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Ph.D. thesis

MODELLING AND ECONOMIC ANALYSING THE BROILER PRODUCT CHAIN BASED ON AN INTEGRATION OPERATING IN THE NORTH GREAT PLAIN REGION

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1. THE OBJECTIVES OF THE RESEARCH

Changes of the economic and market environments as well as the more and more strengthening marketing competition make the investigation of economic factors influencing the competitiveness of the Hungarian poultry sector especially of the broiler sector important and necessary both in a farm level and extended to the whole product chain. Furthermore, it is essential to reveal the product chain connections and to introduce the value generation and partial markets continuously. In association with these, the **general objectives** of my research are the followings:

1. Determining the economic and technological factors influencing the profitability of the broiler product chain.
2. Investigating the inner connections of the product chain and the process of value generation.
3. Evaluating the efficiency and the competitiveness of the poultry produst chain, focusing on the broiler product chain in case of capital uniformity, and in a product chain operating without capital uniformity.

My hypotheses are:

- Considering the present economic conditions, the broiler sector may operate in case of a product chain with capital uniformity in the more effective way.
- The technological factors have essential significance in influencing the profitability of the product chain.

Tasks attached to the objectives are:

1. Working out a simulation model of the broiler product chain, which makes carrying out analysis on product chain level possible.
2. Investigating cost and profit relations in the certain product chain phases.
3. Constructing the Balance of Enterprise Connections (output-input model) relating to the broiler product chain.
4. Economic analyzing the whole product chain.
5. Carrying out sensitivity examination of factors determining the profitability of the product chain.
6. Carrying out value chain analysis of the product chain.
7. Determining the value of the fixed assets in the product chain.
8. Defining the significance of the product chain in case of capital uniformity.

2. PRELIMINARIES AND THE UTILIZED METHODS

2.1. Defining the Research Work

On the basis of geographical extension, the research has regional feature, as according to my objectives, I used the database of an enterprise group located in the North Great Plain Region, and on the other hand I utilized national data for constructing and testing the model. Regarding the special field, the thesis deals with the economic issues of animal husbandry emphasizing on the poultry industry, in a narrower meaning it concentrates on the broiler product chain. Both literature and statistical databases supported my dissertation work. The international databases (such as FAO, EUROSTAT, USDA) helped in introducing the international situation and the future tendency of the poultry industry in the chapter of reviewing literature. The data from national databases (Hungarian Central Statistical Office, Agricultural Economics Research Institute, Poultry Product Council) were used in the chapter of literature review as well as during own investigations. Besides secondary data gathering, I carried out even primary data gathering. The enterprise group provided me farm-level data. For analyzing the whole product chain, only partial pieces of information were available at the national level. Neither the Hungarian Central Statistical Office, nor the Agricultural Economics Research Institute nor the Poultry Product Council gather and publicize data expressing partial natural efficiency and economic relations in connection with feed production, rearing parent stock, hatching egg production and hatching, thus when analyzing certain fields I could not use representative data at the national level. From the other aspect, only a few enterprise groups are suitable for the examination of the practical realization and operation of the whole broiler product chain (from feed production through rearing parent stock till processing) operating in a closed way (in case of capital uniformity). One of them operates in the North Great Plain Region. This vertical integration provides 15% of the national chicken meat production and processing, which proves its marketing significance and its role in the region. Regarding the temporal extension the dissertation contains the work (reviewing the literature, data gathering, processing, modeling, evaluating) carried out in the period between 2005 and 2008. With respect to the relevance of the gain results, it includes the average marketing prices of the year 2007. Besides, the investigations deal with even the economic conditions of the beginning of 2007 and 2008, which aims at examining the effects of the latest changes on the product chain.

2.2. The Structure, Operation and General Aspects of the Simulation Model

I worked out a model for examining the chicken meat production at the product chain level, which is symbolic structured and expresses the characteristics of the reality by mathematic and logical notations. According to the solving method of the models, it belongs to the analytical models as it contains concrete production and cost functions as well as input-output analysis. As during modeling, I neglected the sudden effects, and the correlations are unambiguously expressed, it may be considered as a deterministic model, which is characterized by the fact that the results may be unequivocally deduced from the input data. Regarding that it is a model for animal husbandry, I handled the stock change in a dynamic way according to simulation models. For constructing the model, different exogenous (input; independent) variables were used, which can be divided into two main groups, such as technological and economic parameters. The technological parameters include variables expressing the farm sizes of certain product chain phases as well as the natural efficiency indicators of the production. The economic parameters involve the output and input prices of the production, where the average prices of 2007 are the basic values. The determination of the basic values and the constant parameters of the model were carried out by different statistical methods (such as descriptive statistics, time series analysis, trend calculation) – according to the results of MÉSZÁROS (2006) – and by „apriori" hypothesis on the basis of expert appraisal. Similar to the simulation model done by SZÉKELY (1978) to hog farms, the output tables containing the endogen (output; dependent) variables of the simulation model introduced in the dissertation were constructed according to the aim of the economic analysis. These tables include production cost, production value (gross production value, added value), profit and profitability indicators of the certain product chain phases. The model contains costs in cost-element structure and in the form of overhead and direct cost separated on the basis of calculability. Furthermore, different profit categories (net profit, gross value[I]) and prime cost were determined. The output-input model adapted to the product chain, aggregating tables containing cumulative and non-cumulative costs and model parts necessary for carrying out the sensitivity analysis was constructed as an output table.

[I] Gross production value – direct costs

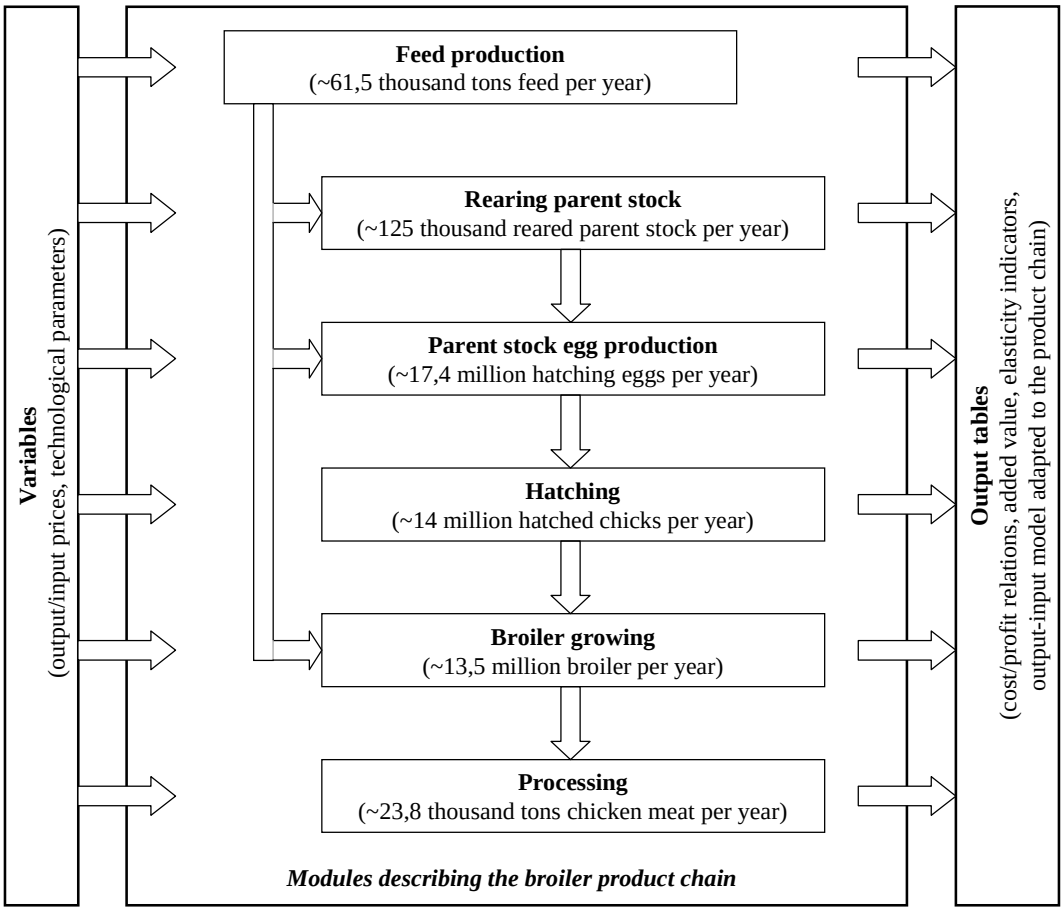


Figure 1.: **The Simulation Model of the Broiler Product Chain**

Source: Own construction

The structure of the simulation model of the broiler product chain is illustrated in Figure 1. The figure contains the certain product chain phases and in connection with this the natural outputs expressing the size of the whole product chain. During sizing the model I strove to satisfy the harmony of phases joining each other from both professional (production organization) and economic (size economy) aspects. According to my objective, I worked out a model, which is able to handle vertical integration with capital uniformity[I] operation and without capital uniformity[II] operation, as I could analyze the difference between the two varieties on same database only in this way. Sizing the processing firm had a clue significance, which was built in the model, on the basis of the integration operating in the region, by a nominal capacity of 6000 chicks per hour, 6 labour days a week and 8-hour-shift. All these make cutting near 14 million broiler

[I] The whole product chain belongs to one owner or owner-group, and the value-transmit between the enterprises happens on an inner calculating price.
[II] Every phase of the product chain is handled as a separate enterprise, and value transmit happens on marketing price.

and by this producing 23,8 thousand tons chicken meat[I] possible projected to one shift. Comparing this capacity at domestic and international levels, it turns out that while it is one of the biggest and most up-to-date firms in Hungary, it means only 30 to 50% of the capacity of firms in Western Europe. Starting from this I constructed the previous phases of the product chain, setting the aim that a processing capacity of over 90% is achieved continuously during the whole year by the necessary broiler raw material. If the chain is examined in the phases of the product chain it can be determined that 13,5 million broiler is necessary in order to provide the firm with raw material. To produce this, supposing 6,5 rotations according to the 6+2 weeks production system, a poultry house of 126 thousand m^2 is necessary. In order to realize the continuous growing settling near 14 million day-old chicks in a year is required and for this approximately 17,4 million hatching eggs are needed regarding the hatching indicators. The production of hatching eggs may be satisfied by settling 125 thousand parent stock in four farms of 6 000 m^2 to which a rearing phases is connected naturally. This requires importing and settling 134 thousand day-old parent stock, which may be carried out in two farms having a poultry house of 4 000 m^2 in two turns yearly. In order to satisfy the feed requirement of the three phases of the product chain (rearing parent stock, egg production and growing) in adequate quantity and quality (this last one is highlighted), a feed mixing firm capable of producing 61 to 62 tons feed (projected to three shifts) are essential. All in all, data in Figure 1 and deduced previously give the farm size and frames of the simulation model done for the research work, which were handled as fixed parameters when determining fixed costs. Naturally, the model handles the outputs of the phases building on each other in a flexible way according to the change of certain input parameters, which in this context model the utilization of the farm capacity in a dynamic way as well.

When constructing the model, it was a general condition that the revenue and the variable costs should be determined from the natural data gathered during data gathering and gained from the result of operating the model, and titles considered as fixed should be gathered, processed and built in value and as costs regarding scaling. The so-called system theory played a role when building the model (CSÁKI-MÉSZÁROS 1981; MÉSZÁROS 2006), that is the partial models of the certain product chain phases join

[I] Products after cutting and chopping. Modeling disregards further processing.

each other in a direct or in an indirect way, in one or more joining places, thus the model describing the whole broiler product chain is a coherent and dynamic system.

3.4. The Used Analyzing Methods

I summarize the methods used during the research work in Table 1, detailing the reasons and fields of their utilization.

Table 1.: **Summarizing the Used Methods**

Method	Reason / Field
Data gathering	Gathering the necessary secondary and primary data for carrying out the research work.
Reviewing the relevant literature	Introducing and evaluating the situation of the industry based on secondary data gathering.
Descriptive statistical methods	Processing secondary data during reviewing literature as well as primary data necessary for building the simulation model (determining variables and constant parameters, describing tendencies in the reality in forms of functions).
Time series analysis, trend calculation	
Building the model, modeling	Introducing the logical processes of broiler product chain building on each other, providing data for further analysis.
Cost-Benefit Analysis	Evaluating the outcome of the model from the aspects of farm business management.
Sensitivity analysis (elasticity analysis, critical value examinations, scenario analysis)	Introducing the effects of different conditions of input parameters on the result and checking the model at the same time.
Value chain analysis	Revealing the connections of product chain, introducing the processes of value generation.
Output-input model	

Source: Own construction

3. THE MAJOR FINDINGS OF THE THESIS

3.1. Modeling the Operation of the Broiler Product chain

On the basis of the data of the year 2007 of the simulation model and its results being in accordance with the general aspects, I introduced that altogether a production cost of 21,5 billion HUF (904 HUF/kg chicken meat) incur in the level of the modeled product chain, and parallel to this a production value of 22 billion HUF (925 HUF/kg) is realized. These values, however, may contain accumulations, and in order to filter these, I used the structure of output-input model in a novel approach. The output-input balance of the product chain contains the output and input of certain product chain phases that is it reflects the direct connections of the producing and utilizing product chain phases (Table 2). On this basis, I concluded that the produced mixed feed and hatching chicks are responsible for 80% of the production cost of broiler growing. Near 25% of the production cost of rearing parent stock, 73% of the cost of egg production, 75% of the cost of hatching and 60% of processing cost come from value transmit within the product chain. Only the last processing phase plays a role in the marketing outside the product chain (99%), and only the by-products of the products of the other enterprise get into markets outside the product chain. Even the fact can be determined from the output-input model that in what ratio the broiler product chain contributes to the revenue of national economic branches providing the poultry enterprise. In case of purchased inputs, producing mixed feed has determent significance (70%) through its utilization of feed raw material. The processing (67%) and broiler growing (17%) phases of the product chain have outstanding roles in direct employment. In case of material assets and required services, even these two phases are determent.

By the help of the output-input model, I constructed the non-cumulative form of the costs, production value and profit conditions of the product chain (Table 3). The production costs approaches the 9,6 billion HUF, which is 403 HUF projected to chicken meat of one kilogram. Considering the ratios, 41% of the production cost is shared by the processing phase, 40% gets to feed production, and broiler growing is responsible for near 13% of the costs. 52% of the total production cost is material cost, within which the costs of feed raw material (35,4%) and energy (9,7%) are determent, which gives 87% of the material cost.

The former incurs wholly during producing feed, the latter is influenced by growing (43%) and processing (41%). Personal cost constitutes 13,5%, required services gives 13,3% and other direct costs are responsible for 12% of the total production cost. The most determent one in the latter is processing (88%) as a result of the commercial refund[I]. Parallel to costs, production value at the level of the modeled produst chain totals up to near 10,2 billion HUF, which is 424 HUF projected to one kilogram. As a result, the net profit of the product chain is 0,5 billion HUF, which is 21 HUF projected to one kilogram chicken meat. On this basis, it may be concluded that producing chicken meat is profitable regarding the whole product chain. The profit to cost ratio[II] of the product chain is 5,3%, the profit to fixed asset ratio is 3,6%. Regarding market prices, the profit distribution within the product chain is not proportional; as a result, parent stock rearing and the broiler growing reflect deficiency. This last one worsens the benefit of the product chain to a significant degree. On the other hand, huge profit is realized during feed production and processing. On the basis of profit to cost ratio[III] hatching is outstanding showing a value exceeding 12%. Feed production (near 9%) and hatching egg production (6,6%) are significant as well. It is clear from the data that the profitability of cutting and processing activities is near the same as the profit to non-cumulative cost ratio of the whole product chain. Growing reflects a deficit of 4% profit to cost ratio. If the performance of certain enterprises is evaluated at the level of the product chain, the profit reached may be compared to the non-cumulative production costs. As a result, the profit to cost ratios are 50% and 25% for hatching and egg production, respectively. The profitability of processing (6,4%) exceeds that of the whole product chain to a small degree. The broiler growing, however, may be characterized by a deficit of near 20%.

[I] The processor has to pay different fees to the retailer (commercial chains) after the sold products.
[II] Comparing to the non-cumulated production cost incurred at the level of the product chain.
[III] Evaluating the enterprises themselves, comparing to cumulated costs.

Table 2.: **Output-Input Model of the Broiler Product Chain (2007)**

Unit: thousand HUF/year

Input enterprises / *Output enterprises*	**Feed production**	**Parent stock rearing**	**Parent stock hatching egg production**	**Hatching**	**Broiler growing**	**Processing**	**Selling**	**Other factors increasing production value**	**Total**
Feed production		58 432	283 156	-	3 805 018	-	-	-	4 146 606
Parent stock rearing	-		234 503	-	-	-	3 149	-	237 652
Parent stock hatching egg production	-	-		686 799	-	-	65 909	-	752 708
Hatching	-	-	-		1 030 273	-	348	-	1 030 621
Broiler growing	-	-	-	-		5 799 013	17 138	-	5 816 152
Processing	-	-	-	-	-		9 986 857	-	9 986 857
Purchased inputs	3 491 535	138 049	43 740	97 125	541 710	665 531			4 977 691
Personal inputs	92 505	10 266	38 744	65 975	219 414	863 402			1 290 306
Depreciation	44 484	14 014	25 918	19 425	89 388	153 277			346 507
Required services	64 586	5 966	15 162	28 875	210 678	947 473			1 272 740
Other inputs	117 880	11 649	65 156	20 825	159 354	1 308 109			1 682 973
Total	3 810 989	238 376	706 380	919 024	6 055 836	9 736 805			21 467 410
Net profit	335 616	-724	46 328	111 597	-239 684	250 052			503 185

Source: Own construction and calculation, results of the model run by basic parameters

Table 3.: **The Structure of the Non-Cumulative Production Cost and Profit of the Broiler Product Chain (2007)**

Denomination	**Feed production** *(thousand HUF/year)*	**Parent stock rearing** *(thousand HUF/year)*	**Parent stock hatching egg production** *(thousand HUF/year)*	**Hatching** *(thousand HUF/year)*	**Broiler growing** *(thousand HUF/year)*	**Processing** *(thousand HUF/year)*	**Total** *(thousand HUF/year)*	**Distri-bution** *(%)*	**Distri-bution** *(%)*
Material costs	3 491 535	138 049	43 740	97 125	541 710	665 531	4 977 691	52,01	49,41
Raw material	3 388 793	89 845	-	-	-	-	3 478 638	36,35	34,53
Feed raw material	3 388 793	-	-	-	-	-	3 388 793	35,41	33,64
Day-old chick	-	89 845	-	-	-	-	89 845	0,94	0,89
Auxiliary material[1]	2 171	33 126	16 630	41 475	121 992	5 430	220 824	2,31	2,19
Energy	82 330	11 907	22 921	39 025	392 730	375 015	923 927	9,65	9,17
Other material[2]	18 240	3 171	4 190	16 625	26 988	285 086	354 301	3,70	3,52
Personal costs	92 505	10 266	38 744	65 975	219 414	863 402	1 290 306	13,48	12,81
Depreciation	44 484	14 014	25 918	19 425	89 388	153 277	346 507	3,62	3,44
Building, technology	44 484	14 014	25 918	19 425	89 388	153 277	346 507	3,62	3,44
Services	64 586	5 966	15 162	28 875	210 678	947 473	1 272 740	13,30	12,63
Other direct costs[3]	80 158	5 209	34 266	5 600	15 444	1 003 001	1 143 678	11,95	11,35
Overhead costs	37 722	6 440	30 890	15 225	143 910	305 108	539 294	5,64	5,35
Total production cost	**3 810 989**	**179 945**	**188 721**	**232 225**	**1 220 544**	**3 937 792**	**9 570 216**	**100,00**	**95,00**
Net profit	**335 616**	**-724**	**46 328**	**111 597**	**-239 684**	**250 052**	**503 185**		**5,00**
Total	**4 146 606**	**179 221**	**235 049**	**343 822**	**980 860**	**4 187 844**	**10 073 401**		**100,00**

[1]Medicine, vaccine, cleaning and antiseptic supplies, bedding
[2]Wrapping material, technical supplies, accessories, printed paper, material assets used within a year, other
[3]Local tax, banking costs, selling costs, other inputs

Source: Own construction and calculation, results of the model run by basic parameters

Regarding the available possibilities during the research, I could not compare my own results in the given phases of the broiler product chain to the adequate data, though on the basis of professional consultations the model is suitable for introducing the reality under the conditions (Table 4.).

Table 4.: **The Method of Testing the Simulation Model**

Model parts	Evaluation on the basis of farm-level data	Subjective evaluation according to professional consultations	Comparison on the basis of data from other sources
Feed production	✓	✓	-
Parent stock rearing	✓	✓	-
Parent stock hatching egg production	✓	✓	KOVÁCS et al., 2007[1]
Hatching	✓	✓	-
Broiler growing	✓	✓	BÉLÁDI-KERTÉSZ, 2007[2] PPC, 2008[3]
Processing	✓	✓	-

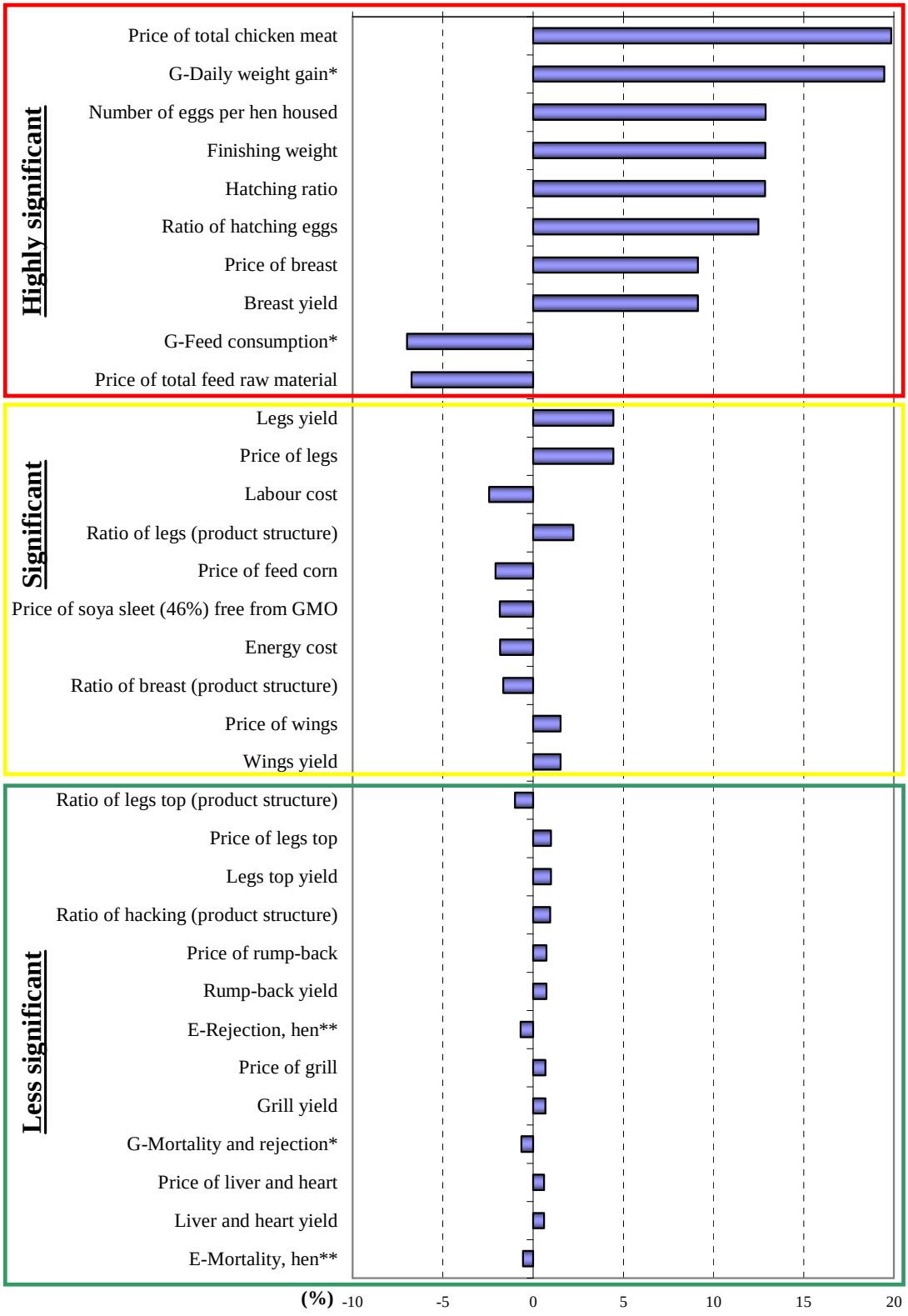
[1]Data of given enterprise
[2]Test farm data of the year 2006 of Agricultural Economics Research Institute
[3]IV. Quarterly prognosis of 2007 of Poultry Product Council
Source: Own construction

3.2. Investigating Factors Influencing the Profit of the Product Chain

In this part of the thesis, I reflect the results of the sensitivity analysis of the simulation model and by this the broiler product chain. The objective of the investigation is to measure and evaluate the effects of different stages of economic and producing parameters on certain elements of the product chain and on the whole product chain.

3.2.1. The Elasticity of Input Parameters of the Product Chain

During the elasticity analysis of the input parameters of the model, I studied the fact that what factors influence the profit of the whole product chain mostly. As a result of the elasticity analysis I ranked the factors and classified them into five groups: highly significant, significant, less significant, insignificant, neutral. Figure 2 reflects factors from only the first three categories; the introduction of the other categories is detailed in the appendix of the dissertation.



*G: broiler growing; **E: parent stock egg production; ***R: parent stock rearing

Figure 2.: **Gradation on the Basis of Elasticity Indicators**

Source: own construction and calculation, results of the model run by basic parameters

The price of total chicken meat[I], the daily weight gain of broiler[II], number of eggs per hen housed, finishing weight of broiler, hatching ratio, the ratio of hatching eggs, the selling price and yield of breast constituting 46% of the production value of processing, feed consumption of broiler, as well as the price of total feed raw material have highly significant effects on the profit of the product chain. From these parameters of highly significant, it may be concluded that most of them influence the profit of the product chain in a direct way[III] and contain indicators expressing mainly natural efficiency. The effect of these factors expressed in value exceeds 30 million HUF separately.

The significant parameters include the price of corn constituting near 75% of the quantity of feed raw materials and soya sleet free from GMO, the selling price and yield of legs and wings determining the production value of processing in the second and third place. The prices of labour and energy as well as the ratio of legs[IV] and breast[V] within the product structure of the processing phase have further significant effect on profit. All in all parameters causing direct and inverse[VI] effects got into the significant parameters in same ratio, and their values are between 5 and 30 million HUF.

The price and output indicator of products constituting 3 to 5% of the production value of processing (legs top, rump-back, grill, liver and heart) have less significant effects on the profit of the product chain. Even the ratio of legs top within the product structure and ratio of hacking belong to this group. Further less significant parameters are mortality and rejection during broiler growing and parent stock egg production. Most of these parameters influence the profit of the product chain in a direct way.

Insignificant parameters are the followings: purchase price of parent stock hatched chick, feed consumption, mortality and rejection during parent stock rearing and egg production. Besides these, there are neutral parameters, which do not influence the profit of the whole product chain at all, for example the prices of products (semi-ready products) from the certain phases of product chain.

The participants of the product chain have the opportunity to affect most of the factors, mainly technological parameters, influencing the profit of the product chain, which

[I] Price of every product changes that is the average price of products increase by 1%.
[II] It contains accumulations with respect to finishing weight and feed consumption.
[III] The profit increases by 1% growth of the factor
[IV] Legs/legs top: 69,2/30,8%
[V] Breast filet/boned skinned breast: 97,5/2,5%
[VI] The profit decreases by 1% growth of the factor

make improving the results possible from the point of view of the decision maker. My hypothesis is proved by the results of the investigation that is technological parameters have determent significance.

3.2.2. The Scenario Analysis of the Product Chain

Scenario Analysis Relating to Economic Parameters

I carried out the scenario analysis of the product chain from two approaches: first relating to economic parameters and second with respect to technological factors. Examining the economic parameters, I ran the simulation model of broiler product chain by data of 2007 prior price growth ("A" scenario), that is by output and input average prices of February and March of 2007, as well as by average prices of February and March of 2008 after the price growth ("B" scenario). I looked for the answer that how a price growth being in accordance with the tendencies of 2007 influences the cost and profit relations of the enterprise.

Table 5.: **The Cost and Profit Relations of Broiler Product Chain in Case of the Certain Scenarios**

Unit: HUF/kg chicken meat

Denomination	Basis	„A" scenario	„B" scenario
Direct production cost	380,13	365,84	431,34
Production cost	402,82	388,54	454,04
Production value	424,00	396,41	449,08
Gross value	43,88	30,57	17,74
Net profit	21,18	7,87	-4,96
Added value	214,49	201,18	188,35

Source: Own calculation, results of the model

On the basis of the results of the scenario analysis of economic parameters, I concluded that the growth of processing selling price and production value in the output side cannot cover the effect of price growth, being experienced during the last period, in the input side of the product chain on production costs (Table 5). Taking the present (February of 2008) input prices into consideration, the broiler product chain shows deficit, which cannot be maintained in a longer term. If the present input prices, mainly prices of feed raw materials, do not decrease, the further price growth of processed products will be inevitable, on the contrary the bankruptcy of processors. The problem

is that the output prices are determined by not processors but by the trade and the prices of imported goods.

Scenario Analysis Relating to Technological Parameters

According to the other approach of the scenario analysis of the product chain, I created two extreme versions, a pessimistic and an optimistic version relating to the technological factors and similar to the above mentioned I examined their effects on the profit and cost structure. In this case I used the weaker national averages and data from other sources as pessimistic values comparing to the basic values (farm-level data), while in the optimistic scenario I focused on the performance indicators determined to Ross 308 by AVIAGEN (2007a; 2007b). These latter indicators reflect the reachable performances under adequate farming and environmental conditions as well as by keeping the recommended feeding technological guidelines and using technologies of hight standard. Almost all of the technological factors of highly significance got into the examination.

Table 6.: **The Cost and Profit Relations of Broiler Product Chain Under Extreme Technological Parameters**

Unit: HUF/kg chicken meat

Denomination	Basis	Pessimistic	Optimistic
Direct production cost	380,13	446,15	324,50
Production cost	402,82	473,87	341,33
Production value	424,00	422,25	437,58
Gross value	43,88	-23,90	113,08
Net profit	21,18	-51,62	96,24
Added value	214,49	186,86	255,80

Source: Own calculation, results of the model

When carrying out the scenario analysis of technological parameters, I concluded that the growth of output and production value contributes to improving the profit of the product chain to the highest degree (Table 6). Parallel to this the decrease of prime costs causes profit growth. This is on the fact that most of the parameters of highly significant have effect on the output side of the given product chain phases. The examination revealed that the effects of the certain parameters appear in an accumulated way along the product chain getting higher[I] (Figure 3). As a result of this it is clear that the product chain can be operated by a significant deficit if the efficiency indicators are worse than

[I] Imagining the product chain as a system built from bottom to up.

the given farm data, which comes from the negative result of broiler growing and processing. Contrary to this, there are better indicators than the basis data, which means that there are extremely great reserves in the broiler product chain.

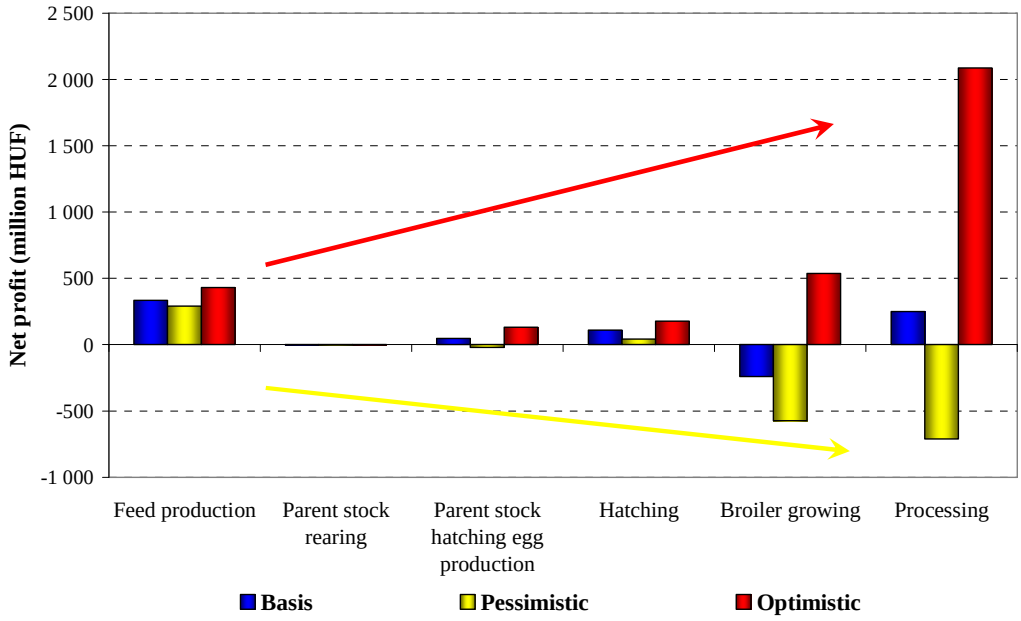


Figure 3.: **The Profit of Product Chain Phases under Extreme Technological Parameters**

Source: Own calculation, results of the model

3.2.3. Critical Value Analysis of the Product Chain

In the previous subchapter I introduced that the broiler product chain all in all reflects deficit at the beginning of 2008, which resulted from the increase of input prices, experienced in the latest years, to a higher degree than that of output prices. During the critical value analysis I calculated the fact that under the present input prices for reaching the profit level (1,99%) at the beginning of 2007 the price of processed products should grow by an average of 2,88%. Regarding the average data of 2007 for reaching a determined profit level (5,00%) a price growth of 5,87% is necessary in the output side.

After these, I looked for the answer of the question that under what price the profit of the product chain can be divided proportionally among the certain phases. I used two approaches. The criteria of distributing the profit in the ratio of the cost are decreasing the price of mixed feed by 5,9%, as well as reducing the prices of hatching eggs and hatched chick by 6,35% and 13,03%, respectively. On the other hand it is necessary to increase the selling price of reared parent stock by 1,23% and the price of broiler by

0,3%. In accordance with the value of fixed assets feed prices should be decreased by a greater degree, by 7,24%, the price of hatched chick by a smaller degree, by 7,47%. At the same time the value of reared parent stock should be higher by 7,91%, the price of hatching eggs by 2,09% and the selling price of broiler should grow by 2,48%.

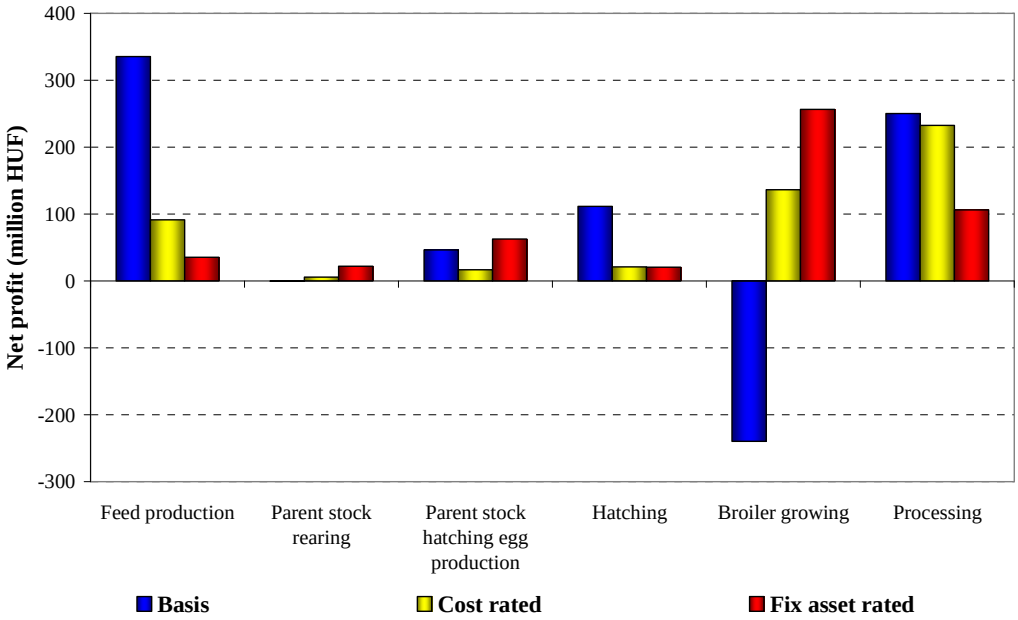


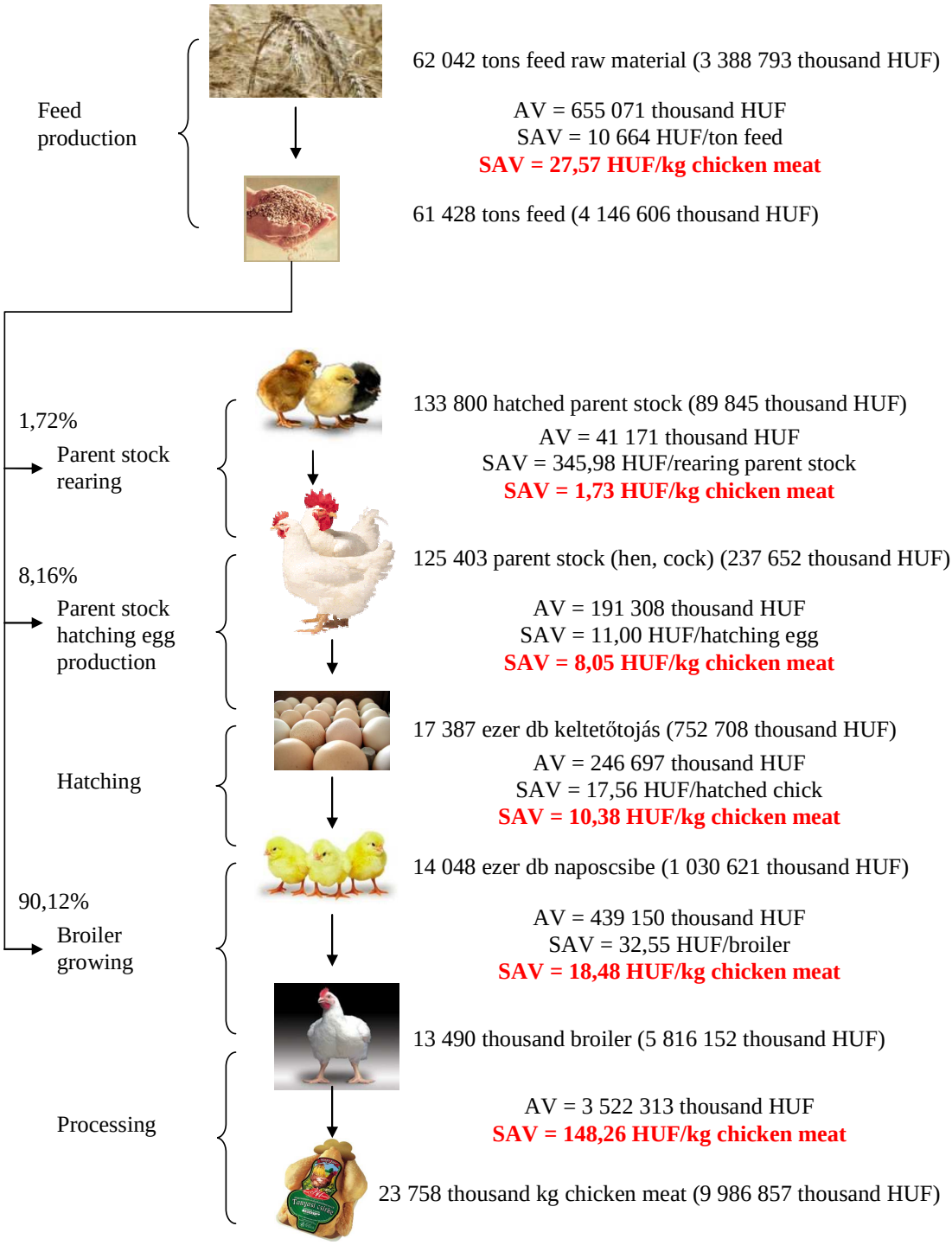
Figure 4.: **Profit Distribution Among the Phases of Product Chain**

Source: Own calculation, results of the model

It is clear from the results of the investigation that besides the profit distribution in the ratio of costs improving the results of phases showing a deficit may be realized only at the expense of the lower phases (feed production, egg production, hatching) of the product chain. Parallel to this, the broiler growing is exposed to a greater extent within the product chain in the input side (feed mixture and hatched chick) than in the processing side. In case of investment rated profit distribution the ratio of defencelessness is more emphasized, though its tendency cannot be defined in an expressed way (Figure 4).

3.3. Examining Added Value in the Broiler Product Chain

The value generation of broiler product chain is realized as Figure 5 reflects, which shows the total and per unit added value of the modeled product chain, furthermore it contains the natural quantity and value of the products from the certain phases of the product chain.



AV: Added Value; SAV: Specific Added Value

Figure 5.: **Value Generation Along the Broiler Product Chain (2007)**[I]

Source: Own illustration and calculation, results of the model run by basic parameters

[I] Supposing a product chain without capital uniformity

The arrows show the process of the value generation (Figure 5). On the basis of the value chain analysis, starting from the feed raw material (3,4 billion HUF) getting into the product chain and the imported hatched parent stock (near 0,1 billion HUF) we go through rearing, egg production, hatching then growing, and we reach processing, where ready products of near 10 billion HUF get to the market. The whole vertical integration realizes 5,1 billion HUF added value, which is 214,5 HUF per one kilogram chicken meat. I revealed by the value chain analysis that the determining phase is processing as it constitutes 69% of the total production value. Besides, feed production (13%) and broiler growing (9%) have highly significance within the value chain.

The ratio of value generation between the certain phases of product chain is influenced by the tendency of economic and technological parameters. According to the results of elasticity analysis on the generated value most of the input parameters definitely affect on the total performance of the product chain. The inner ratio is influenced by the selling price of broiler by increasing the added value of growing and by this it side by side decreases the produced value of the processor. I highlight the effect of the price of feed mixtures as well, which concerns the other three phases of the product chain and most of all decreases mainly the performance of growing. Relating to the generated value of the whole product chain the selling price of processed products and the daily weight gain of broiler are relevant factors. There are other significant factors such as number of eggs per hen housed, hatching ratio, ratio of hatching eggs and finishing weight of broiler. Factors influencing the added value of enterprises mainly in a negative way are prices of feed raw material and per kilogram feed consumption of growing.

3.4. The Fixed Asset Requirement of the Product Chain

The total fixed asset need of the product chain modeled in the dissertation is near 14 billion HUF (Table 7), which is 600 HUF per one kilogram ready product. The phase generating the broiler raw material has the biggest share (51%), which is followed by the processing firm by 21% and the egg producing phase by 12%.

Table 7.: **The Fixed Asset Value of the Broiler Product chain Supposing New Investments (2007)**

Denomination	**Capacity**	**Investment cost** *(thousand HUF)*	**Quantity** *(unit)*	**Total** *(thousand HUF)*	**Distribution** *(%)*
Feed mixing firm	60-70 thousand tons	986 000	1	986 000	7,04
Parent stock rearing farm	4 000 m^2	306 699	2	613 398	4,38
Parent stock layer farm	6 000 m^2	434 987	4	1 739 948	12,43
Hatchery	17,5 million hatching eggs	566 162	1	566 162	4,05
Broiler growing farm	10 500 m^2	594 379	12	7 132 548	50,96
Processing firm	6 000 chick/hour	2 958 000	1	2 958 000	21,13
Total				**13 996 056**	**100,00**

Source: Own calculation on the basis of JANKOVICS (2008) and BÁRÁNY (2008)

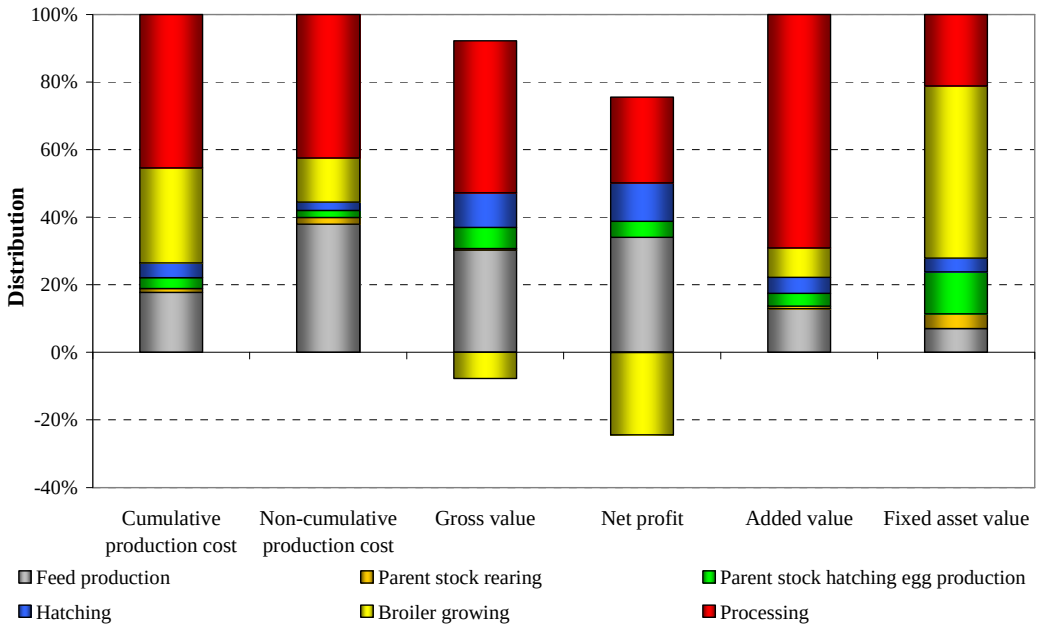


Figure 6.: **The Weight of the Phases of the Product Chain According to Different Aspects (2007)**

Source: Own calculation, results of the model run by basic parameters

When comparing the ratio to other fields (Figure 6) it is clear that realizing a whole, viable and operating product chain requires significant capital, on the other hand the profit and value generation of the phases within the product chain is not in harmony with the value of fixed assets. Evaluating the long-term profitability of the broiler

product chain on the basis of expert appraisal the investment cost of the product chain calculated on new value does not recover within 15 years under the profit conditions of the year 2007, the whole product chain is full of risks.

3.5. Evaluating the Broiler Product Chain in a Product chain Operating with Capital Uniformity

In the "Literature review" chapter of the dissertation, I introduced and processed the relevant literature relating to vertical integration in a detailed way. Several authors (BOWRING, 1957; BARKEMA-DRABENSOTT 1995; SZÉLES, 1995; CSETE-PAPÓCSI, 1996; SZALAY, 1997; ZOLTÁN, 1997; CLEMENT, 1998; SZENTIRMAY, 2003; SZÉLES, 2003; MANNING-BAINES, 2004; SZENTIRMAY-GERGELY, 2005; BAMIRO et al., 2006; SHANE, 2006) highlight the view of product chain with capital and interest uniformity, with which under the present market conditions I agree considerably.

The results reflecting the average data of the year 2007 proves the fact that under the present conditions the growing phase of the product chain shows a significant deficit. Contrary to this, certain phases (feed production, egg production, hatching) reflect high profit level. During the critical value analysis I highlighted that growing is exposed within the product chain, which comes not from the side of the processor but from the side of inputs (mixed feed and hatched chick). In my opinion considering a product chain without capital uniformity, under marketing conditions an activity showing a deficit is not viable for a long run, as this may lead to the drop of not only the expanding and developing but the maintaining investments and through this to the decline of the quality product generation. Such enterprises cease and leave the market and as a result generating products of adequate quantity and quality becomes uncertain from processing aspects. All these may worsen the utilization of the processors, because of the high fixed costs it influences the profitability, secondly it may generate unemployment, which may not be converted, and which is a social problem at the same time. This goes with the decrease of the competitiveness for the whole sector. The capital requirement mentioned in the previous subchapter and the disproportion of profit generation meaning the source of recoveries may be sources of further conflicts among the participants of the product chain under the present market environment.

For solving these problems a product chain operating with capital uniformity may be a solution where the whole product chain from feed production till processing belongs to one owner or owner-group. By this the owner becomes interested in every phase of the product chain thus the proper profit distribution and the optimal recovery of investments between the certain phases may be ensured without conflicts. By the help of calculating prices within the product chain the cash flow may be made optimal, which contributes to maintaining and improving the competitiveness of the sector through the liquidity. If semi-ready products are passed over on prime cost between the enterprises, according to the ownership interests, the enterprise generating profit finances the other elements of the product chain. In this system the lower phases of the product chain have the function not to generate higher profit as as keeping cost to a minimum and producing raw materials of good quality come forward, and the profitability and competitiveness of the whole product chain depend on the final products. Not only the broiler raw material production of good quality but producing mixed feeds and hatched chick of good quality is equally important.

Besides the above mentioned facts, the further advantages of a product chain operating with capital uniformity are summarized as follows:

- The quality control, food safety, keeping animal sanitary guidelines and traceability becomes more effective along the product chain. The whole production chain control and process view may be realized in a more effective way, which is the clue issue of the quality products. The views “from land to table” and “from the consumer to the raw material production” may be proven in an increased way.
- The owner has unlimited attention to the product chain led by him thus the owner is able to organize and schedule the production of the product chain according to the all-time market requirements. By satisfying the consumer needs on higher standards and on competitive prices may come forward.
- Greater bargain position may be reached at both input (feed raw material) and output (chicken meat) sides of the product chain. The defencelessness if it arises concerns the product chain only on these two points as interest contradictions cease within the product chain.

- The international tendency shows this as well, as in the big poultry producing countries of the world such typed and structured great enterprises manage and rule the majority of the markets.
- It is a significant power in the Research+Development+Innovation activity as it may be realized along the product chain in a more effective way than separately in segments.
- Because of the short biological cycle it is practical to make the production and the product movements optimal, which may also be realized better in a closed system. Logistic and storing costs may be reduced and organizing the production may be made optimal.
- The management of the product chain concentrates and the overhead cost decreases thanked to the size economy.
- Establishing the optimal size (enterprise, farm, house) as well as harmonizing certain phases and solving size economic issues become possible.
- Certain activities (such as cleaning and disinfection) may be more easily organized in order to improve efficiency. This results in the effective utilization of labour.

The high capital requirement may retard the development of the product chain with capital uniformity. Spreading the capital uniformity to interest uniformity may be a solution. Almost all of the integrations starting with capital uniformity reach a point where not the capital but the interest uniformity will be relevant. In case of interest uniformity further growing enterprises may join the integration through connections in form of long-term-contracts. At present 1 to 2 such enterprises already operate in the domestic poultry sector, but it is a question that whether the other participants are able to co-operate in such a form.

To sum up in my opinion I proved the more effective operation of vertical integrations with capital uniformity and with interest uniformity as a higher step based on the cited literature and the carried out investigations. In this way the broiler product chain may become more competitive than a product chain without capital uniformity.

4. NEW AND NOVEL SCIENTIFIC RESULTS

1. I worked out a simulation model for the economic analysis of the broiler product chain, which involves every phase from feed production to processing. Under given product chain size the model regarded as novelty from methodological aspects is able to simulate farm business management relations of the whole product chain and its certain phases supposing different economic and technological conditions.

2. I determined the cost, revenue and profit relations of the analyzed broiler product chain and its phases by the help of the model. I proved that chicken meat production under the domestic economic condition of the year 2007 is profitable relating to the whole product chain, although the profit distribution is disproportioned.

3. By adapting the output-input model to the product chain, I revealed and calculated the direct connections of the certain product chain phases and between the participants outside the product chain.

4. I graded and classified the economic and technological parameters based on their effects on the profit of the product chain, which proved my hypothesis relating to the determining significance of technological factors. According to the elasticity of the input factors the price of ready products, the daily weight gain of broiler, the number of eggs per hen housed, the finishing weight of broiler, hatching ratio, the ratio of hatching eggs, the selling price and yield of breast, the feed consumption of broiler, the price of the total feed raw material are considered as highly significant parameters.

   I calculated the effect of changes of input-output prices on the result of the product chain as well as the economic benefits reached by extreme technological parameters compared to basic data. My major conclusion is the fact that the broiler industry shows a deficit regarding input prices at the beginning of 2008, furthermore the extreme technological parameters reflects significant losses at one hand, and rather big reserves in the product chain on the other hand. I determined the critical value of prices of processed products covering the growth of input prices, and made the prices belonging to the proportional distribution of the profit in the product chain optimal.

5. I revealed and calculated the value generating process realizing along the broiler product chain and I concluded that processing is dominant (69%). I determined the most important factors influencing the added value and its ratio within the product chain.

6. I proved by my investigations that a product chain operating with capital uniformity ensures a more effective operation and higher competitiveness than a product chain without capital uniformity. The fact must not be neglected that all integration starting with capital uniformity reaches a point where not the capital but the interest uniformity will be relevant.

5. THE PRACTICAL USE OF THE RESULTS

The major result of the dissertation is the simulation model, which is able for carrying out economic analysis of the broiler product chain considering different economic and technological parameters. From the aspect of practical use the model can be utilized both in research and in production. I find it suitable for revealing the effects of different market prices and economic regulators on the outcome of the product chain, for making economic decisions relating to genus, for strengthening the research-developmental tendencies of product chain phases by data such as genetic improvement of certain valuable features, evaluation of effects of different feeding and keeping technological developments at product chain level.

In my view, the farm business analysis covering every phase of the product chain has a supplementing function, which may serve as a basis for other similar examinations. The set gradation between the factors influencing the result of the product chain is beneficial from practical aspects as on this basis the reachable aims may be defined in production. By determining critical values I attracted attention to the disproportions within the product chain. The investigation provides opportunities for decision makers to realize source allocation in a more adequate ratio.

The result of the dissertation may be well utilized in the field of education, the analysis due to its structure may be fit into the subject “Enterprise Economics” based on the traditions of the Business School of Debrecen. Besides, it may serve as an example in educating the methodology of cost analysis, sensitivity analysis and product chain analysis.

6. PUBLICATIONS IN THE SUBJECT OF THE RESEARCH

Scientific book/textbook chapter in foreign language:

1. Majewski, E. – Cyganski, L. – Janiszek, M. – Was, A. – **Szőllősi, L.** (2006): "Business planning – cases; Instruction for teachers" Prepared within the Leonardo da Vinci project (PL/04/B/F/PP-174 455) "Developing teaching materials and Quality Standards for a network of MBA programs in Agribusiness Management". Warsaw Agricultural University, 2006. Case 3. 12-13. p. (elektronikus oktatói segédlet) *1,0*

Scientific book/textbook in Hungarian:

2. Apáti F. – Felföldi J. – Grasselli N. – Lapis M. – Nábrádi A. – Nagy A. – Popovics P. A. – **Szőllősi L.** – Szűcs I. (2005): „A szarvasmarha-ágazat gazdasági, szervezési és piaci kérdései" Szaktudás Kiadó Ház, Budapest, 2005. 207 p. ISBN 963 9553 41 7 (Szerk.: Szűcs I.), 1.7., 2.1.-3., 2.5., 2.6., 2.8., 3.1., 3.3., 4.1., 5.1., 5.3.-6. fejezetek *0,111*

Scientific book/textbook chapter in Hungarian:

3. Apáti F. – Antal J. – Bácsné Bába É. – Bonis, S. – Gályász J. – Grasselli N. – Kovács K. – Mos, S. – **Szőllősi L.** – Szűcs I. (2006): „Vidékfejlesztési esettanulmányok a magyar-román határ mentén" Debreceni Campus Kht., Debrecen, 2006. 28-41, 80-92 p. ISBN 963 87118 0 9 (Szerk.: Gályász J.), III./1., III./5. fejezetek *0,5*
4. Apáti F. – **Szőllősi L.** – Felföldi J. (2007): „A gyümölcsültetvények tervezésének gazdasági szempontjai" In.: Gyümölcsültetvények tervezése, fajtahasználat. (Szerk.: Nyéki J.), InterClaster Kht. Kecskemét, 2007. 67-92. p. ISBN 978-963-9773-09-7 *0,167*
5. **Szőllősi L.** – Szűcs I. (2007): „Beruházások gazdasági értékelése" In.: Vállalkozások működtetése az Európai Unióban. (Szerk.: Nábrádi A. – Nagy A.), Szaktudás Kiadó Ház, Budapest, 2007. 178-195. p. ISSN 1789-3542, ISBN 978-963-9736-36-8 *0,25*
6. **Szőllősi L.** – Nábrádi A. (2007): „A baromfiágazatok szervezése és ökonómiája" In.: Üzemtan II. (Szerk.: Nábrádi A. – Pupos T. – Takácsné György K.) DE AMTC AVK, Debrecen (elektronikus tankönyv) 261-284. p. *0,25*

Institutional issue in Hungarian:

7. Apáti F. – Felföldi J. – Gyarmati Á. – Kovács K. – Kiss Z. – Lukácsné Berke Z. – **Szőllősi L.** – Széll S. – Szűcs I. – Tikász I. (2006): „Hajdú-Bihar megye mezőgazdasága – gazdálkodás az egyes tájegységekben – Bihar – Hajdúság – Hortobágy/Tiszamente – Erdőspuszta/Érmellék – Sárrét" Debreceni Egyetem, Debrecen, 2006. 132. p. ISSN 1588-8665 (Szerk.: Szűcs I.) 3., 4., 5., 6., 7. fejezetek *0,05*

Institutional issue chapter in Hungarian:

8. **Szőllősi L.** (2003): „Gépberuházások döntés-előkészítésének modellezése" In: A Debreceni Egyetem Tehetséggondozó Programjának I. Konferenciája – Tanulmányok, Debreceni Egyetem, Debrecen, 2003. 37-41. p. (Szerk.: Balogh L. – Mező F. – Tóth L.) *0,1*
9. **Szőllősi L.** (2005): „Adott mezőgazdasági vállalkozás önfinanszírozó képességének elemzése" In: A mezőgazdaság tőkeszükséglete és hatékonysága, DE-ATC-AVK, Debrecen, 2005. május 26. 251-257. p. ISBN 963 472 896 0 (Szerk.: Jávor A.) *0,1*
10. Nábrádi A. – **Szőllősi L.** – Szűcs I. (2007): „Projektismertető" In: Ágazatspecifikus innováción alapuló projektek generálása a baromfi ágazatban – A baromfi ágazat helyzete, kilátásai és fejlesztési lehetőségei (Szerk.: Nábrádi A. – Szőllősi L.), Debreceni Egyetem, Debrecen, 2007. 9-17. p. ISSN 1588-8665 *0,033*

11. Nábrádi A. – **Szőllősi L.** (2008): „A vágóbaromfi termelés helyzete, gazdasági jelentősége” In: Kárpátalja bekapcsolódásának segítése az Észak-alföldi régió gazdasági életébe (Szerk.: Madai H. – Nábrádi A.), Licium-Art Kiadó, Debrecen, 2008. 137-146. p., ISBN 978-963-8030-54-2 *0,05*

Editing Hungarian institutional issue:

12. Nábrádi A. – **Szőllősi L.** (szerk.) (2007): „Ágazatspecifikus innováción alapuló projektek generálása a baromfi ágazatban – A baromfi ágazat helyzete, kilátásai és fejlesztési lehetőségei” Debreceni Egyetem, Debrecen, 2007. 152 p. ISSN 1588-8665 *0,125*

Scientific journal in foreign language:

13. Nábrádi A. – **Szőllősi L.** (2007): „Key aspects of investment analysis” In: Applied Studies in Agribusiness and Commerce (APSTRAC-T) Official Periodical of the International MBA Network in Agribusiness and Commerce (AGRI-MBA) Vol. 1. Number 1. 53-56. p. Agroinform Publishing House, HU-ISSN 1789-221X *0,2*

Scientific journal in Hungarian with a summary in foreign language:

14. **Szőllősi L.** (2008): „Brojler hízlalás költség- és jövedelemviszonyai Magyarországon” In: Agrártudományi Közlemények (Acta Agraria Debreceniensis) (megjelenés alatt) *0,2*

15. **Szőllősi L.** – Nábrádi A. (2008): „A magyar baromfi ágazat aktuális problémái” In: Bulletin of the Szent István University 2008. Special Issue, Part 1. 315-325. p. ISSN 1586-4502 *0,1*

Educational journal in Hungarian:

16. **Szőllősi L.** (2005): „Hűtőház-üzemeltetés és -tulajdonlás” In: Magyar Mezőgazdaság 60. évfolyam, 2005. március 2. 9. szám 26-27 p. *0,05*

Revised presentation published abroad in foreign language:

17. **Szőllősi, L.** (2003): „Assessment of Investment Financing on the Basis of Analyzing the Case of a Certain Agricultural Enterprise” In: IX. medzinárodná vedecká konferencia študentov a doktorandov, Nitra, 10. April 2003. 63-64. p. ISBN 80-8069-181-9 (Szerk.: TRAKOVICKÁ, A. – STRAPÁKOVÁ, E.) *0,3*

18. Nábrádi, A. – **Szőllősi, L.** (2006): „Key Aspects of Investment Analysis” In: The 4th International Symposium “Natural Resources and Sustainable Development”, Oradea, 10-11. October 2006. 109-116. p. ISBN (10) 973-759-158-5; ISBN (13) 978-973-759-158-6; HU ISBN-10: 963-9274-99-2; HU ISBN-13: 978-963-9274-99-0 *0,15*

Revised presentation published in Hungary in foreign language:

19. **Szőllősi, L.** – Nábrádi, A. (2006): „Financing by Foreign Capital in point of Investment Analysis” In: Summer University on Information Technology in Agriculture and Rural Development, Debrecen, 19-22. August 2006. 112-117. p. ISBN-10: 963-87366-0-7; ISBN-13: 978-963-87366-0-4 *0,075*

Revised presentation in Hungarian with a summary in foreign language:

20. **Szőllősi L.** (2003): „Beruházások finanszírozásának értékelése adott mezőgazdasági vállalkozás beruházásainak elemzése alapján” In: XXVI. Országos Tudományos Diákköri Konferencia Agrártudományi szekció előadásainak magyar-angol nyelvű összefoglalói I. Agrárökonómia „A” tagozat, Kaposvár, 2003. április 3-5. 62-63. p. ISBN 963 206 840 8 ö (Szerk.: Dér F.) *0,1*

21. Nagy A. – **Szőllősi L.** (2005): „Tejtermelő családi gazdaságok életképes méretének vizsgálata” In: Agrárgazdaság, Vidékfejlesztés, Agrárinformatika (AVA 2) Nemzetközi Konferencia, Debreceni Egyetem ATC AVK, Debrecen, 2005. április 7-8., CD-melléklet, 10 p. *0,05*

22. **Szőllősi L.** (2005): „A Sárándi Hűtő TÉSZ hűtőházi beruházásának gazdasági elemzése” In: XXVII. Országos Tudományos Diákköri Konferencia Közgazdaságtudományi szekció Előadás kivonatok, Ágazati gazdaságtanok tagozat, Sopron, 2005. április 27-29. 27. p. ISBN 963 9364 50 9; ISBN 963 9364 51 7 (Szerk.: Gildai E. – Andrássy A. – Juhász L. – Kolozsár L. – Horváth P.) *0,1*

23. **Szőllősi L.** (2007): „Tenyésztojás-termelés hatékonyságának vizsgálata” In: Agrárgazdaság, Vidékfejlesztés, Agrárinformatika (AVA 3) Nemzetközi Konferencia, Debreceni Egyetem ATC AVK, Debrecen, 2007. március 20-21., CD-melléklet, 11 p. *0,1*

24. **Szőllősi L.** (2007): „Brojler szülőpár-telep létesítésének és üzemeltetésének gazdasági kérdései” In: Európai integráció – elvek és döntések; Gazdasági fejlődés Európában; II. Pannon Gazdaságtudományi Konferencia, Pannon Egyetem, Veszprém, 2007. június 07., ISBN 978-963-9696-29-7, 31. p. *0,1*

25. **Szőllősi L.** (2007): „Brojler előállítás ökonómiai elemzése” In: Erdei Ferenc IV. Tudományos Konferencia Agrárökonómiai szekció II., Kecskeméti Főiskola, Kecskemét, 2007. augusztus 27-28., ISBN 978-963-7294-64-8, 73. p. *0,1*

26. **Szőllősi L.** – Nábrádi A. (2007): „A magyar baromfi ágazat aktuális problémái” In: Tradíció és Innováció Nemzetközi konferencia, Mezőgazdasági vállalatok és ágazatok ökonómiája szekció, Szent István Egyetem GTK, Gödöllő, 2007. december 03-05. CD-melléklet, ISBN 978-963-9483-85-9, 12 p. *0,05*

Presentation in Hungarian without any summary in foreign language:

27. **Szőllősi L.** (2005): „Üzemeltetés és tulajdonlás kérdéseinek értékelése adott beruházás ökonómiai elemzése alapján” In: XI. Ifjúsági Tudományos Fórum, Veszprémi Egyetem Georgikon Mezőgazdaságtudományi Kar, Keszthely, 2005. március 24., CD-melléklet, 5 p. *0,05*

Revised proceeding and summary:

28. **Szőllősi L.** (2005): „A tőkével kapcsolatos döntések előkészítésének módszertani háttere” In: Agrárgazdaság, Vidékfejlesztés, Agrárinformatika (AVA 2) Nemzetközi Konferencia, Debreceni Egyetem ATC AVK, Debrecen, 2005. április 7-8., CD-melléklet, 12 p. *0,025*

Other publication:

29. Szűcs I. – **Szőllősi L.** - Grasselli N. (2004): „II. kutatási részfeladat: Költség-haszonelemzés” In: Zárójelentés a 98857/32/2003 számú FVM NAKP támogatási szerződésben vállalt feladatok szakmai teljesítéséről, DE-ATC-AVK Vállalatgazdaságtani tanszék, Debrecen, 2004. 28-57. p. (Projektvezető: Nábrádi A.)

30. Nábrádi A. – **Szőllősi L.** (2007): „Összefoglaló tanulmány a baromfi ágazat helyzetéről” Ágazatspecifikus innováción alapuló projektek generálása a baromfi ágazatban c. Baross Gábor projekt (BAROSS-2-2005-0032), DE-ATC-AVK, Debrecen, 2007. (Projektvezető: Nábrádi A.)

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