438	28 736	28,1	36,3	11 448	-1 010	109,7	9,7
2003	9 846	27 070	28,9	36,4	10 804	-959	109,7	10
2004	11 807	40 987	35,4	28,8	11 813	-6	100	10,3
2005	14 172	29 789	29	47,6	12 992	1 180	91,7	12,4
2006	14 714	28 470	27,8	51,7	13 501	1 213	91,8	13,6
2007	15 685	33 550	27,9	46,8	14 181	1 504	90,4	13,3
2008	17 112	30 869	25,8	55,4	14 610	2 502	85,4	13
2009	11 701	18 904	19,4	61,9	14 704	-3 003	125,7	7,3

Source: drawn up by the author according to the ČSÚ, Time series, Agriculture, Aggregate Agricultural Account

Note: fixed prices of 2000, * … a preliminary figure for 2009

Table 2: Indicators of the level and development of investments in the agricultural sector in 1998-2009*, CZK in millions.

The impact of the value of purchased inputs was unfavourable for the formation of own resources for investment financing. The average annual decrease in the GVA amounted to CZK 553 thousand. The value of the GVA of 2009 is the lowest in the whole studied period.

The net value added is as much fluctuating as is the value of the GVA, also showing a generally decreasing tendency; in 2009, its value dropped deep under the level of the previous years. In all the studied years, the NVA was so low that it even did not cover staff expenditure and production (costs) taxes and other operational costs. According to these data, the possibilities for gross fixed capital formation in agriculture were deteriorating, especially as regards using profit as farmers' own internal source of financing the costs of

investments. Under these conditions, depreciations have remained to be the decisive disposable component of internal resources for GFCF.

The values of the absolute as well as ratio indicators characterizing the investment activity in agriculture in the studied period are shown in Table 2.The growing trend of GFCF (Chart 2) prevails in the studied period. Although the FC consumption was also growing during most of the studied years, its increase was slower, which was demonstrated as a gradual improvement of the net fixed capital formation value. The net formation in 2004 turned from negative figures to positive ones, but in 2009 it was negative once again. Because the aggregate of all positive values of net FCF is smaller (8,896) than the aggregate of negative values (-13,495), it must be stated that the investments made in

1998-2009 did not secure the simple reproduction of the original value of tangible and intangible fixed (investment) assets.[1]

In the years with net FCF, investments were also financed by means of a part of the positive entrepreneurial income[2], as shown in Table 3. It may be considered to be positive that entrepreneurial income got to positive figures after 2004, but in 2009 it decreased approximately to a quarter of the value of the previous year, which again limited the possibility of financing provided from this source.

The low proportion of other financing sources in GFCF is caused by unfavourable income of the agricultural sector – here they are expressed in the form of entrepreneurial income - that reached negative or low positive values in most of the years.

This negatively influenced not only the possibility to use the profit for investments, but also access to loans and credits. The interest expense stated in Table 4 inform about how bank loans were used. The decrease down to 31.3 % of the original value results especially from decreasing interest rates. Unfortunately, neither the volume of credits nor the interest rates from the Aggregate Agricultural Account may be documented with numbers.

The gross investment rate in agriculture according to data from the Aggregate Agricultural Account shows considerable interannual differences. The simple average of the period was 37.7 %. It is positive that it started to increase after the drop in 1999-2001, increasing significantly after 2004 – it grew by more than 50 % - and also that, once again, other equity and debt resources started to contribute to financing resources from 2005 in a more intensive manner (see the FC consumption/GFCF ratio in 2005-2008 and also the net FCF indicator in the same period). (Table 4)

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[1] This is based on the assumption that: the assets of 1998 + acquisition – retirement – depreciations = the assets of 2009. According to the available data, the assets of 2009 are lower than the assets of 1998.

[2] As regards its contents, the entrepreneurial income nearly corresponds to profit from ordinary activities before tax, i.e. the sum of earnings from operational and financial activities. Because profit from extraordinary activities usually oscillates in low values, it is possible to abstract away from it and, consequently, consider the entrepreneurial income to be the gross profit of farming enterprises, i.e. the profit before income tax.

The table 5 shows that the total value of investment donations was the highest in 1998 and since then the level has not been reached again. The interannual fluctuation is high. The evidence suggests that not even state subsidies provided under grant headings created the conditions required for more intensive stabilization of development of the agricultural sector as a whole either. The importance of investment subsidies for investment financing is documented in Table 5 by means of their proportion to GFCF, and furthermore in Table 6 by means of the proportion of their value to the value of the basic internal source of financing, i.e. depreciations.

The last indicator in Table 2 - i.e. GFCF/production - draws attention to the growing investment demands of agricultural production since 1999. The value has increased up to 1.85 multiple in 2008, while GFCF has a decisive share in this increase because the production in fixed prices did not grow nearly at all. The value achieved in 2009 is out of the common run, which is caused first by a drop in production and subsequently by a drop in both the GVA and entrepreneurial income. The reciprocal of the indicator may be described as the production efficiency of investments - the tendency is decreasing, i.e. negative.

The focus of the investment activities in agriculture during the studied period is documented by the material structure of investments – GFCF – as shown in Chart 3.

The decisive component of the material structure of GFCF (Table 7) is the expenses on non-agricultural products expended during the whole period, i.e. on deliveries from other sectors of the national economy. Their absolute value had been slightly growing until 2008. The contribution of GFCF was very volatile, with a slight tendency towards decreasing.

At the same time, the structure of deliveries of non-agricultural products had been changing – the proportion of expenses on machinery had mostly been increasing and the proportion of expenses on buildings and constructions had been decreasing until 2006. The development after 2006 was reversed – the proportion of expenses on machinery and equipment had decreased but the proportion of investments to buildings and constructions has increased. This is partially related to a change in the

$$y = 521.02x + 8,755.2$$
$$R^2 = 0.4053$$
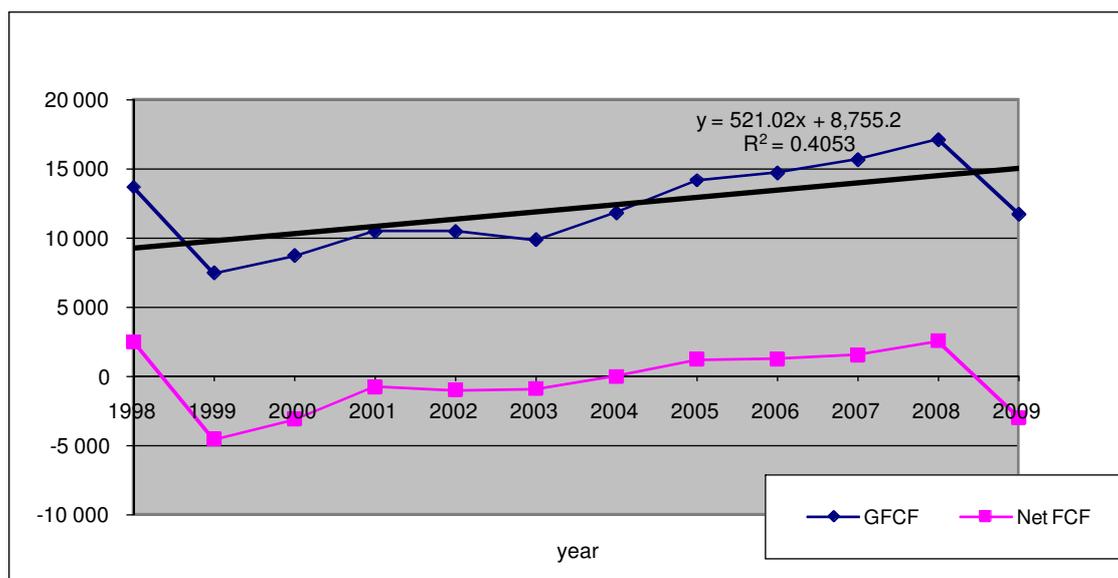
Source: ČSÚ, AAA and the author's own calculation

Chart 2: GFCF and net FCF in 1998-2009, c.p. in CZK million.

Entrepreneurial income	year	1998	1999	2000	2001	2002	2003
	c.p. in CZK million	-4,332.64	-8,080.65	-1,183.7	3,056.443	-2,643.08	-2,502
	year	2004	2005	2006	2007	2008	2009
	c.p. in CZK million	8,547.789	7,050.756	6,834.788	10,009.01	10,142.68	2,584.612

Source: ČSÚ, AAA and the author's own calculation

Table 3: Development of the entrepreneurial income in agriculture in 1998-2009, c.p. in CZK million.

Interest expense	year	1998	1999	2000	2001	2002	2003
	interest	3,648.6	3,475.0	1,762.0	1,550.6	1,505.9	1,714.9
	development in %	100	95.2	48.3	42.5	41.3	47.0
	year	2004	2005	2006	2007	2008	2009
	interest	1,388.1	1,521.6	1,567.6	1,434.0	1,443.5	1,140.8
	development in %	38.0	41.7	43.0	39.3	39.6	31.3

Source: ČSÚ, AAA and the author's own calculation

Table 4: Development of interest expense in 1998-2009, c.p. in CZK million.

Interest expense	year	1998	1999	2000	2001	2002	2003
	interest	3,648.6	3,475.0	1,762.0	1,550.6	1,505.9	1,714.9
	development in %	100	95.2	48.3	42.5	41.3	47.0
	year	2004	2005	2006	2007	2008	2009
	interest	1,388.1	1,521.6	1,567.6	1,434.0	1,443.5	1,140.8
	development in %	38.0	41.7	43.0	39.3	39.6	31.3

Source: ČSÚ, AAA and the author's own calculation

Table 5: Development of investment subsidies to agriculture in 1998-2009, c.p. in CZK million.

| The proportion of investment subsidies	year	1 998	1 999	2 000	2 001	2 002	2 003
	%	18.32	6.21	12.24	13.7	13.7	13.66
	year	2 004	2 005	2 006	2 007	2 008	2 009
	%	16.01	7.08	5.85	5.73	8.22	12.85

Source: drawn up by the author according to the ČSÚ, AAA

Table 6: The proportion of investment subsidies to the value of the FC consumption in agriculture in 1998-2009.

| year/indicator	GFCF of agricultural products	Out of which plantings	Out of which animals	GFCF of non-agricultural products	Out of which machinery and equipment	Out of which buildings	Out of which other GFCF	Net FC formation
1998	16.96	1,26	15,71	84.5	35,5	48,9	0	18,28
1999	29.48	2,01	27,46	69.6	27,6	41,9	0,1	-61,75
2000	24.62	1,09	23,53	75.4	39,2	36,1	0,1	-36,1
2001	24.57	1,09	23,49	76.4	40	36,1	0,2	-7,57
2002	24.95	1,01	23,94	76.0	48,9	26,9	0,2	-9,68
2003	28.27	1,15	27,12	68.9	34,5	34,3	0,1	-9,74
2004	23.89	1,5	22,39	75.0	59,3	15,5	0,1	-0,05
2005	31.28	1,21	30,07	66.7	48,2	18,4	0,1	8,32
2006	29.34	1,33	28,01	66.8	49	17,7	0,1	8,25
2007	26.43	1,1	25,33	84.5	35,5	48,9	0	9,59
2008	18.61	1,26	17,36	69.6	27,6	41,9	0,1	14,62
2009	24.28	1,69	22,59	75.4	39,2	36,1	0,1	-25,66

Source: drawn up by the author according to the ČSÚ, AAA, Note: Total GFCF = 100 %

Table 7: Material structure of GFCF in agriculture in 1998-2009, in % out of the current prices.
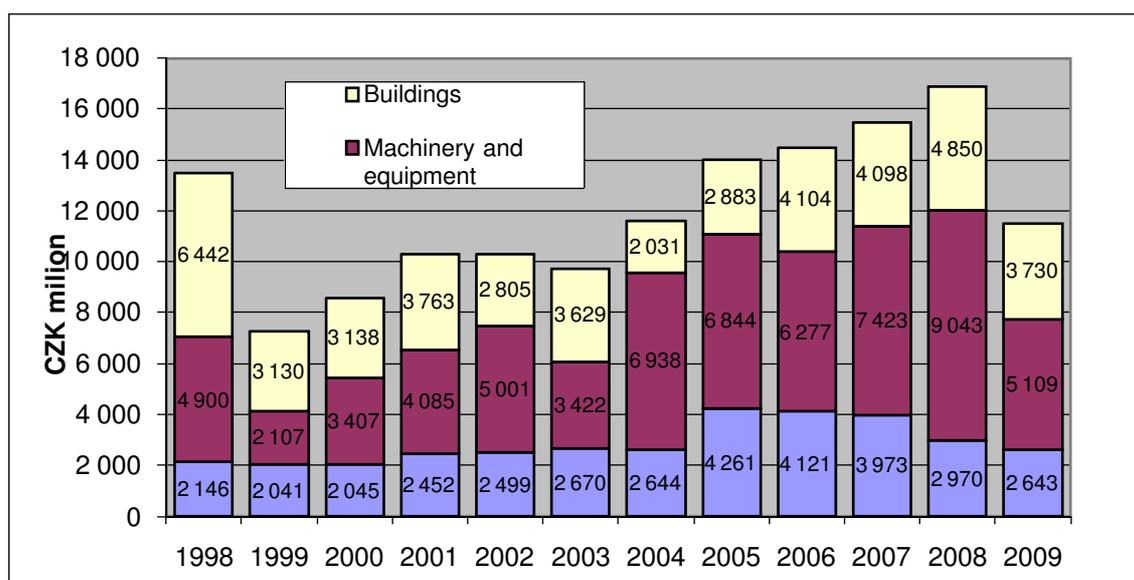
Source: drawn up by the author according to the ČSÚ, AAA

Chart 3: Focus of investments in agriculture in 1998-2009, in CZK million.
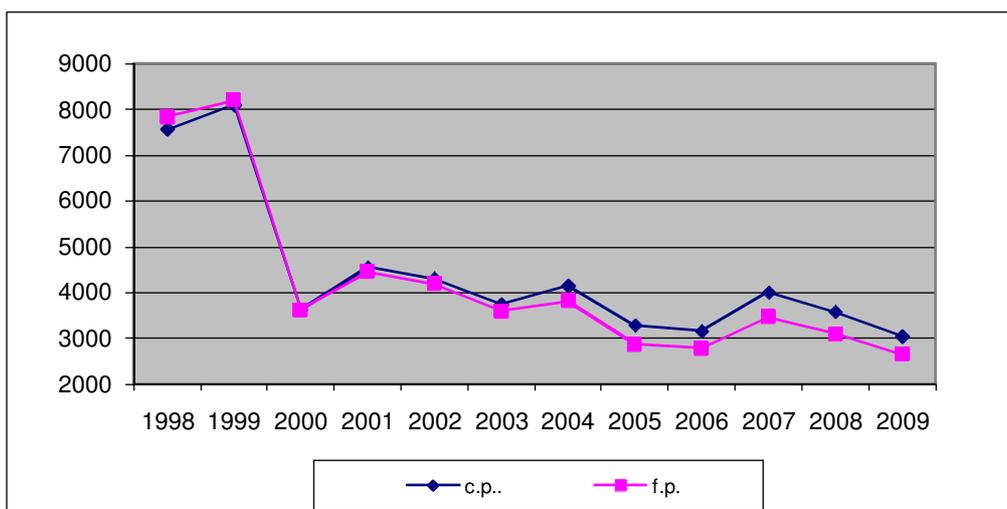
Source: drawn up by the author according to the ČSÚ, AAA

Chart 4: Development of the costs of maintenance and repairs of machinery in agriculture in 1998-2009, in CZK million.
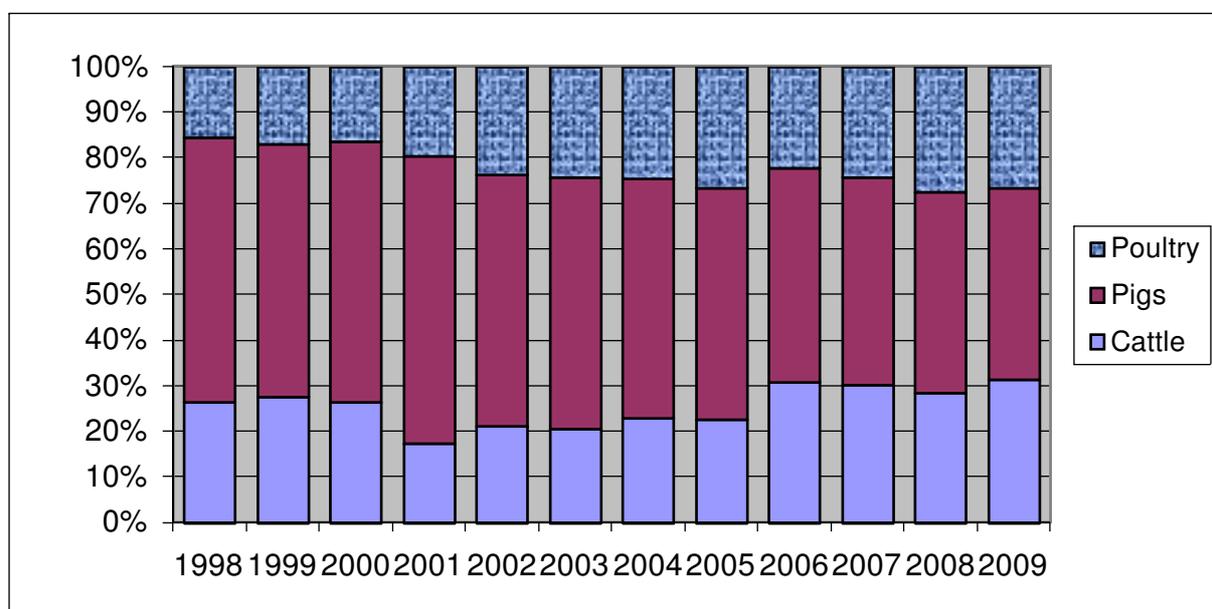
Source: drawn up by the author according to the ČSÚ, AAA

Chart 5: Development of the structure of animal production in 1998 – 2009, in %.

GFCF -animals /production of animals ratio	1998	1999	2000	2001	2002	2003
	0.070	0.078	0.072	0.077	0.096	0.110
	2004	2005	2006	2007	2008	2009
	0.102	0.175	0.160	0.154	0.110	0.111

Source: drawn up by the author according to the ČSÚ, AAA

Table 8: Requirements of animal production for investments on animals in 1998-2009, in CZK.

orientation of the policy of subsidies since 2007, when the Rural Development Programme funded from the EAFRD3 started to contribute to the financing.

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[3]Axis I, Priority 1.1. Modernization, innovation and quality

The absolute values of all three important components of GFCF are very volatile. The volatility rate may be expressed by r^2 coefficient. The value of buildings and constructions was the most volatile of all, hence the development tendency is not pronounced – r^2 nearly equals to 0.

This may be explained by the nature of these investments - their preparation is more time-consuming, financially demanding, they are acquired for a longer period of time, and so they require the market development to be known in a perspective which is longer than the other types that are being compared here. The growing tendency is shown for machinery and equipment (the average annual growth is 394.58, $r^2 = 0.5114$), which is given by the pressing need to substitute human labour, save the costs of energy and the costs of repairs and maintenance. The volume of these investments was increasing especially in 2004-2008. Considerable changes were introduced in this area, i.e. availability of assets in enterprises, as regards efficiency and labour productivity. The influence on operational costs is shown in Chart 4.

In GFCF - agricultural products, investment expenditures on animals prevailed. The absolute value of investments on animals showed growth during the whole period - the average annual growth in the whole period was 143.1, $r^2 = 0.414$. A significant change in the gradual growth occurred in 2005 when - compared to the previous year - the value increased to 198 % to be decreased down to 123 % subsequently in 2009. The investing on animals is accompanied with a decrease in the animal production caused by declining inventory of animals and a change in the structure of the inventory, which is indirectly expressed in AAA by the production of animals in c.p. and its structure - the value of the production of animals in 2009 represents only 77.8 % of the value of 1998 (i.e. the decrease is approximately from CZK 30,609 million mil. to CZK 23,804 million), while the most significant change has been recorded as regards pig breeding the production of which dropped down to 55.8 % of the value of 1998.

As a result of the growth of investments on animals and the decreasing production, the requirements of the production for these investments were increasing (i.e. the production efficiency was decreasing) - see Table 7. At the beginning of the period, every CZK 1 of the production received CZK 0.07 of investments, however at the end of the period it was already CZK 0.11.

After 2007, investments creating conditions for meeting of applicable EU regulations and standards are supported in the animal farming sector to improve the quality of production, eliminate negative impacts on the environment, and improve animals' welfare and health. Further increase in the costs of animal farming may be expected because this support is not intended to increase the production

Conclusion

The evaluated period is quite long, affected with a number of changes in the economic policy of the state on the national economy level and especially on the level of agriculture. Farming enterprises were adapting to the changes in the business environment during the whole studied period also in the area of investments on tangible and intangible fixed assets.

The increasing investment activity in 1998-2009 may be explained by positive expectations of farmers (the necessity and will to invest with respect to) in connection with preparations for the accession to EU and the accession to EU itself, improved profit/loss formation (i.e. the entrepreneurial income in this study) - especially by means of enhanced incomes of farmers resulting from increased subsidies – in other words non-investment subsidies contributing to the funds covering operational costs of farming enterprises, enabling to create profit (single area direct payments – SAPS and complementary national direct payments – CNDP, TOP-UP), and partially also by assistance to credit applications and obtaining. The development of investments, the structure of investments and its changes are always influenced by a number of factors concurrently. On one side, the structure of investments reflects the structure of assets from the previous period (when production is to continue, worn assets need to be renewed). On the other side, it also reflects changes in the orientation of production or the scope of production or production processes (technologies), but also changes caused by technical progress in the production of machinery and equipments and the construction production. Last but not least the development of the investment structure is influenced by the development of prices of individual types of assets. On the supra-enterprise level of the study, the effects of these factors are difficult to be documented because the incompleteness and inconsistency of statistical surveys, data aggregation or changes in methodologies prevent this. The studying of outputs of the agricultural sector by means of the AAA

method application enables to consider investment activities only in a partial manner through a limited number of indicators and also to consider only a limited number of influencing factors.

The executed analysis of investment activities enabled to acquire the following knowledge:

i) GFCF, representing the result of investing and the aggregate of all sources used to acquire assets, was increasing;

ii) Development of the final production was acting in favour of GFCF, specifically by the slight increase of the production in f.p. (it shows the implemented quantity), and by a slight increase in the current prices of production;

iii) The growth of intermediate consumption, i.e. inputs purchased from other sectors of the economy, had a negative impact; the negative impact of the price factor (growing current prices) is prevailing because the intermediate consumption in fixed prices was stagnating;

iv) Net FCF was improving but its level did not manage to cover the simple reproduction of the value of tangible and intangible fixed assets;

v) GVA was decreasing and because of the growing value of depreciations NVA was decreasing; the amount of NVA and its development suggest that the agricultural production itself did not generate any profit; the positive entrepreneurial income reported in the 7 years was created thanks to production subsidies;

vi) Investment subsidies were not a stable source; their importance in GFCF dropped considerably in 2005-2008;

vii) Requirements for investments in agriculture were generally increasing;

viii) AAA does not monitor assets (property), so it is not possible to know the pace of reproduction of the fixed items of assets;

ix) The methodology applied by AAA uses the term ´entrepreneurial income´ to define profit/loss and it is shown as a gross value before the income tax and it is not known how it is divided among owners, an enterprise, the state and other entities; accumulation may not be expressed.

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