BUDAPESTI CORVINUS EGYETEM

IMPACT OF QUALITY SYSTEMS ON HUNGARIAN FRUIT AND VEGETABLES PRODUCTION

Thesis of PhD dissertation

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1. Introduction and objectives of the research

Consumers of the developed world more and more reconsider the food safety, the environmental issues of production, health consciousness and the credence attributes of food (GMO-free, organic products) (Myers et al., 2004). There is an increasing demand for information about food (the importance of geographical origin, ethical and social compliance), as well as the demand for convenience and premium products (Orbánné, 2003), as the consumer decides a product's success or failure (Shewfelt, 1999). Global food systems are increasingly based on trust and symbolic dimensions and quality systems are to provide information and assistance for those attributes which can not be evaluated during purchase. Consumer's trends are getting to focus on credence properties, and consumers are willing to make purchasing decisions based on information from packaging and quality signs to decrease the information asymmetry among producers and consumers.

The number of and the areas covered by quality certification systems are steadily rising in the last 30 years. The export- or retail-oriented producers must face not only the import and local regulations but there is a variety of additional requirements on different (partly niche-) markets to be complied with. In my opinion the subject has a great significance since food is involved, which are irreplaceable, confidential products, and their safety (quality) is needed to guarantee.

In order to achieve this, on the whole length of the supply chain, on its all items a control process must be implemented. Precisely because of its inadequacy various private initiatives appeared to meet the highest possible level of consumer expectations, mainly on the field of primary production and produce handling which are the least controlled parts of the chain. Meeting the consumer expectations influences crucially the export ability of the Hungarian products. Quality in general is very popular in Hungary as well, despite this, the specialties and unique requirements of the agriculture-specific systems are poorly researched and applied.

My dissertation focuses on the national situation of quality schemes, application of the worldwide used systems among the Hungarian Producer Organisations (POs) as well as aiming to show possible solutions and ways and highlighting their difficulties.

My hypotheses:

- The respondents due to their poor knowledge on quality, quality management misvalue the importance of quality, do not recognize its role in competitiveness, therefore, able to exploit its potential in a limited capacity.
- The major force for system application is the market pressure, the expectations of customers. I assume the internal demand primarily rarely appears, accordingly, the ratio of external introduction and operation is very high.
- In spite of the objections and complaints, most of the approved POs operate a quality system, and the parallel application is even more common.
- I presume that the greatest perceived barrier to the introduction of these systems is its high cost, but it is not economically justified because of economic calculation and/or cost-benefit analysis is not carried out by producers.

2. Material and methods

2.1 Material

Primary research was carried out in 2009-2010 among the Hungarian horticultural Producer Groups (PGs) and Producer Organisations (POs) and retailers/processors of fresh fruit or vegetable related to their knowledge, attitude, usage of quality systems. I chose the producer organizations, because they are the basic elements and subsidised units of the European Common Agricultural Policy and constitute a known population. Statistical data can hardly be found about them.

The distribution of respondent can be seen in Table 1.

Table 1: The distribution of respondents

Region	Type	Existing organisations (based on registry)		No. of respondents		Sample ratio by counties	Ratio of total respondents by counties
		Pc.	%	Pc	%	%	%
Central Hungary	PG	2	8,33	2	14,29	100,00	
	PO	5	10,42	5	17,24	100,00	100,00
Northern Hungary	PG	3	12,50	3	21,43	100,00	
	PO	2	4,17	2	6,90	100,00	100,00
Northern Great Plain	PG	10	41,67	4	28,57	40,00	
	PO	16	33,33	9	31,03	56,25	50,00
Southern Great Plain	PG	8	33,33	4	28,57	50,00	
	PO	17	35,42	10	34,48	58,82	56,00
Central Transdanubia	PG	0	0,00	0	0,00		
	PO	2	4,17	1	3,45	50,00	50,00
Western Transdanubia	PG	1	4,17	1	7,14	100,00	
	PO	3	6,25	1	3,45	33,33	50,00
Southern Transdanubia	PG	0	0,00	0	0,00	0,00	
	PO	3	6,25	1	3,45	33,33	33,33
Total	PG	24	100,00	14	100,00	58,33	
	PO	48	100,00	29	100,00	60,42	59,72

To the sample beyond the producer organisations, the sector or retail and food processors, as well as the public administration, the consultancy and the professional organisations were added. Furthermore, I asked 9 food processing companies and 11 retailers and I performed in-depth interviews.

2.2 Methods

After the theoretical foundation of the research in the primary research I have collected qualitative and quantitative information using standard questionnaire and expert in-depth interview technique. I made two interrelated questionnaires, one for the producers' side, and the other for the customers' side in order to be comparable in some questions.

Quantitative and qualitative evaluation methods were used, most often cross and frequency tables. The independence in the correlation examinations was verified by Pearson's Chi-square test and Fisher's exact test and Cramer's were applied for the strength. Nonparametric tests were performed for the assessment of rankings. I used Friedman test for all factors, Wilcoxon and McNemar for pair wise comparisons. To determine the latent variables factor analysis, then to group the respondents cluster analysis (K-mean method) were used. The discriminant analysis is confirmed the results of the cluster analysis. I performed in-depth interviews with three persons representing the authority, the consultancy and the professional organisations based on interview plan and checklist.

The analysis of data obtained from questionnaires and interviews were examined with Pasw Statistics 18.0 (formerly known as SPSS 18.0) and SPSS Clementine program packages, for the preparation of figures Microsoft Office Excel software were used.

3. Results

3.1 Attitudes and opinions concerning quality systems

The 95% of respondents felt that quality systems have a palpable impact on the quality of fruits and vegetables to be marketed. The specific value of the answers is that nearly 70% of the questionnaires is filled out by professional staff. Opinions about the strength of this effect, however, divergent, 54% believe that it is significant, while 41% think that this effect is slight, as this is shown in Figure 1. The majority opinion of customer side is that the systems have slight effect, but processors evaluate it significantly more important than the retail respondents.

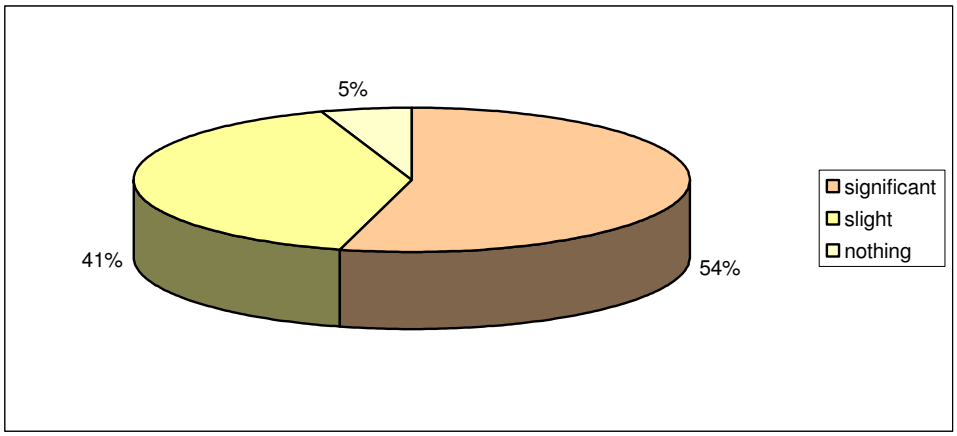

Figure 2: The general opinion of respondent about the systems' impact on quality

Respondents were asked to express their agreement or disagreement on Likert scale towards five statements about the future of quality schemes. Figure 2 shows two contrary claims with their judgments which mean the same.

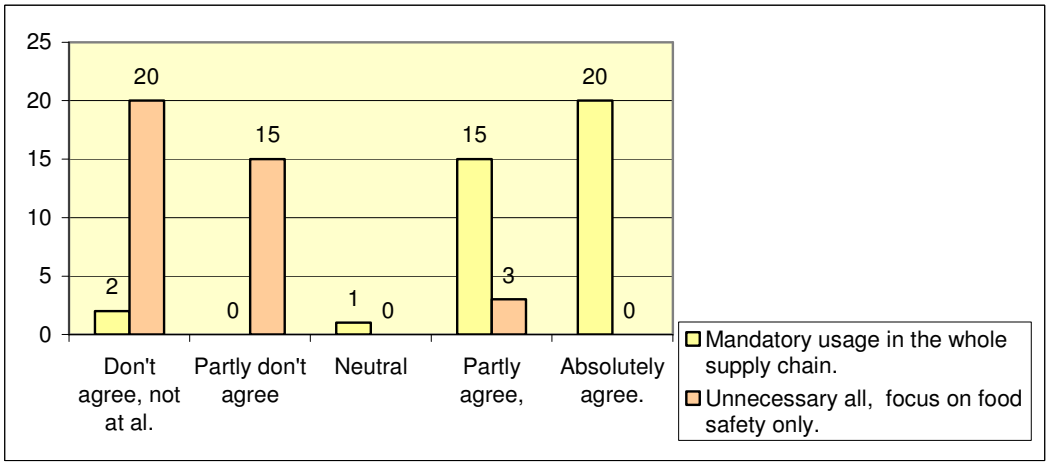

Figure 2: Comparison of opinions regarding quality application

The vast majority of respondents reject that there is no need for quality systems. They feel their impact on product quality, but they wish to change the current, somehow chaotic situation. According to 52.6% of the respondents usage should be mandatory in the entire food chain, and nearly 50% partially, 18% completely agree that the usage of a state-developed system would be the solution. Those who partly agree dispute the mandatory nature of the scheme. They agree that a voluntary state-run system is needed which can replace the international schemes in Hungary and they trust in the lower cost need. The representative of public administration argued against the mandatory nature, he thinks if the systems become mandatory, it reduces their value, they would become only "paper".

Eight general scheme factors have been identified which is inherent in almost every system and asked respondents to assess their importance. The Friedman test has proved that there are significant differences in the importance of the factors. The factors are plotted on Figure 3 based on their (converted) rank average. Four distinct groups of factors can be constructed based on the responses (for close couples Wilcoxon test was performed). The product quality is the most important (0.709 Wilcoxon test), traceability and hygiene were the second group (Wilcoxon test, 0.828), yet these are clearly more important for the respondents then the third category of environmental protection, occupational safety and sustainability. The marketing value of systems forms a separate group, which the respondents strongly devalued.

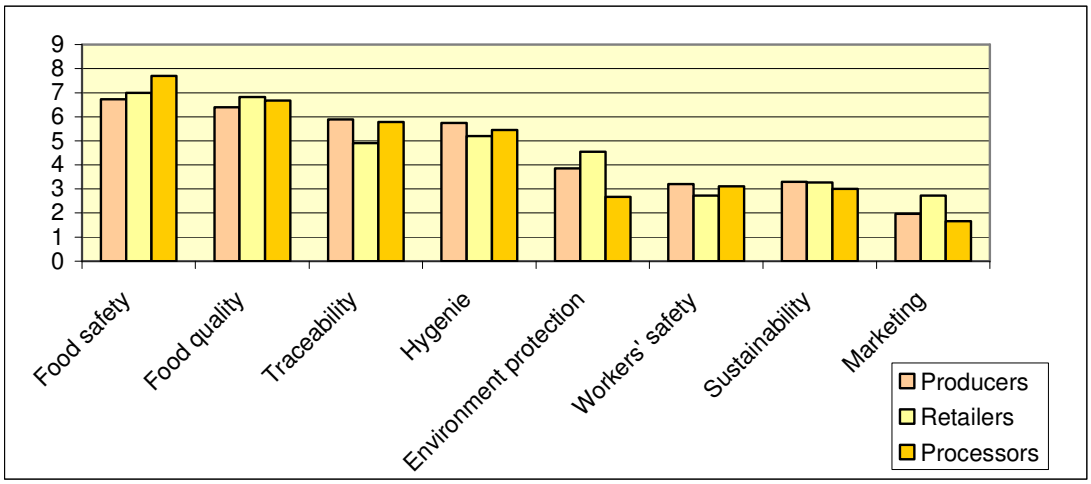

Figure 3: The importance of general scheme factors

The producer and consumer sectors have the same sequence, but buyers found much more important the product safety. The processors awarded the food processing parameters with crucial importance (product safety, hygiene, traceability) and revalued significantly compared to all other respondents.

3.2 Knowledge and application of quality schemes

The awareness and knowledge of quality systems are essential to the competitive production, the first step towards their application. The next figure (4.) shows the respondents knowledge of quality systems.

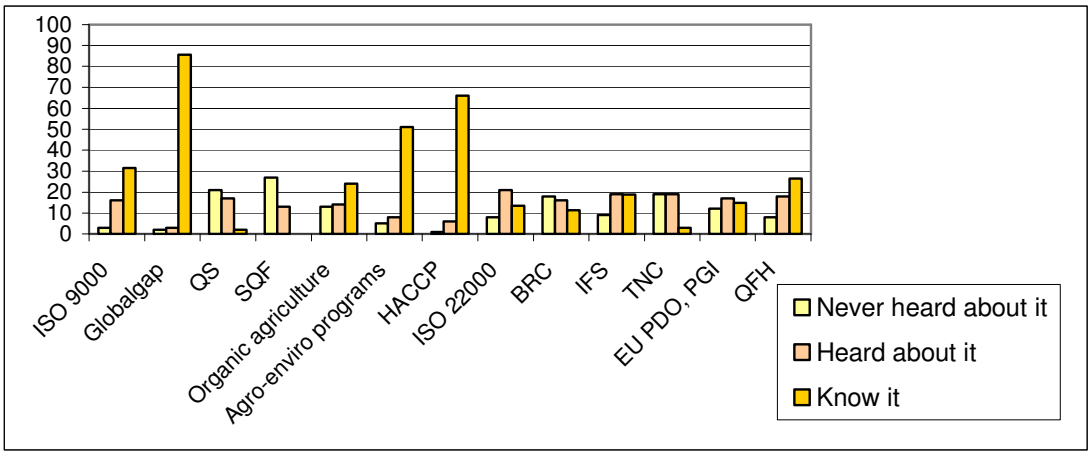

Figure 4: Respondents knowledge on quality schemes

The GlobalGAP system is the best known of more than 88% knowledge. The HACCP obtained a high (above 80%) rate of knowledge, because it must be applied for manipulation. The other food safety systems are poorly known. The EU geographical indications are almost unknown, it can be explained with their short history in Hungary, but also the Quality Food from Hungary is hardly known.

Respondents were also asked to estimate the current and future proportion of the systems. The responses were usually overestimated the survey results. Assessment of each system have very high deviation in the data, almost identical to their means, therefore I conclude that the respondents (neither side) have no information, knowledge on horticultural applications, therefore it would be particularly important to have records of the applied systems. The responses expect significant increase of operating systems in the 5 and 10 year prospective, but the ISO 9001 system.

3.3 Motivations towards system implementation

The respondents evaluated the pre-listed factors, the strength of their motivation in their case. The main motives are clearly their market retention, and their customers, trading partners' requirements but it is hardly behind finding new and international markets. The respondents did not trust that the system operation results in price premium, but they hoped for increasing their sales volume. The enhancement of product quality, the reduction in

customer complaints, and compliance with legislation were not decisive factors. Factor analysis was performed for identifying the latent factors behind the motivations. The factor analysis identified three factors behind the 11 listed factors (Figure 5).

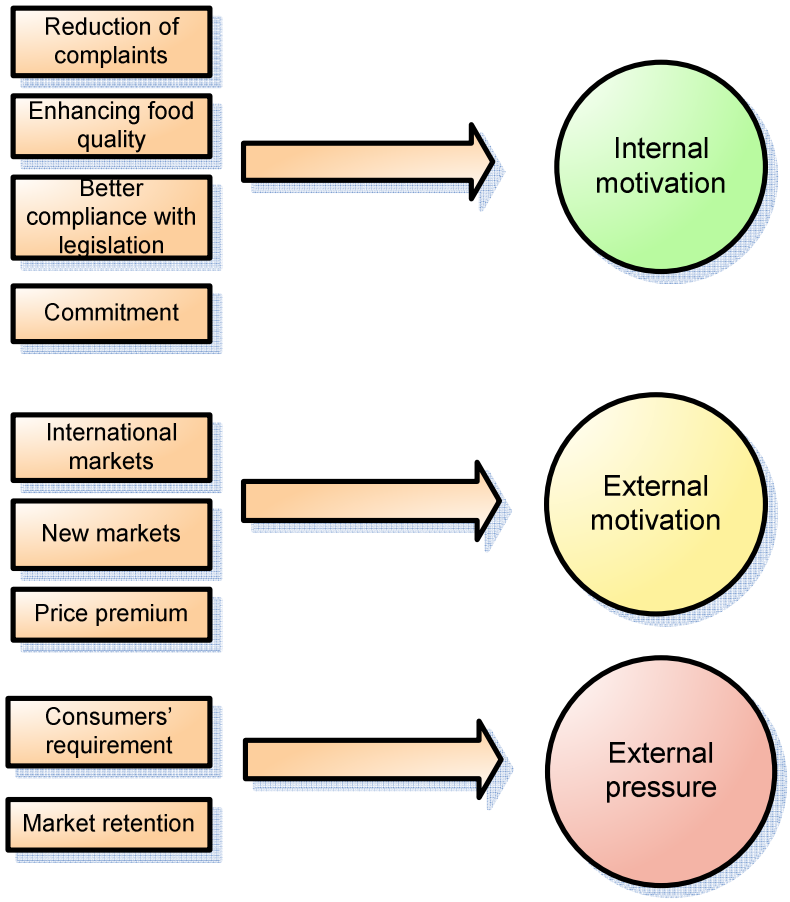

Figure 5: Identification of latent variables behind the motivations

The first factor consists of reduction of complaints, quality enhancement, formal compliance with legislation and a commitment towards their system. This latent factor is named after the nature of its contents: internal motivation. These factors derive from the company culture, management philosophy, direct external impact can not be found.

The second factor includes the international appearance, reaching new markets and price premium, this has been called to external motivation, because internal decision and the recognition of external needs are mixing.

The third factor contains the market retention and customer demand which are purely external requirement, independent from the company thus its name is external pressure.

Respondents were grouped into three major groups by cluster analysis method based on the factors above: the first group (cluster) internal motivation-driven (11 members), the second group external motivation-driven (8 members), while the third group external

pressure-driven (18 members) were. The significance level of the second factor was not significant.

Figure 6 shows the perceived separation of the three clusters. The horizontal axis is the external pressure and the vertical axis represents the internal motivation factor scores.

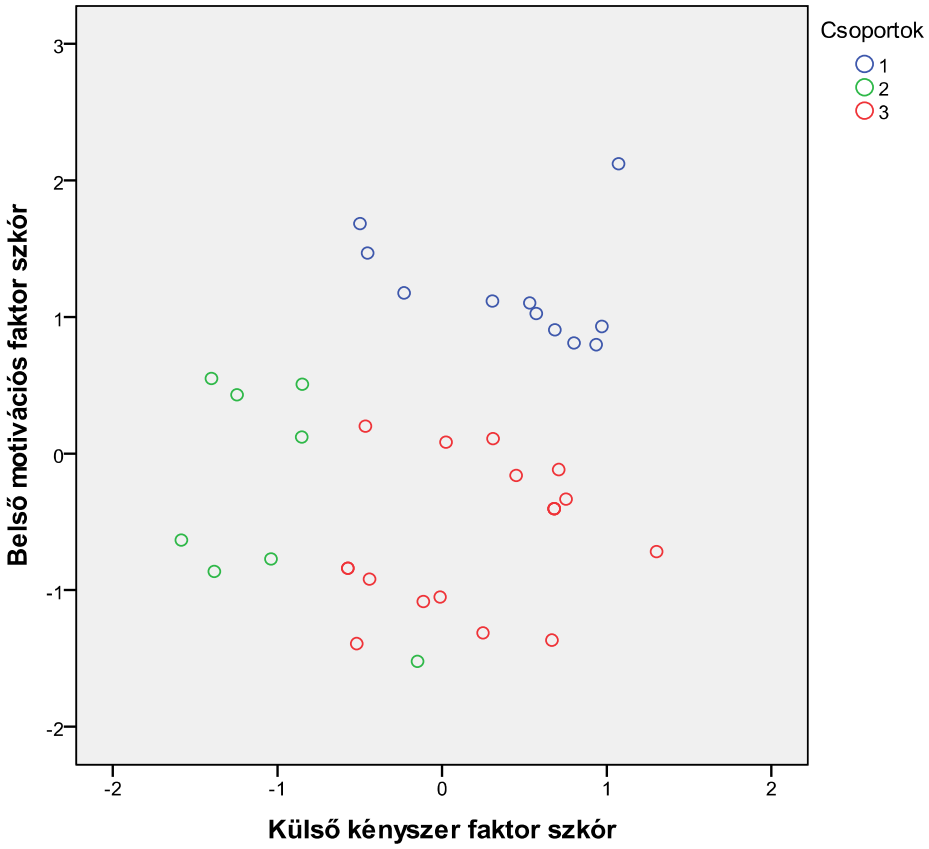

Figure 6: Respondent groups divided by cluster analysis, horizontal axis: external pressure score, vertical axis: internal motivation score

It shows that internal motivation-driven and non-driven members (first and non-first group) can be clearly separated based on the value of the internal motivation factor score. The second and third group is mainly distinguished by the power of external pressure involved. The clustering characteristic is proved by discriminant analysis.

Details of cluster attributes

In addition to differences in motivation, which is the main distinguishing factor between the groups, further differences can be observed. Substantive differences between the first and third factor-groups were observed, the group formed on the basis of the second factor has mixed properties.

Among the internal motivation-driven group the POs are dominant (91.7%), while in the external pressure groups PGs are more likely. The impact of quality systems is considered to be significant by internal motivation-driven group (75%), and its members vote rather for mandatory application, while in the other groups slight-significant votes have the same ratio, and more understanding of the systems unnecessity.

In the first group, the introduction of schemes carried out by staff at 30%; and they need shorter time to reach the smooth operation, and this is followed by the certification, while in the third group the task is entrusted to outsiders, first obtain a certificate, and then settled in the operation.

A higher proportion of internal motivation-driven consider too high the introduction and operational costs (80/50%). The steady aim of reducing consumers' complaint can be observed among these groups. Among the external pressure-driven there is a lower proportion of members involved in the Quality System.

3.4 The system application of respondents

More than 90% of the respondent organizations apply at least one system, only four of them are not operated at the time of the survey (Figure 7). It certainly be said that this result is biased in a positive direction in we consider the total horticulture. It is assumed that there is a higher rate in non-use among non-respondents. Among the respondents, however, comparing to the earlier opinions (data not known), this is a good result, but organizations usually involve a smaller group of their producing members into the system, approximately 50% participation in case of respondents.

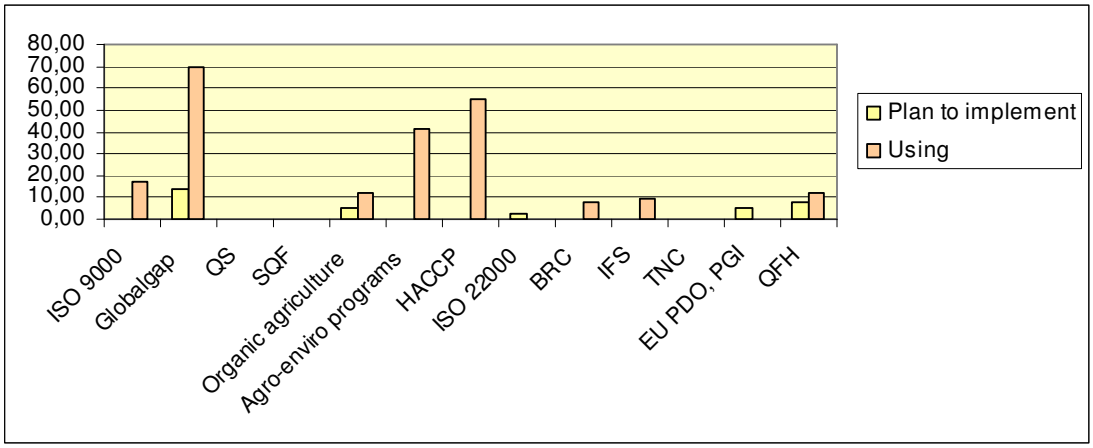

Figure 7: The applied systems of the respondents

The knowledge and application trends are similar, so the majority of respondents, nearly 70% is GlobalGAP certified, and then a further 14% planning to introduce it in the near future. The "popularity" is due to the demands of retail chains, but also the export is almost impossible without it. . The food safety systems were not common, their use is very low, except HACCP applied by processing and storage units. The application of Agro-Environmental Programs, in contrast to the weakness of their knowledge, is quite high, 66% reported participation in it. The ISO 9001 standard was no longer uncommon.

The proportion of organic farming organizations are 12% (5 pieces), it is very high compared to national statistics, but this can not be related to the overall formation, but it means that there members who are engaged in organic farming. The same amount uses Quality Food from Hungary system in case of at least one product, improve the image that there are other three organizations planning to introduce. This is a poor result, especially in such a way that almost 20% of the respondents have not known it-. The geographical indications of European Union are out of use, which can be explained that only in 2010 our first horticultural products have been accepted.

The traders and processors expect most the HACCP systems and their own suppliers' systems, and then GLOBALGAP, but in six cases (43%) they do not require any system. The HACCP is necessary in primary processing, and it is required in cultivation. GLOBALGAP is expected by the half of the retailer respondents, and processors mention it only two times as an advantage. Organic certificate is required when it is distinguished towards the customers. Both producers and customers mentioned the same systems, this confirms that producers apply the systems based on customer expectations. Product produced in compliance with any quality standards are not distinguished from others and do not gain a price premium but organic.

The first systems have been adopter in the '90s, almost exclusively ISO 9000. The introduction of ISO systems was supported by state subsidies (Sembery-Miller, 1999). Then a long pause, and from 2003 (1 IFS) the introduction of voluntary schemes has started (2004-6 GLOBALGAP, 4 AEP, 2 BRC; 2005-8 GLOBALGAP, BRC 5, 1 Eco) with the help of subsidies again.

System introducing has been decreasing in recent years, but still continuous, despite a radical contraction of support possibilities. I found only one PO operational program from which the majority of agriculture is excluded.

The grouping of respondent according to the number of applied systems can be seen in Table 2.

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Table 2: The grouping of respondent according to the number of applied systems

No. of applied schemes (pc)	No. of formations (pc)	Ratio (%)
None of them	4	9,52
1	11	26,19
2	12	28,57
3	9	21,43
4	3	7,14
5	1	2,38
6	2	4,76

50% of the respondents operate two or three systems parallel. The "recorders" participate in 6 programs at the same time (two responses). These clusters have ISO 9000, GlobalGAP and BRC certification, HACCP system in place, as well as participate in the agri-environmental and the Quality Food from Hungary program. The first 4, possibly 5 based on customer requirements or benefit. In some cases occur that next to the mandatory "basic" operating system (HACCP), other voluntary food safety system is used (BRC), which is not required in the domestic market and all users are export-oriented. Only four respondents did not use a single system, they supply processing and/or domestic retail units. It is perceived that the export-oriented firms use more systems, but no statistical proof.

Beyond the systems and their number there is a very important additional data the ratio of members and area involved. The two typical ratios are up to ¼ and at least ¾ of members involved. The small ratio shows connection to external pressure. In case of the second cluster internal decision led to certification in 36%.Examining the territorial basis, higher results occur. This may arise from the fact that the members involved have the bigger areas (second group between 25-50%). 4/5 of those who involved only small area have been forced by consumers to implement.

There is a significant difference between PGs and POs in implementation decision. In case of PGs there is a minor role of internal decision. Most of the respondents were under external pressure to introduce the system, based on business partner request / proposal. Only a little less, and this is good news, the management and the trade partners' joint decision, where the company decided with "some help" to launch the issue and then at last the individual internal decision came.

Time request

The smooth functioning required slightly less than 7 (6.87) months in average, and gaining the certificate slightly more than 7 months (7.13) in average. In case of the 30% of

respondents the system works properly after three months, but far fewer acquire the certificate in such a short period of time. Most frequently 4-6 months, but for a ¼ of respondents need a year to operate well and get the certificate. The certification takes place usually after the smooth operation but 17.6% of responses obtain the certificate before.. In these cases, external forces are dominated. Weak relationship detected between the implementing motivation and time till the smooth functioning. When the well-functioning is reached in short time, at least partly internal motivation decision occurs in 80%.

Consumers' requirement

In case of three respondents no one, in five cases approximately the 25% of the buyers request the certificate. In case of 18 answers - this is the most common case - the majority of customers (approx. 75%) require it, and all customers required in 4 cases. Almost all of the exported products are certified (asparagus, peppers, melons, nuts), however, products intended for the Russian market seem to be faced less expectation, nearly third of it not accompanied by a certificate. For domestic market the majority of the respondents' certified products (cherries and plums in many cases excluded). Only 50% the certification rate in case of berries.

3.5 Quality resources of respondents

Human resource

I also asked for the number of their quality trained employees. The average number of qualified stuff of the respondent organizations is almost 2 (1.95). 10 (26%) of the total 38 respondents have full-time worker for quality management (15 people), in part-time 60 persons in 30 organisations. Only six (40%) of the permanent staff graduated in quality, the other nine (60%) participated in courses. 13 of part-time employees have quality education, while 41 persons attended training courses. The information above I believe this is very weak and the small number of specialized workers may explain the previously described large external expert dependence.

The groups are reluctant to the do implementation by themselves (78% external). There is moderate strength association between motivation and the type of implementation. Where staff introduced scheme, the motivation for implementing was almost 100% internal, while those who have decided to introduce it by external pressure external experts are dominated.

Operation is managed by stuff in case of more than 80%, in 18% of new staff were recruited, while in 66% the old staff got the new tasks. This is partly due to the fact that

businesses are more confident themselves, since the frameworks, procedures and forms are in place, no need to implement a totally new thing. Second, the internal staff is "cheaper", and they willing to pay more money on implementation.

Information

In my interpretation I separated obtaining information and asking for help, because I think the first one is a passive information flow while the second needs activity from producers. 1/3 of respondents never search for official information. However, certain areas of quality are (e.g. food, hygiene, traceability) officially regulated and lack of knowledge can cause problems. The major source of first-hand information is certification bodies, only then standard owners come. The reason is that the certification bodies are present in the country, at least auditor level and can offer information in Hungarian whilst owners provide information mainly in English.

The consultants supply information to their clients in 75% even if the operation managed internally. Surprisingly, buyers play a smaller role, although they should influence more the quality of the products intent to buy. How is it possible to reach customer satisfaction, if the 16% of producers never get customer's info on quality of their customers?

I asked about active process of asking for information, because I think it paints more realistic picture on producers' activity. Respondents turn to certification and inspection bodies most common (66.7% have already requested), for help, followed by consultants (approximately 54%), then professional organizations (49%). In contrast, according to the in-depth interview primary producers help each other

The producers must be in contact with the members of the two groups (contractual obligations, audits) so this activity needs the least amount of activity. There are two explanations I have found the leadership of the certification and inspection bodies. One is that the real risk is in their opinions and judgments (certification, justification). The other is that - ideally - they have the most up to date, latest information, and producers have more trust in them (implicit professional advisors, date they are less). Academic, research and educational institutions have been asked for help only once.

3.6 Results of operated quality schemes

The most important result is maintaining their markets, more than 63% (maximum score 85%) of the respondents marked as very important. The phase systems, without many of the certificates could not be further supplied to at least some of their customers.

This ratio almost fully corresponds with the proportion of external pressure introduction. The following two result factors are the better compliance with and higher product quality (63, 62%) showing a minimal difference. A little behind is reaching new markets (international market presence and expanding the customer base).

The moderate results are reduction of complaints and a more efficient operation (45 to 44%). The introduction of systems typically does not yield any results in winning a tender, employee satisfaction. Eight respondents identified professional awards as a result of their quality system. The respondents mentioned three times in the Hungarian Agricultural Quality Award, three times for obtaining the Quality Food from Hungary, and twice the HORTICO Product Award. The main results and motivations can be seen together on Figure 8.

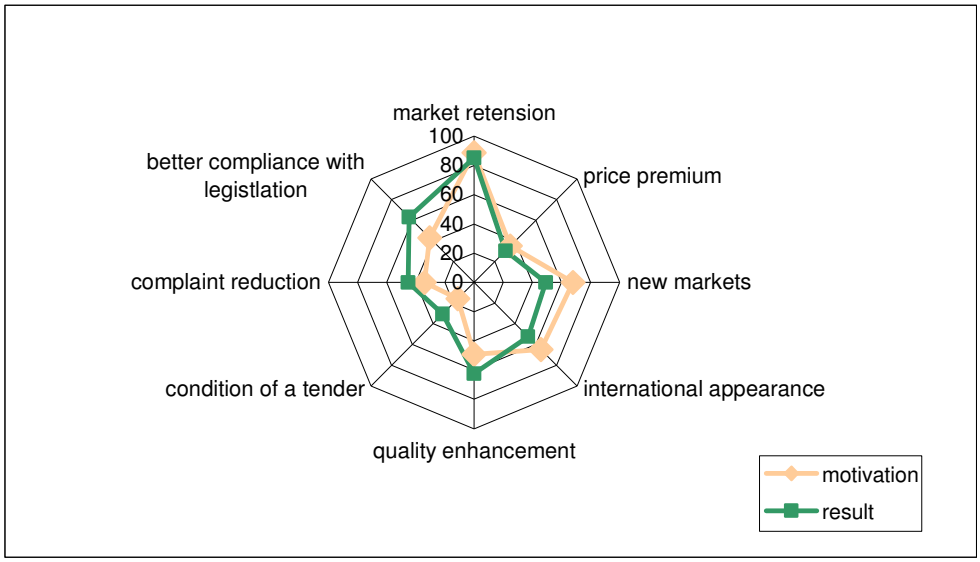

Figure 8: Motivations and result of respondents

The main motivation, the market retaining is almost succeeded totally. Finding new markets and international appearance are a little less than expected, the producers were more optimistic, very trusted that the certificate brings them new possibilities, and it have not been fully realised. The price premium is slightly below the expected; based on the replies of the trade - manufacturing survey respondents price premium is not available only with organic product yet not always.

The other less important motivations are exceeded. The customer complaints have decreased more then expect, it is due to the generally better product quality. The better compliance with legislation is because voluntary schemes and mandatory requirements overlap, as well as the more efficient, more transparent operating activities. Despite the fact

that the element is not evaluated in the tendering system, it helped in many cases the candidates.

Respondents mentioned as concrete result that systems in place facilitate the traceability and food safety, and resulting high percentage of first-class product, furthermore the overall management “more conscious, traceable", "more transparent and coherent". In one case, it is noted that the HACCP and GLOBALGAP improved the operating result as well.

Two main groups can be observed based on the result of systems: one as defined the system operation ad a required market condition, the other considers it as a tool of opportunity for emerging trust which fruits priority and better market opportunities.

3.7 Burdens, barriers related to quality systems

The described difficulties, obstacles of responses are shown on Figure 9.

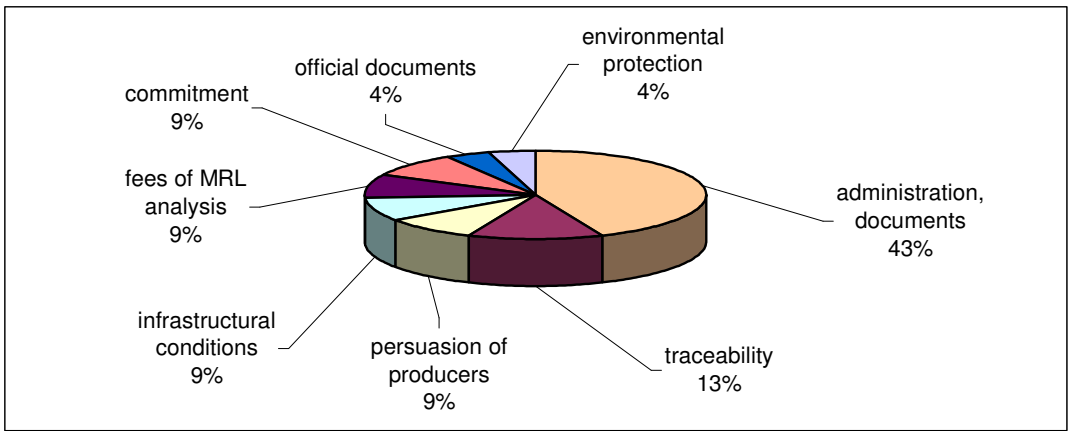

Figure 9: The hardest obstacles related to the operation of quality systems

The biggest barrier according to the respondents is the high cost associated with their introduction. The few (4) respondents who completed the questionnaire despite does not apply a quality system alluded to this as well. The situation concerning economic calculations of quality systems are bad. Only one of the 35 respondents has carried out any kind of economic calculation results, so when 90% of the respondents mention that operating a system overall results in increased cost this can not be considered as an established statement.

The most difficult requirement is meeting the burden of administration, the regular paper work, more than 40% complains of this and in-depth interviews confirmed it. Then the implementation of traceability (a required element), and persuading the farmers come. The personal/managemental commitment to creating a system, the infrastructure development to fulfill the requirements and the fee of MRL lab result got the same number of reference.

3.8 Willingness to introduce a(nother) system

The last question of survey was whether the respondents planned to introduce a(nother (more) quality system) in the near future. 26.7% of responses probable to introduce a further system, GLOBALGAP, QFH and ISO 22000 standard has been indicated. The respondents who are unlikely implement one planned expend the number of involved members. The others would introduce another system just in case if the market requires it. The introduction boom has over among the organisations, in my opinion, as most of them already have it.

3.9 Judgment of Hungarian horticulture by retailers and processors

I consider extremely important that Hungarian growers should know their customers' exact requirements, be aware of how they are assessed, which areas can and should develop in order to improve competitiveness. There is a brief summary of the customers' view.

I asked the retailer and processor respondents to assess some aspects of the Hungarian fruit and vegetable products and producers based on their experience. The predefined criteria were product quality, safety, the cultivation technique applied, the producers' supply discipline and the organisations' market organisation.

The quality of products received the highest value (3.8) in average, but still only ¾. Opinions state that quality is extremely volatile, variable; there are very good and very poor quality products on the market at the same. There were a little bit higher scores in in-depth interviews, but the same criticisms appeared. There was a comment that the quality is much better at the producer than what the buyer may experience on the counter. The food safety in graded 4 in deep interviews, whilst consumers gave only 3.3 and there is no a grade 5 among them.

Price is a sensitive area, so questions about it only were asked in open questions. In general the prices are acceptable, less expensive compared to Western Europeans, but in one case, the opposite appeared. It was mentioned that the producers can not live on it, and it is very volatile. The interviews also highlighted that the prices are low at the producers, and due to the commercial margins customer meet with much higher prices. The evaluation of technique, discipline of technology and supply were gained only the grade 3. The respondents approached the question in several point of views, two of them have also identified that there are fewer and fewer producer. According to one opinion producers can be divided into two groups: the professionals who are principally engaged, and the backyard growers, and the difference between them is enormous. The same proportion believes that "only small proportion is ready to supply multinational companies" and they are good professionals, but

"it is very difficult to explain to them the importance of new production and quality systems, and even more difficult to induce them to apply.... "

It is mentioned that they are not well organized and unable to structure their activities. Another criticism is that they can not unite, there is an explanation from an interview: "they do not trust in the current structure" or. - this leads to the following question –they are uncoordinated in activities. The POs‘ activities in market organization is very scarified, it gained 2.1-2-4 grades, this can derive from their bankruptcies and current problems, but the result is very weak and it is clear a change is needed.

The most difficult expectations for producers pointed out by traders, processors are the uniform high quality and quantity of supply, and ensure traceability. Perhaps these resulted in the high ratio of suppliers’ audits. More than 71% of them carry them out at least sometimes in spite of operated voluntary schemes.

3.10 New scientific results

- I studied the quality and knowledge of registered producer organisations and producer groups and their resources available for quality management by multivariate statistical methods. I found that their general knowledge on quality is poor, they are thoroughly aware of the requirements only of the used system(s), therefore they can not take advantage of the operated systems. Their professional stuff is less than two persons on average, and only 26% of the respondent has full-time employee dealing with quality, in my view, the high degree of external dependence can be explained by this situation.
- Analyzing statistically their motivations underlying the introduction of quality systems I reached to the conclusion, first, that although the primary effect is the external pressure, internal motivation and commitment have already appeared. Based on the listed motivational factors I have developed three latent factor by factor analysis: internal motivation, external motivation and external pressure. Cluster analysis has been used for making three distinct groups of respondent organisations (internal motivation-driven, external motivation-driven and external pressure-driven organisations). Discriminant analysis has confirmed the results of clustering.
- I have examined the system application patterns of registered producer organisations, 90% of the respondents use at least one system, but more typically operate in parallel. Globalgap is used in the largest proportion (70%), and a further 14% planning to introduce it in the near future. However, on average, only 50% of the members have involved in the systems. Voluntary food safety management systems (20%) are barely used except the mandatory HACCP system. Quality Food form Hungary scheme is used in 12%.
- I have also asked the fresh fruit and vegetable processing and retail sector by questionnaire to evaluate the Hungarian horticulture. I have explored judgment differences between producer and customer, discovered discrepancies in customers' expectations according to customers' type. Differences can be detected between customer types in the importance of product attributes; while retailers focus on product quality, product safety, traceability and hygiene are crucial for processors,

4. Conclusions and suggestions

The future trend of food supply chain clearly points towards regulation in all the elements, and horticulture as well must catch up with other actors. The only question is whether this regulation will be on voluntary or mandatory base. Some quality system – especially the basics – is already a minimum requirement, "quasi-mandatory" for retailers and processors. In practice they are transportation requirements in almost all cases (such as GLOBALGAP). In the light of present conditions it can be stated that the increase of quality systems in number is slowing, but their significance will not be decreasing. It is extremely important that all participants in the supply chain should understand the business processes, market dynamics and the nature of the operation, in which are affected.

Hungarian producers wishing to supply exporting or international companies, retail chains must use these world-wide-known and applied systems. The vast proportion of producer groups supply them typically have already used more than one quality system, so the situation is not so bad, at least in the "white" sector. The greatest disadvantage of the schemes is the administrative and financial burdens of them, and in case of the most commonly used basic systems revenue growth, price premium can not be achieved, although there is an increase in cost. The value-added systems typically serve only the retailers with price premium except organic production. In my opinion, it would be very important that the emerging new quality policy includes also the principles of system benchmarking to consolidate the burden of producers.

It is also observed that during introduction and operation due to the domination of external pressure producers do not consider the positive effect a system may results. The most important effect of the systems is changing the producers' mentality, forming their quality approach over the past decade. The care, control and more transparent processes may lead to increased operational efficiency, and if they do not consider the process for only "paper buying" instead of really application of a system, they can noticeably improve product safety and quality, making it easier to manage and reduce customer complaints and also helps meeting legislation. I think the incorrect activity of consultants that often force a general system-frame to the producers instead of tailor-sewed with a purpose of energy and cost saving (for themselves) are also adversely affect the quality of the emerging mentality.

The key to the successful operation of the producer groups is overcome resistance, the initial reluctance and increase the confidence in the organisations, which unfortunately is very difficult to achieve the seeing the Hungarian current conditions. International retail chains

nowadays have a power over suppliers. The forms of producers' associations (but in viable size!) can help to balance the power between producers and retail chains and purify the sector (the illegal market rate is about 25-30%). Secondary coordination is increasing in Hungary as well, but a I can see an opportunity in co-operation by product specification as well (e.g., tomato, red pepper producers). The specialization can also facilitate meeting the quality requirements.

At the same time, technological change can not be delayed either. The traditional systems should be revised, increasing efficiency, cost reduction are needed to meet consumer expectations. The infrastructure backlog harden the catch up, some of these are basically determined hygiene, food safety and quality which is inevitable in the market. In my view, the needed developments above are unfeasible in the poor Hungarian horticulture without state or community funds. The former quality related tenders, funds should be opened again, the survey data clearly show that implementation has been raised in tender years, because implementation needs much money in a short time, which is even greater burden on farmers. National and Community resources would be available (1698/2005 EC on support for rural development by the European Agricultural Fund for Rural Development).

Wider co-operations should be mentioned either vertical ones with traders, processors, but these relationships are not satisfactory based on the answers. There is only little information, no real information flow among them, but unfortunately this is also true for the direction of other actors (professional associations, research and educational institutions). Under the co-operations producers and institutions can share their problems, develop joint projects in order to increase the competitiveness, looking for answers on acute problems of and students may acquire practical experience in working together.

I recommend a combination of official control system and a voluntary scheme where certificate or verification of meeting the key requirements can be obtained for farmers selling for domestic markets. The system may substitute international schemes in domestic costing less, and authorities may have more data on producer. Furthermore, authority should recognize the operation of voluntary quality systems (as a positive discrimination) the frequency of official control would be based on risk. There a re many available consumer quality schemes and trademarks on the Hungarian market, but as a well-known, true regularly (independent) controlled system Quality Food from Hungary may only be accepted. I propose a certification scheme created specifically for fresh fruit and vegetables, which may be connected to the integrated official control. This would be a part of QFH as a sub-program (QFH Fresh!) for horticultural products, but successful community marketing is a must!

Publications published on the topic of dissertation

Publications in journals without IF:

1. Czeglédi M. (2011): A magyar kertészet minőségügyi helyzetelemzése, *Kertgazdaság,* in press
2. Czeglédi, M (2011): Analysis of Quality Schemes' application in the Hungarian Horticulture, *Acta Horticulturae,* in press
3. Czeglédi, M. (2010):Analysis of Quality Schemes in the Hungarian Horticultural Producers' Co-operatives, *Journal of International Scientific Publication: Ecology and Safety*, Vol. 4. 2:104-112 p.
4. Czeglédi, M. (2008): Quality assurance in the horticulture. *Annals of the faculty of Engineering Hunedora*, Vol 7. No. 2. 179-182 p.
5. Czeglédi M. (2007): A friss zöldségtermesztésben alkalmazható minőségügyi rendszerek bemutatása. *Zöldségtermesztés*, XXXVIII. (3) 15-19. p.
6. Mezei M. (2007): A minőségbiztosítás és lehetőségeinek ismerete a magyar kertészek körében. *Élelmiszervizsgálati Közlemények*, LIII. (1) 45-51 p.
7. Czeglédi M. – Kiss O. (2007): The significance of logos, brands and trademarks on the horticultural products. *Lucrari Ştiintifice* (Universitatea de Stiinte Agricole si medicina veterinara a Banatului, Timisoara) Seria I, IX (1), 313-321. p.
8. Czeglédi, M. – Ferencz, Á. (2006): Introduction of quality assurance system and its cost in the Hungarian horticulture, *Annals of the Faculty of Engineering Hundedora,* Vol. 5. No. III. 25-28. p.

Other publications in journals:

1. Czeglédi M. (2007): Tanulságok a minőségtanúsítás kapcsán. *Zöldség és Gyümölcspiac*, X (8-9-10) 18-19. p.

Conference publications (Hungarian, full paper):

1. Czeglédi M. (2009): A magyar TÉSZ-ek minőségügyi rendszerrel kapcsolatos motivációi és érzékelt eredményeik, Erdei Ferenc V. Tudományos Konferencia, Kecskemét, 3-5th September 2009, 590-595 p.
2. Czeglédi M. (2007): Quality assurance systems in the horticulture, Erdei Ferenc IV. Tudományos Konferencia, Kecskemét, 27-28th August 2007, 464-467 p.
3. Mezei M. (2005): Az élelmiszerbiztonság jelentősége és lehetőségei a kertészeti termesztésben, Erdei Ferenc III. Tudományos Konferencia, Kecskemét, 23-24th August 2005, Vol. I. 553-558. p.

Conference publications (Hungarian, abstract):

1. Ferencz Á. – Czeglédi M. (2007): Minőségbiztosítás szervezése és költségei a magyar kertészeti vállalkozásokban. Agrárgazdaság, vidékfejlesztés, agrárinformatika Nemzetközi Konferencia, Debreceni Egyetem, Agrártudományi Centrum, Agrárgazdasági és Vidékfejlesztési Kar, 20-21st March 2007.

International conference publications (English, full paper):

1. Ferencz Á. – Czeglédi M – Lévai P. – Berde Cs. (2010): The Role of Quality Schemes in the Hungarian horticulture, Special focus on the European Geographical Indications, 2010 2nd International Conference on Chemical, Biological and Environmental Engineering, 2-4th November 201, Cairo, Egypt
2. Czeglédi M (2009): Application of Quality systems of fresh fruit and vegetables, 2nd International Economic Conference, 2-3rd April 2009, University of Kaposvar, Kaposvár, electronic, 1-6. p.
3. Czeglédi M. (2009): Spreading of quality systems in horticulture, 44th Croatian & 4th International Symposium on Agriculture, 16–20th February 2009, Opatija, Croatia 149-152 p.
4. Czeglédi M. (2008): Quality assurance schemes in horticulture advantage or pre-requisite? 43rd Croatian & 3rd International Symposium on Agriculture, 18–21st February 2008, Opatija, Croatia 199-202 p.
5. Czeglédi M.(2007): Is horticulture the weakest link in case of food quality?, Youth seeks progress, Lithuanian University of Agriculture, 13-14th April 2007, 151-154. p.
6. Czeglédi M. – Ferencz Á.(2006): Quality assurance system for sustainability, Sustainability of the Agri-food chain, EFFoST, The Hague, The Netherlands, 7-9th November 2006, 316-320 p.
7. Mezei M. (2005): Labelling for safety and quality in Hungary, INTRADFOOD EFFoST Conference 25-28th October 2005, Valencia, Spain, Volume I. 573-577. p.

International conference publications (English, abstract):

1. Czeglédi M. (2010): Analysis of Food Quality Schemes' Application in the Hungarian Horticulture, IHC 2010, 22-27th August 2010, Lisbon, Portugal, Abstracts, Vol II. p. 626.