

University doctoral (PhD) dissertation abstract

**THE ECONOMIC ANALYSIS OF MANGALITZA SUPPLY
CHAIN**

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1. BACKGROUND, OBJECTIVES OF THE STUDY AND DESCRIPTION OF THE STUDY HYPOTHESIS

I began to study the mangalitzza segment in 2009. Short interviews with questionnaires were used to measure the aspects and future prospects of the producers. During the interviews, the problems of the farmers in the segment were revealed, thus, my aim was to carry out a complex and complete product chain analysis. During my doctoral studies, I collected data and information to describe the mangalitzza segment in collaboration with the National Association of Mangalitzza Breeders (NAMB). This work is necessary because it is important to explore how the industry players are connected to each other and what kind of problems are in the chain.

The significance of the research topic I have chosen is indicated by the increasing demand for the traditional Hungarian products, as increasing number of people realise the market potential in keeping native animals. Modest breeding and feeding conditions must be fulfilled in indigenous farming; therefore, in today's society it is not an unrealistic aim to spread tolerant species by breeding extensive technologies and growing their volume. Due to the fact that Hungary is a traditionally pork consuming nation, in my research I consider it is important to examine the area that still has not important economic significance, as its share in total pork output is only 1.5%, but the market position and the foreign opportunities forecast increasing performance.

Today's food chain is analysed in a wide range of research, which often focus on quantitative and sometimes on qualitative surveys. It is difficult to explore the opinions of chain actors, because every player acts in different ways and with slightly different issues due to their different activities.

Main objectives of the study

The goals of secondary research are as follows:

1. Introduction, perceptions and significance of native pig species in the world. According to these a comparison is drawn with the Hungarian indigenous Mangalitza pig.
2. Description of the current situation of the mangalitza segment process, evaluation and completion of the SWOT-matrix drawn in previous literatures with own results.
3. Mangalitza stock and geographic concentration analysis using mathematical and statistical methods based on the data of the National Association of Mangalitza Breeders, and examination of the effects of different economic factors on the concentration.

The goals of primary research:

1. Exploring the problems between the mangalitza chain actors (production, processing, sales), and drawing up scientific proposals for the more effective cooperation.
2. Defining the relation of Hungarian consumers to the mangalitza products, and determining the purchase preferences and quantifying the willingness to pay for a mangalitza product.
3. Based on the SWOT-analysis and the survey of chain actors, building the problems in a structured system, drawing up the problem-tree and formulating specific objectives and activities to solve the problems with the objectives-tree.

The following hypothesis was determined for the whole mangalitza chain:

Hypothesis 1: The Hungarian pig sector is characterized by fragmentation and concentration at the same time. The Mangalitza segment is unique in this issue, the concentration is not typical.

Hypothesis 2: Hungarian consumers expect the certificate, the origin of the product and the traceability, as they are buying mangalitza sausage.

Hypothesis 3. Hungarian consumers are willing to pay more for those mangalitza products which have certificate and are made from 100% mangalitza due to their reliable origin.

Hypothesis 4. Hungarian consumers are willing to pay the most for the products which they can buy directly from the breeders.

Hypothesis 5. Products without certified origin have worse market competitiveness than products bearing the logo of NAMB.

2. DATABASE AND INTRODUCTION TO APPLIED METHODS

Secondary and primary research has been carried out in my thesis. In my work, secondary and primary research intertwined because of the applied principle during chain analysis, which is based on the principle of SCP paradigm that is suitable for the analysis of supply chains, and which was used for the exploration and analysis of the opinion of producers, processors and dealers. In the scope of the above, secondary research was necessary for the innovative processing of data collected and published by others. This was completed with primary data collection in order to become familiar with the opinion of the members of the mangalitza product chain. Product chain members have been analysed with qualitative methods. In the course of the primary research, data collection was carried out by means of in-depth interviews. Consumers are major members of the product chain, thus, my aim was to survey also the consumer side during my research. The study was carried out within the framework of primary research using specific questionnaires, allowing for a quantitative analysis.

2.1 The SCP-paradigm

The most effective method for the analysis of intra-sector actors is external and internal environment assessment. Among others, the SWOT-analysis and the external-internal assessment matrix are suitable for that, but there are different methods as well: the Structure-Conduct-Performance (SCP) paradigm; the mangalitza product chain is analysed on the basis of its principle.

The components of SCP paradigm are as follows:

Structure – *Szerkezet*: describes the structural properties of a sector, for example the number of market actors, market access limits, commercial relations (vertical integration) amongst the actors.

Conduct – *Magatartás*: involves the operation, market behaviour and strategy of market actors. It represents the way product chain members accept, influence or adapt to market conditions. The most important factors of this component are pricing behaviour and sales strategy.

Performance – *Teljesítmény*: describes the productivity, results and efficiency of a sector, through the technological development and full employment.

2.1.1 Method of secondary research – concentration analysis

Using the theory system of the SCP paradigm, the methodology of concentration analysis is recommended for the analysis of one part of the first component (*Structure*) by the technical literature (SCHERER, 1980; MILAGROSA, 2007; KIZITO, 2008). According to UDOVECZ (2009), one of the criteria of pig breeding is stock concentration, which is confirmed by NYÁRS (2005) as well as POPP and NYÁRS (2009). The authors highlighted that the Hungarian pig sector is both concentrated and scattered, which is caused by the overall bipolar structure of the Hungarian agriculture (NYÁRS, 2005; TAKÁCSNÉ GYÖRGY et al., 2007). In the course of my work one of my objectives is to prove that this bipolar nature applies to the mangalitza sector as well, namely that there is both stock concentration and scattered ownership structure within the mangalitza segment.

The data are based on the national database collected by the Hungarian National Association of Mangalitza Breeders. The data collected in the course of the secondary research contained sow stock by breeders, broken down to settlement level. These data were suitable for the analysis of territorial concentration, and after their restructuring, they could be used for stock-level concentration analysis. The analyses have been carried out for the years between 2000 and 2012. Various indexes and procedures have been used for carrying out the analysis; these were the following:

- Concentration ratio (CR),
- Lorenz-curve,
- Gini-coefficient,
- Herfindahl-Hirschman-index

2.1.2 Methods of qualitative research

For the analysis of conduct and performance of the product chain members, in-depth interviews (based on the principles of the SCP paradigm) have been carried out with experts, producers, processors and dealers of the mangalitza product chain. In the course of the in-depth interviews become deeply familiar with the current situation of the mangalitza sector, personally and closely experience the difficulties related to livestock farming, processing and sales and the opinion of the

subjects about mangalitza breeding and consuming, its advantages and disadvantages and the relation with other chain actors. The discussion with experts allowed to carry out deeper surveys which more realistically reflect future prospects.

The research was based on a non-representative sample; the selection of interview subjects was carried out by means of purposive sampling amongst the producers, with the aim of involving small, medium and large farms in the sample. A total of 11 in-depth interviews have been carried out in the scope of the study between June and August 2013. The sample included experts, mangalitza producers, processors and dealers as well.

Table 1: The number of interviewees according to their activities

Measurement unit: number of people

Activities	Number of interviewees	Farm size		
		Small	Medium	Large
Expert	2	-	-	-
Breeder	6	2	2	2
Processor and seller	2	-	1	1
Breeder, processor and seller	1	-	1	-
Total	11	2	4	3

Source: Own calculations, 2013

Prior to the discussions the subjects have been assured about the anonymity of the survey and their permission has been asked for making a sound recording of the interview. The recordings have been made with a digital recorder for the more reliable information processing and evaluation.

Producer, processor and seller interviews were usually 50-90 minutes long, while expert interviews took 90-120 minutes.

2.2 Data and method of consumer survey

One of the main objectives of supply chain management is to meet customer needs; therefore, it is very important to explore the opinions of the final actors of the product chain which are the consumers. This was carried out using a novel method called choice experiment. The aim of the survey was to analyse consumers' preference and also quantify the

willingness to pay for of a mangalitza product. Given a large number of mangalitza products in the food market, the investigation related to a traditional, popular, accessible and internationally recognised product. Mangalitza sausage was placed in 2010 by an international organisation (Slow Food) product list called ("Ark of Taste"), gaining international exposure and recognition (BALDERESCHI et al., 2010).

Data was collected for the research through questionnaires, personal and online request. The survey was carried out between August and October 2012 in the Northern Great Plain Region. The breeding of mangalitza pig is the most significant in this region, nearly 40% of total number of sows are bred here and the association (NAMB) is also located in this region. The data collection was preceded by focus group interviews in June 2012 to determine the variables of the choice sets and the levels of variables (MØRKBAK – NORDSTRÖM, 2009; MØRKBAK et al., 2011, STEFANI et al., 2012). Attributes created during the interviews are shown in Table 2.

Table 2: Attributes, levels and the codes of the levels in conditional logit model in terms of mangalitza sausage





Attributes	Attribute level	Code	Variable name	Description	
Price of mangalitza sausage	1500 HUF/kg			Denotes the consumer price Mangalitza sausage.	
	2000 HUF/kg				
	2500 HUF/kg				
	3000 HUF/kg				
Rate of mangalitza in product	50%	-1	-1	Indicates the rate/amount of mangalitza in product.	
	75%	1	0		Rate_1
	100%	0	1		Rate_2
Certificate	No	-1		Mangalitza product certified or has the logo.	
	Yes	1			Cert
Purchase place	Breeder/market	-1	-1	Represents the sales channels where consumers prefer to buy.	
	Butcher/small shops	1	0		Purch_1
	hyper-/supermarket	0	1		Purch_2

Source: own construction, 2013

After defining the attributes, the choice cards (product cards) have been edited. Each respondent had to solve 8 choice situations sequentially. Consumers had to choose three options in a preference card („A” and „B”, and „Do not buy under these conditions”) (Figure 1.). The third

alternative, „do not buy” (opt-out) option – the most realistic choice situation – gives the possibility for the consumers to decide not to buy a product if it does not meet their expectations (e.g. too high price, lack of label, etc.) (VAN LOO et al., 2011; GAO – SCHROEDER, 2009).

Figure 1: Example of a choice set

	Price (Ft/kg)	Version „A” 2500	Version „B” 1500	Under these conditions, do not buy.
	Rate of mangalitzta	75%	50%	
	Certified product	Yes	Yes	
	Purchase place	Hyper/ supermarket	Butchers, small shop	
Your choice:		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Source: own construction, 2013

After compiling the questionnaire it was tested with randomly selected consumers, and the questionnaire was modified according to the comments made by respondents. The final version of the questionnaire was filled out with a total of 309 person.

2.3 Problem and objectives tree analysis

According to the data collected during the primary and secondary research, and the information of Mangalitzta segment is justified to draw up the problem- and the objectives-tree. The main problems and their causes and effects become more transparent with the mentioned analysis. In addition, proposals can be made with a well-structured objectives tree analysis to solve the explored problems. A related problem analysis to secondary research covered a SWOT analysis of the segment. The information from the primary research was mainly derived from the in-depth interviews made with the chain actors. The proposal occurred by specific and derived strategies and activities assigned to general objectives.

The problem analysis identifies the negative aspects of an existing situation and establishes the ‘cause and effect’ relationships between the identified problems. The weaknesses and threats taken during the SWOT

analysis can also be of help. Problems are not defined in general, but specifically and based on the cause-effect relationships that are placed above, below or next to the others. This problem tree represents a summary of the existing negative situation which contains the core problem and the causes and also the effects (D'HAESE et al., 1998; NÁBRÁDI and SZÖLLÖSI, 2008). With a clear problem analysis we can range all of the problems and the causes and highlight the core problem this tree structure outlines towards the solutions of the objectives (CSERPES, 2011). The objective analysis draws up the future situation that we can reach by converting negative situations into solutions. With this method, the objectives tree and the needed activities are completed in order to implement these goals. The objective tree provides a summary of the desired future situation, including the indicative means by which ends can be achieved (MDF, 2005).

3. MAJOR FINDINGS OF THE EVALUATION

3.1. Results of the in-depth interviews with breeders, processors and sellers along the principles of the SCP paradigm

3.1.1. The structure of mangalitzza segment

According to the SCP paradigm, for the analysis of the product chain structure it is worth to take into consideration the number of actors within the product path, market access limits, the possibilities of product differentiation and the opportunities of vertical and horizontal integration. With the description of the sectorial structure, the entire product path can be mapped.

In the course of my study it was found that the whole mangalitzza segment is three-polar on the level of every product chain actor. These three poles can be classified to the levels of small, medium and large producers, processors and dealers.

Three levels of the producer side:

- The high number of small enterprises – in the case of the mangalitzza breed the ones with less than 30 sows – represents only a small share within the total stock. In 2012, 54% of the small enterprises owned 16% of the total sow population, the average sow population was 18 for this enterprise size in that year. These producers play a major social role as a result of bio-farming and rural tourism, which might represent a significant potential for the Hungarian economy. Most small producers carry out extensive production, which lengthens the period of fattening, therefore the lower natural indexes result in less effective production. This is the reason why only 6 piglets/sow are born annually in the case of small producers, compared to the 9 piglets/sow average of large producers.
- Medium enterprises owning 30-100 sows are able to produce for market sales besides their own use, and they also play an important role in gene preserving. Approximately one-third of the Hungarian mangalitzza production units belong to this category and they own

almost one-fourth of the total sow stock. The average number of sows for this enterprise size is 48 sows/production unit.

- The 4-5 really large producers own 80% of the porkers; they mainly produce for food chains or foreign markets in large quantity and standard quality. It is important to highlight that in the case of the mangalitza sector, production units with more than 100 sows can be considered large enterprises, their proportion within the total of enterprises hardly exceeds 15%; however, 60% of the total sows is concentrated in their ownership. In this production unit size there were a total of 20 enterprises in 2012, however there are still 4-5 units which work with more than 300 breeding animals. These units own approximately one-fourth of the total sow population and because of their size they have a strategic role as well (Table 3).

In order for small, medium and large enterprises to be able to cooperate effectively, these three production unit types have to cooperate with each other. Small and medium enterprises mainly breed/fatten clean blood mangalitza. With their extensive or semi-extensive breeding they are unable to supply foreign markets either in quantity or in proper quality. However, in large enterprises, the crossbred mangalitza (Mangalitza x Duroc) especially serves foreign demands with proper quantity and always standard quality. The Mangalitza-Duroc crossbred type is accepted in both domestic and foreign markets, as a result of its many advantageous properties. Besides the more favourable fertility and growth vigour, the processors need the hybrid mangalitza, because slaughterhouse technology would not be able to process the high amount of fat and certain quality can be produced in better quality from crossbred animals.

Table 3: The structure of mangalitza segment in 2012

Name	FARM SIZE		
	Small	Medium sized	Large
Category of sow numbers (pc)	<30	30-100	100<
Total sow number (pc)	1176	1724	4427
total farm number (pc)	66	36	20

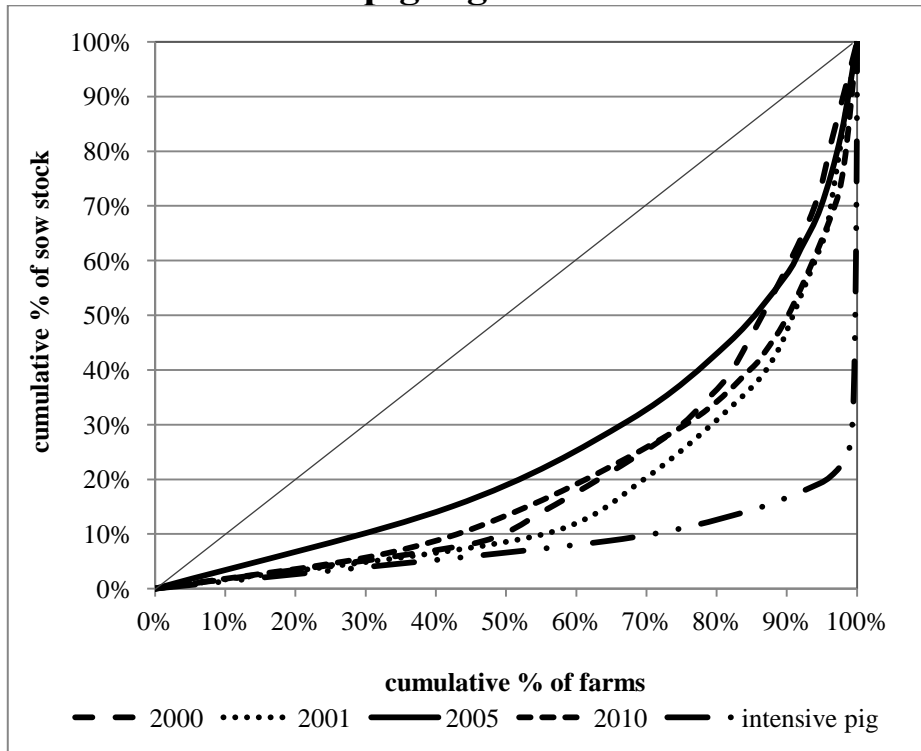
Source: own construction, 2013

3.1.1.1. Results of concentration analysis

Based on the concentration analysis and calculation methods described in section 2.1.1, concentration processes are outlined in the Hungarian pig sector. According to my calculations, the concentration was moderate between 2000 and 2012. With this statement Hypothesis 1 was substantiated. This is also supported by the concentration ratio, because in 2012, the two largest breeders owned 15%, the 4 largest owned 27%, the 8 largest owned 40%, and the 10 largest owned 44% of total sowstock. The Lorenz-curve demonstrates the moderate concentration, shown in Figure 3.

It is important that the curve was closest to the side of the square in 2001, which means that the degree of concentration was the highest then as a result of the 2 largest enterprises having more than 250 sows entering the sector. At this point, the two largest enterprises owned 35% of the total stock, which was the highest during the analysed period. It can also be laid down as a fact that by the EU accession in 2004, and the first cycle of the indigenous animal subsidisation (2005) the concentration area decreased, since small-scale enterprises started to gain power and appear in higher numbers. As a result of the subsidisation the motivation for breeding increased in all three enterprise types. Although many enterprises terminated their operation as a result of the economic crisis and the drought damages of 2007, large enterprises still owned a significant amount of the total stock, this the reason of the 2010 curve approaching the one of 2001.

Figure 2: The Lorenz-curves of mangalitza and the Hungarian pig segment



Source: own calculations on the basis of data of NAMB, 2013

The values of the Gini-coefficient confirm the previously introduced information, characterised by a single number the degree of concentration. According to the results, sectorial concentration was the highest in 2001 (0.63), while it was the lowest in 2006. During the rest of the years a different degree of fluctuation can be observed; the value of the index changed between 0.41 and 0.59 during the analysed period, which is a medium level concentration according to the classification.

3.1.1.2 Product differentiation, entry of barriers

Most mangalitza products belong to the premium category, therefore their sales is carried out on a special path. In terms of the markets there are 3 poles, which characterises the whole mangalitza segment, see in Table 4.

Table 4: The description of mangalitza markets

Farm size	Product producers	Distribution channel	Product type
Small	Breeders	Backyard	Traditional backyard products
Medium sized	Breeders, smaller processors	Farmers' market, fair, festival, or smaller specialized stores	Processed, unique products also appear
Large	Occasionally breeders in own processing firms or processing through integration	National small shops, hyper and supermarkets, foreign markets	Standard quality products, own brand appearance

Source: own constructions, 2013

The market of mangalitza products is characterised by consumer demand; therefore, there is no competition amongst the actors. Still, the most important market access limits are the following:

- competition between small and medium enterprises and non-official, household-based, 1-2 sow producers, mainly in terms of price and quality;
- large producers are exposed to and dependent on the forage supply;
- in the case of large producers, mapping of foreign markets, removing cultural differences.

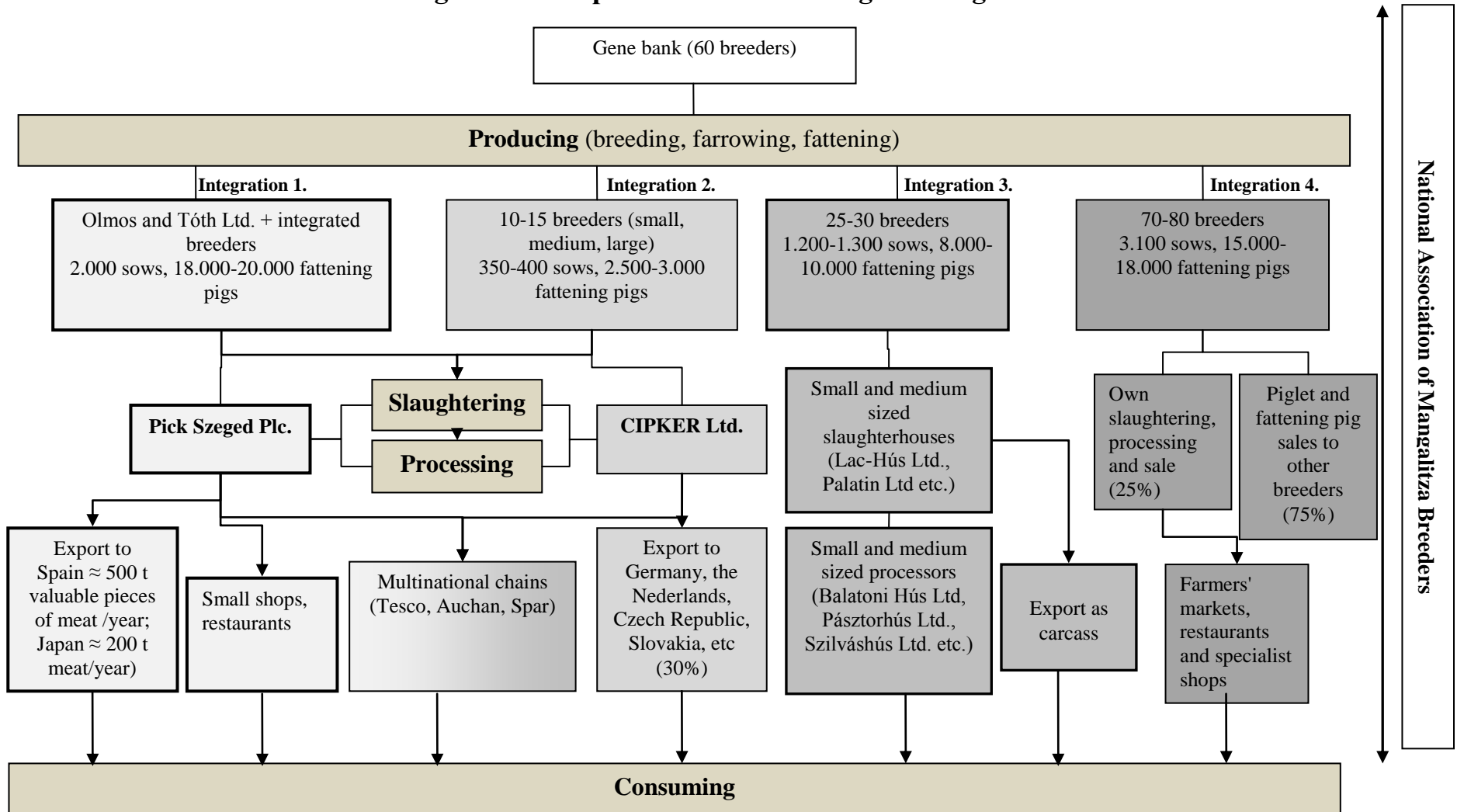
3.1.1.3. The role of vertical integration in the mangalitza sector

The agricultural role of vertical integration is dealt with by FERTŐ (1996) and SZABÓ G. (2002), which works well within the mangalitza sector as well, because basically there are four integration types within the segment. In the course of our research, the actors of the segment have been revealed; they will be introduced in the Figure 4.

There is an other segment of production which is not involved in any of the above listed integrations. The number of producers can be 30-40 and their stock is around 15% of the total population. These producers provide either piglets or they sell the own fattened porkers locally. Their production does appear as finished product within sales.

Spontaneous co-operations for production might have a future within the sector, as it was mentioned by the representatives of small and medium-scale enterprises during the interviews. This organisational form might support joint slaughtering, processing, sales; however its actual chance was discarded by all of them. This was explained by the lack of trust amongst the producers, which is a result of the cooperation form which operated before the change of regime. However, the termination of these agricultural large enterprises resulted in a significant release of labour in rural areas, which contributed to the high level of unemployment of present times within agriculture (MARSELEK – TAKÁCSNÉ GYÖRGY, 2011).

Figure 3.: The product chain of mangalitzza segment



3.1.2 The conduct of mangalitzza product chain actors

According to the SCP paradigm, the behaviour of the mangalitzza product chain members is highly dependent on pricing behaviour, sales practice, advertisements, marketing. Related to the above, the in-depth interviews involved these topics both for producers and processors

The producer price of mangalitzza is mainly formed by production costs, most of which (80-85%) is represented by forage costs. This can change differently on all three production levels, depending on the used forage.

Table 5. Characteristics of feeding by farm size

Farm size	Feed
Small	own feed, feeding food processing by-products
Medium sized	own fodder, own/rented land, buying protein feed
Large	purchase standard, predetermined recipe fodder

Source: own construction, 2013

On an annual scale, producer price is mostly stable, it is less hectic than the change of modern pig prices, it does not change on a daily basis and the change is mainly characterised by increase. In the course of the sales of porkers, the buying up is carried out on a price which is pre-negotiated by the main integrator (Olmos and Tóth Ltd.) and the slaughterhouse, where the integrator takes into consideration the producer prices and the market position of mangalitzza. Smaller producers, which do not sell through integration, change the sales price on their own and communicate their demand towards the buyers. Currently the buy up price of mangalitzza pigs is 500-520 Ft/kg in live weight, which is 30-50% more than the producer price of domestic pigs for slaughter (370-395 HUF/kg) (MÁSZ, 2013).

The marketing activity organised by the Hungarian National Association of Mangalitzza Breeders has a major role in the promotion of the reputation of mangalitzza products. Different marketing activities are realised for all three producer groups, but the objective is the same: to get the products to the consumers.

This has two methods:

1. inspiration of Hungarian consumers
2. increase of foreign demand.

The broadening of domestic consumption was confirmed by every interview subject, thus on a national level the consumption of mangalitzza products increased during the recent years, however they agreed that it is not on the desired level. As previously mentioned, the total meat consumption in Hungary is approx. 40 kg/person/year, 27 kg of which is pork. Mangalitzza consumption is mainly done in processed form, the sales of fresh meat is hardly 10-15%. This low amount has multiple reasons:

- high retail price,
- red colour, similar to game,
- strongly marbled meat, it seems more fatty for the consumers,
- not really available in regular butcher's shops,
- fresh meat cannot be falsified,
- processed products are more popular amongst consumers.

Preservation and improvement of consumer trust by means of a label of the National Association of Mangalitzza Breeders is a task to be solved. With this label, consumers could be sure that they purchase and consume a product which is really made of mangalitzza meat. However, misuse of the label is still possible, since there is no proper control in place.

Some of the interview subjects highlighted the role of the media, mainly television, since in our current consumer society most of the information is received by potential buyers through this channel. The role of public television is especially important, because the mangalitzza and its gastronomic values are represented in numerous programmes. Besides the events and social marketing the more frequent appearance on producer markets could be a market broadening and sales opportunity for small and medium producers. On these markets – just like on fairs, festivals, gastronomic events – food samples and the enclosed business cards are significant tools for later sales and the widening of the scope of consumers. The promotion of export markets is done by Olmos and Tóth Ltd. by means of media appearances, participation of expos, fairs, product demonstrations, food samples, etc.

3.1.3 The performance of mangalitzza chain actors

The performance of product path members also depends on multiple factors; human resource and infrastructural background are the most important ones, as well as motivation for investment and development. It has been stated in the National Rural Strategy that the average age of agricultural employees is increasing, ageing is significant, migration is more frequent, the proportion of agricultural workers is in decline (VM, 2012). Livestock farming is less attractive for young people and the involvement of proper quality labour is a problem even in rural areas.

Table 6. Workforce requirements on mangalitzza farms by farm size

Farm size	Workforce requirements
Small	leader of the farm individually, no employee
Medium sized	1-2 full-time assistant next to owner
Large	qualified full-time employees

Source: own construction, 2013

Easy access (solid cover road) is characteristic to the infrastructural background of production units of all three levels, which has essential role during the transportation of forage, live animals, or in the case of visits from the association or the veterinarian. This requirement was established by a demand from the association, whereas the breeding manager and the person responsible for registration have to be able to easily access the given farm and to leave it with a clean vehicle. Some of the producers had to be excluded from the association, because the registrars were unable to access their premises, therefore they had to terminate their operation.

In his study, NYÁRS (2008b) mentioned that 80% of the Hungarian pig farms require renovation; only 20% apply technology of European standards. Reconstruction of the buildings and the replacement of the technology demands significant investment. The competitiveness of the Hungarian pig sector is influenced unfavourable by the high costs of 'non-productive' (animal welfare, environmental protection) investments. The situation is the same for mangalitzza pigs, however that breed is highly adaptive to breeding conditions, therefore the launch of its breeding or the modernisation of an existing unit does not require a

serious investment for either small or medium-scale farms, because the mangalitzza breed does not need modern technology. In large-scale mangalitzza breeding, in farms with more than 100 sows, modern buildings and equipment are important for the more effective production. All of the interviewed farms with less than 100 sows mentioned the difficulties of subsidisation amongst the limiting factors of development. They referred to the fact that subsidisation has a lot of potential, but the grants always involve the purchase of new equipment, which is very expensive to get. Therefore the used equipment – for a fragment of the own contribution – can be used for carrying out smaller developments on the production units. Moreover, subventions are post-financed and only a certain part is financed by the subsidising authority, which also makes the use of grants difficult because of the necessity of own contribution. These farmers do not apply for loans because of the payback difficulties; they rather wait or look for other resources. The possibility of development is in the previously mentioned lease of state owned land; smaller producers which produce their own forage would be able to large stock increase with more land.

3.2. Results of consumer survey

3.2.1. Results of the choice experiment, preference analysis

Thanks to the personal interviews and the questionnaire settings made in the online interface the respondents answered all the questions; therefore, it does not to have to count with missing data during the evaluation of the results. Data were analysed with conditional logit (CL) model. The observed utility (V_{ij}) can be written in the preference study as the following additive form (ASC: alternative-specific constant).

$$V_{ij} = \beta_0 ASC + \beta_1 \acute{A}r + \beta_2 Ar\acute{a}ny_1 + \beta_3 Ar\acute{a}ny_2 + \beta_4 Igazol + \\ + \beta_5 Besz_1 + \beta_6 Besz_2 + \varepsilon_{ij}$$

During my analysis, three main models were prepared. According to FAUSTIN et al. (2010), different groups of people have different utility; therefore, their willingness to pay is also different. Thus, two subsamples from the total were prepared as they are real consumers or not, and the parameter estimation was performed also for those two

samples. All the three models were completed with the interactions of attributes and demographic factors in order to get detailed results (HENSHER et al., 2005).

The results of the CL-model using the total sample are shown in Table 7, limited only to the statistically significant values. The log-likelihood ratio shows the fitting of the model. The base model fits well and the log-likelihood ratio is $(\chi^2) = 800$ ($p < 0,01$), $R^2 = 0.145$. Based on the results of the β coefficient for each attribute, statistically significant difference can be observed; the signs for all variables met my former expectations. The negative sign of the price coefficient means that people prefer lower prices – one unit increase of price reduces the willingness to buy. However, the higher proportion of mangalitzza in the product, the certificate, and the logo of association have a positive influence on purchase. The parameter estimated from the attributes related to the purchase place has a negative effect in the case of hyper- and supermarkets, as opposed to butchers. Therefore, Hungarian consumers prefer to purchase the mangalitzza products in speciality stores and smaller shops instead of directly from breeders or supermarkets. In accordance with the study of SZABÓ and JUHÁSZ (2012), the origin of the product reliability is more important for the domestic consumers than purchasing them directly. In addition, RESANO et al. (2011) also concluded that the dried ham purchased in butcher shops is more reliable for European consumers compared to the ham sold in supermarkets. During the parameter estimation, it was found that the certificate (+) and purchase in shopping centres (-) are the most significant factors, these factors have a 31.4% and 34.1% effect on the purchase intention of consumers in a positive or negative direction. In the model interactions of socio-demographic characteristics were completed and age was shown to be a continuous variable. In this case, the utility was as follows (ASC: alternative-specific constant; k interactions between the attributes and observed characteristics of consumers)

$$V_{ij} = \beta_0 ASC + \beta_1 \text{Ár} + \beta_2 \text{Arány}_{-1} + \beta_3 \text{Arány}_{-2} + \beta_4 \text{Igazol} + \\ + \beta_5 \text{Besz}_{-1} + \beta_6 \text{Besz}_{-2} + \beta_K \text{Interakció} + \varepsilon_{ij}$$

It was found that the age, education, income and residence situation have statistically significant effect on every preference variables. Older consumers and people with above-the-average income¹ prefer to buy mangalitza sausages at higher price, while people with at least secondary education and with below-the-average income do not prefer more expensive products. According to the results, higher rate of mangalitza in product (75%) matters only to the elderly and the urban population. Statistically significance difference was observed between the existence of certificate and all demographic factors (age, gender, education, residence, income), particularly in the case of older age groups, higher education degrees and the townspeople, as their willingness to buy was higher if the seller indicates the logo of origin on the product. These consumers consider certified food to be a guarantee of originality. In contrast, women and higher income groups do not find the certificate to be important. The purchase place has an important role on the preference of older aged groups and those who have higher education degrees. They are looking for the mangalitza products with greater trust directly at breeders or the butcher, which shows the negative value of β coefficient.

¹ The average monthly gross earnings were 220 700 HUF/person in the first half of 2012.

**Table 7. Parameter estimation of the conditional logit model
for the total sample**

Variables	Coefficient (Base model)	SE	Coefficient (Completed model)	SE
ASC	2.9065***	0.17	3.0000***	0.18
Price	-0.0011***	0.00	-0.0006***	0.00
Rate_1	0.3459***	0.06	0.0031	0.21
Rate_2	0.2673***	0.06	0.5520**	0.22
Cert	0.7419***	0.05	0.1830	0.18
Purch_1	0.2009***	0.05	-0.0185	0.19
Purch_2	-0.8063***	0.06	0.2120	0.23
Price : Age			0.0001***	0.00
Price : Edu_E			-0.0001**	0.00
Price : Edu_H			-0.0001*	0.00
Price : Inc_2			-0.0001*	0.00
Price : Inc_4			0.0002***	0.00
Rate_1 : Age			0.0073*	0.00
Rate_1 : Res			0.1110*	0.06
Cert : Age			0.0098**	0.00
Cert : Gend			-0.0831*	0.05
Cert: Edu_H			0.2600***	0.08
Cert: Res			0.1330***	0.05
Cert: Inc_4			-0.2510**	0.10
Purch_2 : Age			-0.0217***	0.01
Purch_2 : Edu_S			-0.2500***	0.09
χ^2	800***		918***	
R ²	0.145		0.148	
LL*	-2715.65		-2715.65	
LL _(CL)	-2315.49		-2256.75	
Number of observations	7416		7416	

*statistically significant $\alpha = 0.1$ level; ** statistically significant $\alpha = 0.05$ level; *** statistically significant $\alpha = 0.01$ level.

LL*: estimated model only with the constants, as consumers would choose the alternatives by the same probability. $\chi^2 = 2 * [LL_{(CL)} - LL^*]$. $R^2 = 1 - LL_{(CL)}/LL^*$

Price : Age; Rate_1 : Age; Cert : Age the attribute and the interacted demographic factor

Source: own calculations, 2013

3.2.2. Willingness to pay of consumers in terms of mangalitza sausage

In the previous section we found the effect and direction of each variable interactions. To quantify these effects and the preferences of how much respondents would be willing to pay, their willingness to pay and their 95% confidence interval was determined (Table 8.). The extra willingness to pay was also tested for the three samples. It was found

that the WTP in different groups of consumers is positive in the case of the increase of mangalitza rate in products, the certificate and the purchase at the butcher's. They are willing to pay less for mangalitza sausages in hyper- and supermarkets. According to the results of each samples, it can be stated that the regular consumers would pay the highest price, while people who do not know the products made of mangalitza would pay the lowest price. For example, regular consumers are willing to pay 427 HUF/kg more for the sausages which contains 75% of mangalitza than for those which contain only 50%. People who purchase mangalitza products know that a product which is made of 100% mangalitza is not better than those which contain lower amount of mangalitza, so they would not pay more for them. The regular consumers know these foods and they are satisfied with them. It is worth highlighting the wide confidence interval for this consumer population, indicating the previously described high level of preference. In contrast, those who have not tasted mangalitza was no significant difference in the willingness to pay respectively to the attributes of mangalitza rate. The most important variables are the certificate and the purchase in large supermarkets, because respondents are willing to pay the most for the certified product in all three samples, while those buying these products in hyper- or supermarkets would pay the lowest amount compared to direct sales. This result shows the level of distrust in larger shopping centres. Hungarian consumers would pay 896 HUF/kg less in shopping centres compared to the breeder's sale. According to my expectations, products bearing the logo or certificate of association represent a high added value for domestic consumers. All respondents are willing to pay 600 and 824 HUF/kg more on average compared to the products which do not bear any certificate.

Table 8: Willingness to pay for mangalitza sausages and the 95% confidence interval

Unit.: HUF/kg

Attributes	Total sample	„Consumer” sample	„Non consumer” sample
Rate_1	328.43 [229.07; 422.94]	427.35 [261.43; 585.81]	248.66 [119.23; 366.08]
Rate_2	253.78 [145.27; 380.64]	288.23 [103.57; 527.11]	234.52 [105.51; 387.97]
Cert	704.31 [599.83; 824]	869.06 [680.68; 1136.35]	585.69 [470.92; 721.94]
Purch_1	190.73 [77.75; 284.55]	264.14 [116.47; 423.33]	137.63 [29.12; 252.12]
Purch_2	-765.53 [-895.95; -650.21]	-896.51 [-1159.71; -697.66]	-663.81 [-812.21; -530.52]

Notes: The determination of the marginal WTP and the confidence interval occurred by Krinsky – Robb bootstrapp process (Krinsky – Robb, 1986), 10 000 repetitions

Source: own calculations, 2013

3.3 The strategic analysis of the mangalitza segment

3.3.1 Problem tree analysis of the segment

I built the explored weaknesses and threats in the technical literature and in-depth interviews into the SWOT matrix and used them for problem tree analysis. According to the analysis, it can be stated that one of the core problems is that the origin of the mangalitza products is not certified in the Hungarian markets. This basically leads to two problems: one of them is that a lot of producers adulterate the mangalitza products, which is the indirect effect of the lack of information and data service that is typical of the whole Hungarian agriculture. In addition, part of the breeders do not request any certificate of fattening pigs from the NAMB. In addition, because of the high state charges (taxes, contributions), black economy has a significant share. Since there is no EU legislation, it does not prohibit domestic, backyard pig slaughtering and processing and mainly small-scale farmers sell their products, fattening pigs often without certificate, thereby avoiding high taxes. Breeding and fattening unknown animals is typical in the mangalitza sector. Illegal slaughtering is typical because of the low purchase prices breeders can sell their fattening pigs for; therefore, they try to sell pork processed with higher added value. Mangalitza products have special taste.

If the mangalitza is adulterated and it is sold as mangalitza, consumer confidence is decreasing which leads to the decline of consumption and other economic and social negative effects.

Despite the many integrations in the segment, small and mid-sized farms are vulnerable to the purchaser and because of the lack of contractual relationships, the breeders are in uncertain positions and it is also the cause of black economy. The main objective of the association is that all 3 farm size categories would be efficient with exploiting the foreign market opportunities and promoting development. The harmony between the chain actors have an important role in the long-term operation of the segment. Similarly to the production side, slaughterhouses and processors are also divided into 3 farm sizes. Although the slaughtering and processing of mangalitza does not require any special technology, continuously delivered volume and standard quality are essential for high capacity processors. This demand in Hungary is able to be met only in the case of large-scale farms. Large farms are in connection with large processors, they know the market demand and based on it they schedule production. However, this is not typical for small and medium-sized breeders. The collaboration would help them to work together, learn about the slaughterhouses and processor expectations within an organised framework. Established producer organizations would prepare purchasers to receive the mangalitza slaughter pigs; therefore, breeders would not be at the mercy of each purchaser and the producer prices could be developed in accordance with the long-term agreements. However, this can not happen because of the lack of trust between chain actors, which has a significant role during the cooperation of farmers. TAKÁCS et al. (2013) concluded that the changes in political and economic environment have effects on farmers, but the motivation of cooperation is not usual among them. Therefore, the willingness to cooperate is low nowadays in terms of production collaborations.

It is also common that mangalitza breeders do not ask for certificates for their fattening pigs. This tendency is increasing every year. Due to the national and EU subsidies and the improvement of the mangalitza image in Hungary and also abroad, a positive, growing tendency can be observed in the amount of livestock and the number of breeders.

Despite the cooperation with the association and the coordination of breeding work, data service is not satisfactory for the breeders. With this

behaviour, they endanger increasing subsidies; therefore, modernisation and also the raise of the livestock are at stake. It follows from this that the capital for keeping boars and sows is lower which causes a decrease in breeding animals. In terms of gene preservation, it is important to mention those lines in the mangalitza sector which are on the edge of extinction. There are only 27 lines (268 boars), while in the 1950's, there were 56 lines (MOE, 2012b). To save these high genetic value lines, the NAMB put the boars to the mangalitza breeders from the central boar farm. Also, the NAMB keeps these boars as breeding animals in this farm.

It is also problem that the farrowing rate is not the same as the sow number. The average rate inactive sows is 15%, which is the background of animal health and reproduction problems. The number of sows farrowing once a year is high, which is typical in 30-40% of all small farms and only the large farms expect a farrowing rate of twice a year.

In case of mangalitza, there are many factors that are similar to the Hungarian agriculture are negative for the competitiveness of the mangalitza sector. These are the causes of the lack of capital which affect result in the obsolete technology and adverse natural indicators (low prolificacy, higher mortality rate, longer fattening period, slow growth rate). In intensive breeding technologies, Duroc boars are used in crossing to get better meat quality and also the natural indicators are better. With these technologies, the final products will be more standard and safer in foreign markets.

3.3.2. Objectives tree analysis of the segment

After the described problem tree, the structured problems could be transformed to objectives and activities which can be seen in Figure 2 in the sectoral objectives structure. The fact that not only in the foreign, but also in the Hungarian markets should buy certified origin mangalitza products can be defined as a strategic aim. To reach these aims, three specific targets are defined:

- Increase the need for the certificate of fattening pigs by the breeders, motivate the breeders to ask for them
- Reduction of adulterated mangalitza products
- Improve the profitability of the segment

If these specific targets will be realised with the strengthening of consumers' confidence, the Hungarian mangalitzza livestock and the number of farms will increase; therefore, it is easier to satisfy the growing foreign market demand. In order for all these to occur, lots of activities need to be performed in the mangalitzza sector, which are connected with concrete tasks. It must be highlighted that these activities are not enough to be performed alone to achieve the defined targets. Due to the fact that this sector is also a very complex system, some activities must be done in parallel, while others are done at an other time.

This objective structure is only one part of the problem solving, it needs a total strategic rethinking by the decision makers. With a stricter data service discipline, as well as stricter control and sanctions, the segment would be efficient. The industry cannot operate effectively in the pork market, where the farmers focus only on their own short-term interests and they do not take care about their long-term operation guaranteed by the state and association. Sustainable mangalitzza breeding is full of challenges; therefore, in order to solve the problems, the activities and the achievements which can be accomplished with action programmes have to be considered.

4. NEW AND RECENT SCIENTIFIC RESULTS OF THE STUDY

In my dissertation I make the following findings based on primary and secondary research, which are considered new or recent scientific results:

1. I used mathematical and statistical methods that do not have completed concentration processes in the mangalitza segment, similarly to other sectors, both of geographic and stock level and I concluded that the concentration was moderate. I accept Hypothesis 1.
2. Using recent approach, qualitative analysis surveyed the relationship between the supply chain actors of mangalitza segment. On the basis of secondary and primary information using strategic tools (SWOT analysis, problem-tree analysis), I built the problems of the mangalitza segment to a structural system and I listed the activities in the objectives tree to solve the problems.
3. The certificate is the most important factor for Hungarian consumers which is established under a new methodology. This indicator has a positive effect, while shopping in hypermarkets has a negative effect.
4. I quantified the domestic consumers' willingness to pay for mangalitza sausages and determined that conscious buyers would pay for a product bearing a certificate 870 HUF/kg more on average, while it is 896 HUF/kg less in shopping centres.

5. THEORETICAL / PRACTICAL UTILISATION OF THE RESULTS

One of the main objectives of my dissertation was to propose for the more effective operation of National Association of the Mangalitza Breeders on the basis of my research results.

In my opinion, it is necessary with the surveys to perform activities to the producer and consumer side. The association should strengthen the importance of certificate for breeders, which would lead them to an adequate income and can help in long-term survival. In this product group, the purchase place for the existing consumers is very important, because my results show a low level of trust in large hyper- and supermarkets, but also in the case of direct shopping. Since the surveyed consumers prefer butchers, smaller shops, but they could buy directly from the producers with the help of producer organizations, common sales and collaborations. It would be easier to sell also to small-scale players. In terms of the mangalitza rate, it is not necessary to aim for 100% mangalitza products, because they are more expensive to produce, while real consumers know that purebred mangalitza sausages are not better either. They do not prefer the product with only 50% mangalitza, because they think that it is not a real mangalitza product. Therefore, in terms of the Hungarian consumers, mangalitza rate should be raised to 75%, for which they would pay more than the 50% or the 100% mangalitza product.

The unknown origin, often not real mangalitza products which do not have the label of the association have a negative effect on the domestic demand of mangalitza meat. This ruins the domestic competitiveness of the mangalitza, because these kinds of products attract the consumers with lower price and quality. For avoiding this, strict actions of the authorities could be the solution, whereas these sellers could be stopped and sanctioned by means of campaign-like controls on producer markets or with occasional laboratory analyses.

6. PUBLICATIONS RELATED TO SUBJECT MATTER OF THE THESIS

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