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Analysis of some important cost factor of poultry meat production

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SUMMARY

Cost efficiency is one of the most important influencing factors of competitiveness in poultry business because the international price competition of poultry meat products is getting tightly year by year. This study would like to open up some property of the cost structure of chicken meat production, and try to draw up some interesting analysis about the correlation of the different cost factors of poultry meat producing. The starting point of the study is the vertically integrated poultry chain where different supply chain elements working together. The analysed supply chain elements are the chicken growing *(broiler growing)* and the chicken slaughtering *(producing fresh chicken meat products)*. The study analysing the cost structure of these activities and – using the sales price level of live birds and chicken meat products – also the profitability of them. From the correlation analysis of different cost factors other conclusions can be drawn up related to the cost management of chicken growing and slaughtering, which could be helpful for players operating in poultry industry.
Keywords: poultry industry, cost efficiency, cost structure, correlation analysis, vertical integration, profitability.

INTRODUCTION AND SOURCES OF INFORMATION

The examinations related to the operation system and the middle- and long term competitiveness of market players operating as a part of the Hungarian poultry sector become so timely in the last couple of years which were so recessive from the aspect of poultry sector. The future of the Hungarian poultry industry – which count so important in the Central and Eastern European region – is primarily depend on that the sector will be able to pull trough this crisis situation, and with improvement it's efficiency will be able to remain in the competitive environment of the European Union.

One of the most important factors of competitiveness of the poultry sector is cost efficiency, because the international price competition of poultry meat products is mostly depend on the final cost price of the products. The available sales price on the international market of poultry meat products is depend on the price level of the most efficient poultry producer regions like Brazil or the United States, so the players of the Hungarian poultry chain has to reduce their costs if they would like to sell their products also on the internal and the external market of the European Union (*Zoltán* 2004).

The study would like to open up the present cost structure of some elements of the Hungarian poultry chain, and also make a correlation analysis of some cost factors which could help to find the cost elements which influencing the final cost price of poultry meat products. The results of the analysis give the possibility to the players of the sector to find the point where they should meddle to reduce their costs of production.

The data and information used for the detailed examinations been collected from the *Hungarian Poultry Product Council,* from the *Agricultural Research Institute of Hungary,* from the A.V.E.C. and FAO.

Methods and the steps of the analysis

The first step of the analysis was to draw up the system of the poultry chain, which could help to define the supply chain elements which are important from the aspect of cost structure analysis. The poultry industry operating in vertically integrated supply chain in all over the world. The system of this vertical structure had been drawn up in the study on the grounds of the studies of different Hungarian and foreign authors (e.g. *Nábrádi* and *Fáklya* 1997, *Aho* 1999, *Martinez* 1999, *Lakner* and *Hajdú* 2002).

The model is made by a flow sheet by right of the logical attachment of each supply chain elements. After drawing up the whole supply chain two elements of that had been determinated as the territory of cost analysis. These elements are the followings: (1) poultry growing *(broiler growing for slaughtering)*, (2) poultry slaughtering *(producing fresh poultry meat – whole chicken, chicken leg and chicken breast fillet).* The mentioned supply chain elements, and the mentioned products are the most representative activities and products of poultry chicken meat industry so analysing their cost situation gives the possibility to formulate conclusions for the cost situation of the whole sector (*Clement* 1998).

The second step of the analysis was to draw up the cost structure of the selected supply chain elements. For the calculations a database *(Table 1.)* had been set up which contains (from April 2002 until November 2005) the main cost variables of chicken growing and slaughtering. The database also contains the sales prices of live birds and different fresh chicken meat products *(whole chicken, chicken leg and chicken breast fillet)*. The analysis based on the individual cost structure examination of the selected activities.

Table 1. The main structure of database used for the calculations

	Denomination	Marking	Formula
Data of poultry growing	Cost of day-old-chicks (Ft/kg)	TK_1	–
	Feed costs (Ft/kg)	TK_2	–
	Energy costs (Ft/kg)	TK_3	–
	Costs of other materials (Ft/kg)	TK_4	–
	Staff costs (Ft/kg)	TK_5	–
	Other costs (Ft/kg)	TK_6	–
	Cost price of broiler chicks (Ft/kg)	TÖ	$TÖ = \sum TK_1 – TK_6$
	Price of live birds (Ft/kg live weight)	TÁ	–
	Margin realized by the grower (Ft/kg)	TF	$TF = TÁ – (\sum TK_1 – TK_4)$
	Profit realized by the grower (Ft/kg)	TE	$TE = TÁ – TÖ$
Data of poultry slaughtering	Cost of live birds for slaughtering (Ft/kg)	FK_1	$FK_1 = FK_0 + FK_{00}$
	Energy costs (Ft/kg)	FK_2	–
	Packaging costs (Ft/kg)	FK_3	–
	Costs of other materials (Ft/kg)	FK_4	–
	Staff costs (Ft/kg)	FK_5	–
	Cost of storeaging (Ft/kg)	FK_6	–
	Other costs (Ft/kg)	FK_7	–
	Cost price of final product (Ft/kg)	FÖ	$FÖ = \sum FK_1 – FK_7$
	Price of final product (Ft/kg)	FÁ	–
	Margin realized by the processor (Ft/kg)	FF	$FF = FÁ – (\sum FK_1 – FK_4)$
	Profit realized by the processor (Ft/kg)	FE	$FE = FÁ – FÖ$
Sales prices	Sales price of chicken leg (Ft/kg)	$KÁ_{leg}$	–
	Sales price of chicken breast (Ft/kg)	$KÁ_{breast}$	–
	Sales price of whole chicken (Ft/kg)	$KÁ_{chicken}$	–

Source: author's illustration (2006)

By right of the calculations the study determines the profit production ability of the selected supply chain elements. The profit calculation of slaughtering is made for the three different chicken meat products. The calculations made by right of the following formula:

Profitability = Available sales price of final product – Cost price of final product

Next to the cost structure and profit calculations, as the third step of the analysis the study also made a correlation analysis of the cost variables of the supply chain.

In the course of these calculations each cost variables was evaluated as how do they correlate with the cost price of the final product of the selected supply chain elements. On the grounds of the above mentioned things the correlation between the certain cost variables of the supply chain and the cost prices of the final product *(correlation coefficient)* is written down by the following formula:

$$r = \frac{\sum (x_i - x_{avg.}) \cdot (y_i - y_{avg.})}{\sqrt{\sum (x_i - x_{avg.})^2 \cdot \sum (y_i - y_{avg.})^2}}$$

where r = correlation coefficient, x_i = each cost variable, $x_{avg.}$ = average of cost variables, y_i = cost price of the product, $y_{avg.}$ = average of cost prices

The data collected in the database *(Table 1.)* came from the *Hungarian Poultry Product Council,* from the *Agricultural Research Institute of Hungary* (2004–2005), from the online database system of *FAO* (2004), and from the yearly periodicals of *A.V.E.C. (Association of Poultry Processors and Poultry Import and Export Trade in the European Union,* 2003–2005*).*

Results

The first target of the study was to draw up the supply chain of poultry meat producing, and to determine the most important supply chain elements which will be in the focus of the cost structure analysis. The whole integrated system of chicken meat production can be seen on *Figure 1.*

Of course the whole integrated poultry chain is much more complicated than the simplified one which is in the focus of the cost structure analysis, but it is enough to analyse the two main supply chain elements *(poultry growing – poultry slaughtering),* and the consumer prices of their products.

The costs of other supply chain elements *(e.g. feed processing, hatcheries, grandparent stock breeding, parent stock breeding, etc.)* are adding up the costs of growing and slaughtering so the analysis will show them as a part of this two supply chain elements.

The second target of the study was to draw up the cost structure of chicken growing and processing. The results *(Table 2.)* are based on the grounds of different data sources but the main structure is the same.

As it can be seen from the data of *Table 2.,* the cost situation of both activities are orientated by raw material costs. These kind of costs in the case of chicken growing come to more than 90% of total cost price, and in the case of chicken slaughtering come to more than 70% of total cost price. Between the costs of chicken growing the feed costs and the cost of day-old-chicks come to the 81% of the total cost price of the final product. In the activity of slaughtering the costs of live birds count more than 57% of the total costs, which means that the efficiency of growing, and the price of live birds really influencing the cost effectiveness of slaughtering.

Figure 1. General activity structure of the integrated poultry chain

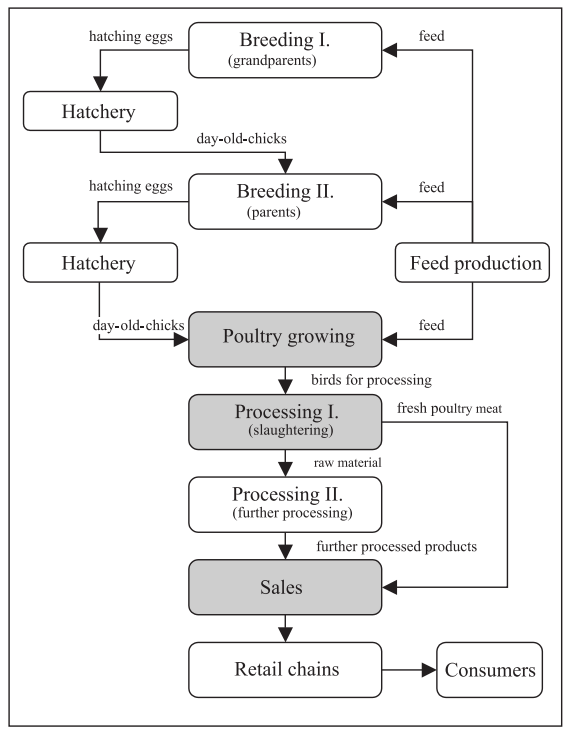


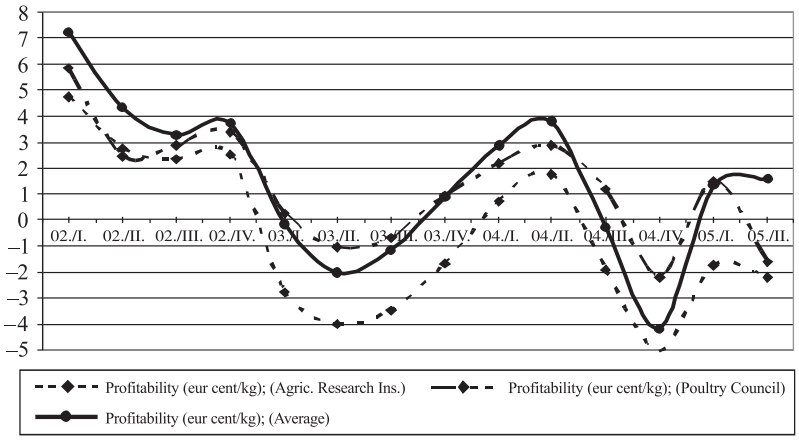
Table 2. Cost structure of chicken growing and slaughtering

Chicken growing		**Chicken slaughtering**	
Denomination	**Ratio** (%)	**Denomination**	**Ratio** (%)
Costs of day-old-chicks	18.68	Costs of live birds	57.76
Feed costs	63.09	Energy costs	1.85
Energy costs	5.63	Costs of packaging materials	4.25
Costs of other materials	3.29	Costs of other materials	4.00
Staff costs	5.95	Staff costs	17.64
Other costs	3.35	Other costs	14.49
Total costs	100.00	Total costs	100.00

Source: *Hungarian Poultry Product Council, Agricultural Research Institute of Hungary* A.V.E.C. (2004)

The profitability of chicken growing is tendentially decreasing in the last couple of years in Hungary. Analysing the data of the database *(Table 2.)* we artlessly certify this statement, which can bee seen on *Figure 2.* The profitability of chicken growing is getting less and in some periods of the analysed term it was a loss-maker activity in Hungary.

Figure 2. Profitability of chicken growing by different data sources

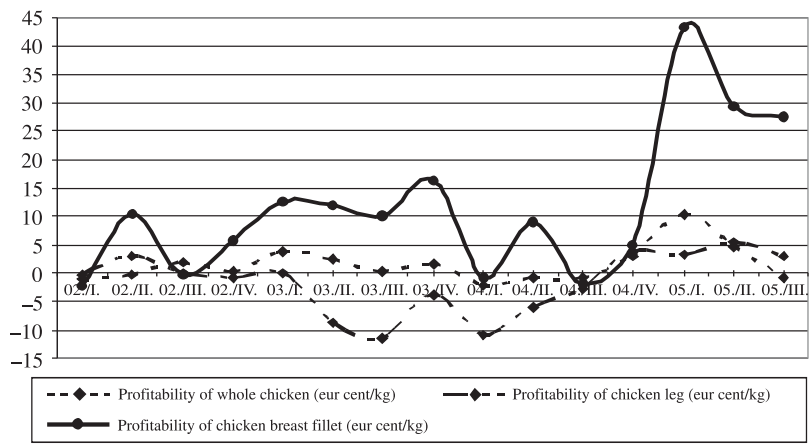


Source: *Hungarian Poultry Product Council, Agricultural Research Institute of Hungary* (2004)

The profitability of chicken slaughtering is also not the best in the last couple of years *(Figure 3.)*.

The results can bee seen on *Figure 3.* shows that the profitability of chicken meat products is unbalanced in the analysed period. Only the chicken breast fillet production has an increasing profitability.

Figure 3. Profitability of chicken slaughtering (different products)



Source: *Hungarian Poultry Product Council, Agricultural Research Institute of Hungary* (2004)

As the third step of the analysis the study made a correlation analysis of the cost variables of selected supply chain elements. In the course of these calculations each cost variables was evaluated as how do they correlate with the cost price of the final product of each supply chain elements.

In the cost variables influencing the cost price of chicken growing (y) the cost of day-old-chicks (x_1), the feed costs (x_2), the energy costs (x_3), the staff costs (x_4), and the feed conversion (x_5) been analysed. The results can bee seen on *Table 3.*

Table 3. The correlation coefficients of cost factors influencing the cost price of live birds

	y	**x_1**	**x_2**	**x_3**	**x_4**	**x_5**
y	1	0.408	0.769	0.480	0.220	0.676
x_1		1	–	0.158	0.137	0.198
x_2			1	0.256	0.029	0.167
x_3				1	–	0.178
x_4					1	0.267
x_5						1

Source: author's calculation

By right of the results the most influential cost factors are the cost of feed and the feed conversion. After them the cost of day-old-chicks and the energy cost are the following most influential factors. By right of the calculations it is easy to diagnose that the factors influencing the cost price of chicken growing are mostly suggestible with technological discipline because the growers can not influence the price of feed products.

The correlation analysis of the slaughtering activity made for the three main product of chicken processing so the study analysed the correlation of cost factors in the aspect of whole chicken, chicken leg, and chicken breast fillet.

In the cost factors influencing the cost price of whole chicken (y) the cost of live birds (x_1), the energy costs (x_2), the cost of packaging materials (x_3), the staff costs (x_4), and the slaughtering yield of whole chicken (x_5) been analysed. The results can bee seen on *Table 4.*

Table 4. The correlation coefficients of cost factors influencing the cost price of whole chicken

	y	**x_1**	**x_2**	**x_3**	**x_4**	**x_5**
y	1	0.726	0.273	0.277	0.262	0.632
x_1		1	0.105	–	–	0.603
x_2			1	0.336	–	0.112
x_3				1	0.133	0.044
x_4					1	0.285
x_5						1

Source: author's calculation

By right of the results the most influential cost factors are the cost of live birds and the slaughtering yield. Other cost variables do not show strong correlation. Only the correlation between the yield and the cost of live birds (0.603) seems to be interesting which means that the better yield bring on lower live bird costs from the aspect of one kilogram final product.

In the cost variables influencing the cost price of chicken leg (y) the cost of live birds (x_1), the energy costs (x_2), the cost of packaging materials (x_3), the staff costs (x_4), and the slaughtering yield of chicken leg (x_5) been analysed. The results can bee seen on *Table 5*.
By right of the results the most influential cost factors are the cost of live birds and the slaughtering yield. Other cost variables do not show strong correlation.

Table 5. The correlation coefficients of cost factors influencing the cost price of chicken leg

	y	**x_1**	**x_2**	**x_3**	**x_4**	**x_5**
y	1	0.612	0.162	0.224	0.050	0.401
x_1		1	–	–	–	0.461
x_2			1	0.307	–	0.307
x_3				1	–	0.023
x_4					1	–
x_5						1

Source: author's calculation

In the cost factors influencing the cost price of chicken breast fillet (y) cost of live birds (x_1), the energy costs (x_2), the cost of packaging materials (x_3), the staff costs (x_4), and the slaughtering yield of chicken breast fillet (x_5) been analysed. The results can bee seen on *Table 6*.

Table 6. The correlation coefficients of cost factors influencing the cost price of chicken breast fillet

	y	**x_1**	**x_2**	**x_3**	**x_4**	**x_5**
y	1	0.857	0.091	0.454	0.162	0.624
x_1		1	–0.170	–	–	–
x_2			1	–	0.045	0.016
x_3				1	–	–
x_4					1	–
x_5						1

Source: author's calculation

By right of the results the most influential cost factors are the cost of live birds and the slaughtering yield. The correlation between the cost price of chicken breast fillet and the cost of packaging materials seems to be also strong, which means that this product is mostly sold in packaged form, and the packaging materials are relatively expensive.

Conclusions

One of the main conclusions of the study is that the cost structure of the poultry industry – which is operating in a vertically integrated structure in all over the world – is absolutely orientated by raw material costs. The cost effectiveness is one of the most important factor of competitiveness in poultry business, because the price competition between different poultry producer countries and regions is getting tightly year by year. The requirements of cost effectiveness come up in several supply chain elements of poultry sector but from the aspect of decreasing costs, the most important activities are poultry growing and slaughtering.

By right of the cost structure analysis, the costs of these two supply chain elements are also orientated by the raw material costs. In poultry growing the most influential factors are the feed costs and the feed conversion, which was also confirmed by the correlation analysis of the cost variables of chicken growing.

The players working in chicken growing has to continually analyse their feed costs, but they have only the possibility to control the technological parameters of feed conversion because the price of feed is mostly by the feed producers.

If a vertically integrated poultry company owns the poultry growing and also the feed producing activity of the supply chain it has the possibility of decision on the feed prices, so it can harmonise the profitability between poultry growing and feed processing. The profitability of chicken growing in Hungary is getting worse in the analysed term, and in some periods it was a loss maker activity.

The cost structure analysis of chicken slaughtering shows that the main cost element of the activity is the cost of live birds. That means that the costs of poultry growing are straight infiltrate into the costs of slaughtering. The second biggest influencing factor is the slaughtering yield of the different meat products which is not a clear and countable cost element, but an important technological factor which has high influence on cost price. The profitability of this activity *(producing fresh chicken meat products – whole chicken, chicken leg, chicken breast fillet)* is so unbalanced in the analysed period.

On the whole the analysed supply chain elements of the poultry sector are really sensible for the level of raw material costs and they have an other special property. These two supply chain elements are hanging together from the aspect of cost efficiency, because the main costs of growing are straight infiltrate into the costs of slaughtering. Considering the cost structure analysis it is easy to declare that in a vertically integrated poultry company *(which owns the poultry growing and also the slaughtering)* the profitability of slaughtering is mostly depend on the cost efficiency of poultry growing. That is the reason why players who working as a part of the integrated poultry industry has to always analyse the cost situation of all the supply chain elements because most of them are in a tight relationship with profitability of the whole sector.

A baromfihús-előállítás néhány fontosabb költségváltozójának elemzése

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Összefoglalás

A baromfiiparban a versenyképesség egyik legfontosabb befolyásoló tényezője a költséghatékonyság, hiszen a baromfihústermékek közötti nemzetközi árverseny évről évre egyre erősebb. Jelen tanulmány a csirkehús-előállítás költségszerkezetének néhány részletét kívánja feltárni, és egyben igyekszik felvázolni a baromfihús-előállítás különböző költségváltozóinak összefüggéseivel kapcsolatos elemzéseket is. A tanulmány kiindulópontja a vertikálisan integrált baromfi termékpálya, amelyben számos termékpálya-elem működik együtt. Az elemzésre került termékpálya-elemek a vágócsirke-előállítás és a csirkefeldolgozás. A tanulmány e tevékenységek költségszerkezetét vizsgálja és a vágócsirke, valamint a friss baromfitermékek értékesítési árszínvonalának felhasználásával bemutatja eredménytermelő képességüket is. Az egyes költségváltozók korrelációs elemzése révén több olyan következtetés is levonható, amely kapcsolódik a vágócsirke-előállítás és a csirkefeldolgozás költséggazdálkodási kérdéseihez, és hasznos lehet a baromfiiparban tevékenykedők számára.

Kulcsszavak: baromfiipar, költséghatékonyság, költségszerkezet, korrelációs elemzés, vertikális integráció, eredménytermelő képesség.

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