Pol. J. Food Nutr. Sci., 2011, Vol. 61, No. 2, pp. 115-124
http://journal.pan.olsztyn.pl

Original paper
Section: Food Quality and Functionality

DOI:10.2478/v10222-011-0012-x

Implementation of Safety Assurance System in Food Production in Poland

Joanna Trafiałek, Danuta Kołożyn-Krajewska*

Food Hygiene and Quality Management Chair, Warsaw University of Life Sciences – SGGW, Warsaw, ul. Nowoursynowska 159C, 02–776 Warsaw, Poland

Key words: HACCP, hardships, advantages

This study has examined the impact of Poland's accession to the European Union in 2004 and that of implementation of EU legal regulations in food legislation on the decision of the HACCP being implemented by middle and small size food production companies in Poland. Problems accompanying the system implementation and advantages ensuing it were reviewed. The biggest problems included the necessity of the processing plant incurring expenses and being revamped, incomprehension of the HACCP system idea by employees, and the quantity/quality barrier. The greatest advantage is an increase in employees' responsibility for production hygiene, improved safety of manufactured products, an increased prestige of the company and its products, a growth in employees' involvement in their work and enhancement of their qualifications as well as improved safety of manufactured products and maintenance of the market position.

INTRODUCTION

Poland's accession to the European Union made Polish food industry face multiple challenges. Polish enterprises had to make a huge effort to adapt themselves to EU requirements in food safety and hygiene and to face up to strong competition on the common European market.

The implementation of the HACCP system in Poland did not become obligatory until 1st May 2004 in all companies and enterprises of the foodstuffs sector notwithstanding their production type, size and specificity. This resulted from amendment of the Polish act on food and nutrition health conditions of 30th October 2003 [Journal of Laws 2003 No. 208 item 2020] which was in force in Poland prior to the implementation of EU regulations. Before that date, as from 2001, large plants employing more than 250 employees were obliged to fulfill HACCP principles, and as from 2002 – middle-sized plants employing 50–249 employees were obliged to do so as well. Thus, it was much later than in the states of the previous UE-15 that the obligation of the HACCP system implementation was introduced in the Polish food sector. Hence, the implementation of the health safety assurance system met with substantial resistance with entrepreneurs who did not think that implementation of HACCP principles was appropriate and justified.

Years 2001–2004 were a period of substantial transformations in Polish food-related law, leading to harmonization with EU regulations, particularly in food safety.

In 2004 EU food hygiene regulations were issued and regulations concerning official food control, the so-called "Hygiene Packet", which have been in effect since 1st January 2006 [Regulation No. 852/2004]. In compliance with Art. 5 of Regulation No. 852/2004, food business operators shall put in place, implement, and maintain a permanent procedure or procedures based on the HACCP principles. Hence, all the EU (inclusive of Polish) food sector plants have to assure health safety based on HACCP procedures.

The HACCP system is a specific novelty for Polish food manufacturers although it became an acknowledged currency of food health safety. The HACCP implementation status in Polish plants has not been known so far. There were only forecasts concerning its implementation degree in plants and suppositions were made as to difficulties that their implementation could involve and to advantages it could cause. The aim of the study was to assess and thoroughly review health food safety in small and medium-sized manufacturing plants in the light of Poland's accession to the European Union.

The implementation of the target of this paper involved the following:

- Assessment of the degree and causes of implementation of the HACCP system and GMP/GHP principles in small and medium-sized manufacturing plants prior to and following Poland's accession to the European Union;
- Review of advantages arising from implementation of the HACCP system in manufacturing plants under study;
- Review of difficulties emerging during the implementation of the HACCP system in manufacturing plants under study.

* Corresponding author:
E-mail: *joanna_trafialek@sggw.pl* (J. Trafiałek)

MATERIAL AND METHODS

The study was supposed to show the degree of preparation of Polish firms to the accession to the UE from the angle of implementation of EU legal regulations as well as proving to what degree has the accession altered food manufacturing safety. The degree of implementation of the HACCP system was assessed in small and medium-size manufacturing plants of different branches and in different locations (urban, rural) from the area of the whole country. The study was conducted in the form of a questionnaire (Table 1). It was carried out in two stages: prior to Poland's accession to the EU and 2nd stage following the accession. The proper study (1st and 2nd stages thereof) was preceded by a pilot study conducted in 2003.

The questionnaire consisted of 17 multiple-choice questions. The questions concerned the reasons for implementation of the HACCP system, the degree of its implementation, difficulties appearing during its implementation and benefits following implementation of the system in the plant. In both stages of the study, 500 plants were examined in each of them (250 small and 250 middle-sized plants).

The results obtained were computed in terms of statistical calculations by means of the Statistica 6.0PL packet (in the pilot tests exclusively percentage participation was calculated). In the proper tests (1st and 2nd stages thereof) by way of verifying whether the answers given by the plants under study differed prior to and following the accession, *i.e.* whether the fact of the accession influenced the opinion expressed, a method was used consisting in verification of significance of differences between two structure indices (structure index = percentage composition/100) (Table 2). With the aim of verifying hypotheses about dependence of different variants of answers to questionnaire questions on marked out factors a nonparametric χ^2 test was applied and for determination of the force of the relation between the variables, the value of φ-Yule index was calculated.

RESULTS AND DISCUSSION

In 2003, the year preceding the integration of Poland with the European Union, foodstuffs manufacturers were little involved in the implementation of the HACCP system. Pursuant to pilot studies, it was shown that only 30% of plants under study assured safety based on HACCP principles. Large plants were prepared to accession in terms of fulfillment of food regulations requirements where the HACCP system was implemented in 60%, while there was much lower percentage with implemented HACCP system: 20% and *ca*. 7%, respectively (Figure 1). It should be emphasized that such results reflected food law requirements that were then in force in Poland since only large plants were obliged to implement the system.

Pursuant to studies conducted prior to Poland's accession to the EU it was found that the degree to which the HACCP, GMP, and GHP systems were implemented in small and medium-sized manufacturing plants prior to the accession was also low. Only 26% of all plants (large, medium and small size) warranted food health safety based on the HACCP system principles. After the accession, the percentage of plants

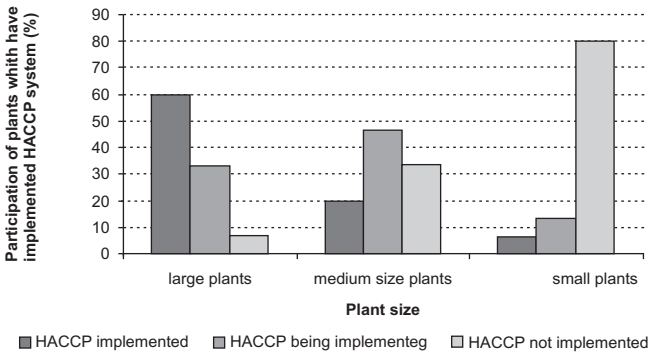

FIGURE 1. The degree to which Polish food manufacturers have implemented the HACCP system in 2003 – pilot studies (% of plants under study).

which implemented the HACCP system was also unsatisfactory even though it significantly increased to 40% (Figure 2). Similarly, unsatisfactory degree of the HACCP system was found in other domestic studies [Morkis, 2005], as well as in Polish catering entities [Czarniecka-Skubina, 2006].

Good Manufacturing Practice principles (GMP) and those of Hygiene (GHP) were implemented by 56% plants prior to the accession whereas one year later by as many as 77% plants and it was a statistically significant difference.

It was found that both prior to and following the accession, the HACCP system was implemented by a much larger group of medium than small size plants. Prior to the accession, the HACCP system was implemented by 16% small, and 34% medium size plants and following the accession by 26% small and 52% medium size ones.

A similar dependence of HACCP system implementation degree on the size of a plant expressed as the number of employed workers was shown by Mortlock *et al*. [1999] and Panisello *et al.* [1999] in English plants, Azanza & Zamora-Luna [2005] in Philippine plants, and in domestic plants by Bernat & Majka [2004], Konecka-Matyjek *et al.* [2005] and Morkis [2005].

It results from the subject matter of the literature that in other countries of the European Union, a larger degree

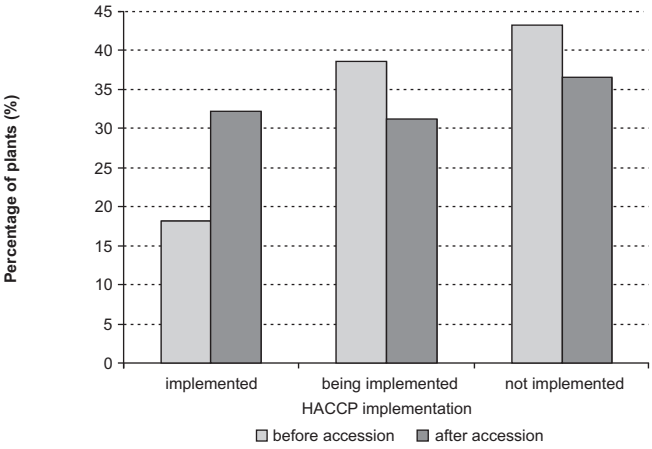

FIGURE 2. The HACCP system implementation degree in food manufacturing plants prior to and following Poland's accession to the European Union.

TABLE 1. Questionnaire applied in the study.

1. Did you heard and get knowledge of Polish Act on food and nutrition heath conditions amendment of 30.10.2003?

- ☐ Yes– please go to question number 2
- ☐ No – please go to question number 3

2. **Do you agree that HACCP implementation is crucial in all food enterprises regardless of their size and specific of action, according to Polish Act?**

Note: Amendment of Polish Act of 30.10.2003 obliges all food enterprises regardless of their size to implement HACCP rules

- ☐ Yes
- ☐ No

3. Did you implement HACCP system in your plant?

- ☐ No – please go to question 5
- ☐ In the progress of implementation – please go to question 4
- ☐ Yes – please go to question 5

4. At what stage is implementation of HACCP system in your plant?

Note:
End phase – The way of monitoring, corrective actions, verification methods and documentation are established,
Middle phase – hazard analysis and critical control points are determined
Beginning phase – HACCP team is established

- ☐ End phase
- ☐ Middle phase
- ☐ Beginning phase

5. Is any other quality system implemented in your plant?

- ☐ GHP/GMP
- ☐ QACP
- ☐ ISO 9000
- ☐ TQM
- ☐ ISO 14000
- ☐ Integrated Management System

6. What principal grounds for implementing the HACCP system are / will be in your enterprise?

- ☐ Polish Law Standard. Polish Act on of food and nutrition heath conditions amendment of 30.10.2003
- ☐ Quality and safety improvement
- ☐ Gaining domestic clients
- ☐ Gaining foreign clients
- ☐ Buyer standard

7. What sources of HACCP information were used by you?

- ☐ Internet
- ☐ Newspapers
- ☐ Professional papers
- ☐ Radio, TV
- ☐ Food Act
- ☐ Official food control (*e.g.* State Sanitary Inspection, Veterinary Inspection)
- ☐ Information from trainers and consultants

8. What kind of economic difficulties have / had you while implementing HACCP system?

- ☐ Changes in legislature
- ☐ Lack of information
- ☐ Recipients' pressure
- ☐ Financial outlay
- ☐ Modernisation

9. What kind of personal – merit difficulties have / had you while implementing HACCP system?

- ☐ Incomprehension of the idea of HACCP
- ☐ Not enough competent persons
- ☐ No time for training
- ☐ Distinguishing between CP and CCP
- ☐ Quantity/quality barier

10. What advantages concerning improvement in food safety you expect after HACCP implementation?

- ☐ Safety improvement
- ☐ Production process improvement
- ☐ Ordering of documentation
- ☐ Increase in employees' responsibility for production hygiene

11. What non-material advantages you expect after HACCP implementation?

- ☐ Increase prestige of the company and its products
- ☐ Change in attitude to work
- ☐ Involvements increase
- ☐ Employees' qualifications improvement
- ☐ Increase of information flow

12. What economic and material advantages you expect or observe after HACCP implementation?

- ☐ Demand increase
- ☐ Product competitiveness growth
- ☐ Maintenance of market position
- ☐ Acquisitions of clients at home
- ☐ Sales expansion abroad
- ☐ Fewer complaints
- ☐ Employment rightsizing

13. Do you expect plant modernization due to HACCP implementation?

- ☐ Yes – please go to question 14
- ☐ No – please go to question 15

14. If „yes" in which area?

- ☐ Machines
- ☐ Wastewater and waste management
- ☐ Department of raw materials
- ☐ Technological line
- ☐ Modification of some workplaces
- ☐ Storing facilities
- ☐ Pest control
- ☐ Storing of washing and disinfecting agents
- ☐ Transport
- ☐ Sanitary conditions
- ☐ Ventilation
- ☐ Lighting

15. Who has or would have the most difficulties in incomprehension of the HACCP system idea in your plant?

- ☐ Rank-and-file workers
- ☐ Managers
- ☐ Plant proprietors

Continued on the next page

16. Have you any information about financial support of HACCP implementation activity?
□ Yes
□ No
17. Are you willing to take the opportunity of financial support offered by any institutions?
□ Yes
□ No
Register questions
1. Size of enterprises
□ **Medium size enterprises** (50–249 employees)
□ **Small size enterprises** (0–40 employees)
2. Location
□ City
□ Country

3. Branches
□ Dairy products
□ Meat products
□ Fish products
□ Poultry products
□ Cereal products
□ Drinks and beverages
□ Fruit and vegetable products
□ Food components
□ Bakery and farinaceous products
□ Potato products
□ Oils and fats
□ Sugar industry
□ Ready-to-eat foods

of implementation of the system principles was observed much earlier than in Poland [Panisello *et al*., 1999; Beyer & Krieger, 2004]. In the opinion of Rothkaehl [2004], a much lower degree of HACCP system implementation in Poland as compared with the EU-15 countries was connected with a different economic situation in our country. After the Second World War, eight out of ten new member states (including Poland) had a difficult and different economic development route than that of the EU-15, so they had to introduce basic changes in their economies.

Small and medium size manufacturing plants, implemented optional quality or environment assurance and management systems to a low degree (QACP, TQM, ISO 9000, ISO 14000). The most commonly implemented system was the quality management system compliant with ISO 9000 standards (*ca*. 14% prior to and *ca.* 18% following the accession), while the other systems were implemented by a very small percentage of firms.

Factors determining the HACCP system implementation degree were identified based on statistical calculations conducted. Both prior to and following the accession, the HACCP system implementation degree was influenced by: the size of the plant, implementation of GMP/GHP principles, employees' training, implementation of quality management systems, knowledge of amendments in the act on health conditions of food and nutrition of 30th October 2003 and the knowledge concerning possibilities of additional financing of implementation activities (Figure 3). The force of impact of those factors on the HACCP system implementation status prior to the accession was large (clear) or moderate. Whereas following the accession it was found that the size of the plant, its possession of quality assurance systems and knowledge concerning amendments had a lower impact, while the importance of additional financing increased. The impact of implementation of GMP/GHP principles and participation in HACCP training remained unchanged in the implementation of the HACCP system.

The studies conducted also gave an answer to questions concerning the sources of the knowledge from which the plants managers obtained information on the HACCP system. Prior to the accession, the largest number of plants used the Internet, the second largest number used training officers' experience, and the third largest number – legal acts. Following the accession, the largest number of plants made use of legal acts, then, as before the accession, from training officers' knowledge and the third place was taken by the Internet and branch press. The specified sources of knowledge varied the degree of the HACCP system implementation. The implementation of the system, both prior to and following the accession, was statistically significantly influenced by the use of legal acts, the Internet, branch press and an official food control body. The influence of those factors was definitely stronger prior to than following the accession.

When summing up the results concerning the HACCP system implementation degree it should be said that both prior to and following the accession, the HACCP system implementation degree was not influenced by such factors as: the plant branch, its location, and certain sources of knowledge of the system such as daily press, radio, or television.

Difficulties accompanying the implementation of the HACCP system, both prior to and following the accession, were considered in terms of three categories: (1) economic; (2) personal and that concerning the merits of the subject matter, and (3) that concerning modernization.

The largest economic difficulties, both prior to and following the accession were caused by financial outlay and the necessity of revamping the plant as indicated by 70% of the plants and variability of food-related legislature, as declared by 45% of the plants. The other difficulties in this category are presented in Figure 4. No statistically significant difference in the frequency of indicating specific economic difficulties following the accession was found with relation to the period prior to the accession.

Modernization expenses were by food manufacturing plants connected directly with the HACCP system implementation, which can be proved by a nearly identical percentage of plants declaring the necessity of incurring financial outlay and modernization of the plant. Obviously, an improvement in technical and hygiene conditions and investment related therewith included a high financial outlay but they did not di-

TABLE 2. Data of statistical analysis.

No.	Question	Answer	Before accession		After accession		α^g
			N	%	N	%	
1	Knowledge of Polish Rule on Food and Nutrition	No	101	39.7	66	21.7	0.02*
		Yes	153	60.2	238	78.2	0.00*
2	Acceptation of Polish Rule	No	153	60.2	170	55.9	0.47
		Yes	101	39.7	134	44.0	0.54
3	Implementation of HACCP	No	55	21.7	46	15.2	0.37
		In the progress of implementation	131	54.6	133	43.7	0.08
		Yes	65	25.6	122	40.1	0.04*
4	HACCP implementation phases	End phase	43	16.9	67	22.0	0.52
		Middle phase	43	16.9	35	11.6	0.54
		Beginning phase	48	18.9	36	11.8	0.39
5	Other system	GMP/GHP	143	56.2	234	76.9	0.00*
		QACP	4	1.57	3	0.98	–
		ISO 9000	35	13.7	56	18.4	0.62
		TQM	1	0.39	3	0.98	–
		ISO 14000	2	0.78	5	1.64	–
		Integrated Management System	13	5.11	16	5.26	1.00
6	Principal grounds for implementing the HACCP system	Polish Law Standard	207	81.4	214	70.3	0.01*
		Quality and safety improvement	140	55.1	177	58.2	0.59
		Gaining domestic clients	97	38.1	145	47.6	0.13
		Gaining foreign clients	81	31.8	118	38.8	0.39
		Buyer standard	165	64.9	188	61.8	0.56
7	Information about food akt	Internet	160	62.9	159	52.3	0.05*
		Newspapers	85	33.4	90	29.6	0.67
		Professional papers	89	35.0	158	51.9	0.01*
		Radio, TV	63	24.8	71	23.3	0.79
		Food Act	126	49.6	184	60.5	0.05*
		Institutions	104	40.9	117	38.4	0.65
		Information from trainers and consultants	139	54.7	167	54.9	1.00
8	Economic difficulties	Changes in legislation	116	45.6	139	45.7	1.00
		Lack of information	78	30.7	65	21.3	0.18
		Recipients' pressure	60	23.6	78	25.6	0.79
		Financial outlay	190	74.8	226	74.3	0.82
		Modernisation	179	70.4	217	71.3	0.83
9	Personal and essential difficulties	Incomprehension of the idea of HACCP	169	66.5	184	60.5	0.24
		Not enough competent personnel	92	36.2	125	41.1	0.46
		No time for training	116	45.6	148	48.6	0.63
		Distinguishing between CP and CCP	76	29.9	102	33.5	0.57
		Quantity/quality barrier	130	51.1	157	51.6	0.87
10	Advantages concerning health safety improvement	Safety improvement	153	60.2	210	69.0	0.08
		Production process improvement	116	45.6	140	46.0	1.00
		Ordering of documentation	154	60.6	145	47.6	0.02*
		Increase in employees' responsibility	188	74.0	201	66.1	0.09
11	Declared non-material advantages	Prestige increase	174	68.5	236	77.6	0.02*
		Change in attitude to work	125	49.2	160	52.6	0.50
		Involvement increase	150	59.0	182	59.8	0.85
		Employees' qualifications improvement	140	55.1	168	55.2	1.00
		Increase of information flow	87	34.2	102	33.5	0.87

Continued on the next page

12	Declared economic and material advantages	Demand increase	112	44.0	148	48.6	0.42
		Product competitiveness growth	135	53.1	166	54.6	0.73
		Maintenance of market position	158	62.2	183	60.1	0.71
		Acquisitions of clients at home	123	48.4	178	58.5	0.05*
		Sales expansion abroad	97	38.1	113	37.1	0.88
		Fewer complaints	82	32.2	128	42.1	0.15
		Employment rightsizing	25	9.84	39	12.8	0.72
13	Making modern	No	15	5.90	32	10.5	0.59
		Yes	239	94.0	272	89.4	0.07
14	Type of modernization measures	Machines	112	44.0	30	9.86	0.00*
		Wastewater and wastes management	48	18.8	118	38.8	0.01*
		Department of raw materials	114	44.8	85	27.9	0.02*
		Technological line	69	27.1	120	39.4	0.05*
		Modification of some workplaces	78	30.7	69	22.6	0.28
		Storing facilities	107	42.1	119	39.1	0.65
		Pest control	120	47.2	116	38.1	0.16
		Storing of washing and disinfecting agents	79	31.1	117	38.4	0.32
		Transport	100	39.3	106	34.8	0.55
		Sanitary conditions	159	62.5	127	41.7	0.00*
		Ventilation	90	35.4	176	57.8	0.00*
		Lighting	59	23.2	103	33.8	0.14
15	Problems with understanding the idea of the HACCP	Rank-and-file workers	201	79.1	259	85.1	0.09
		Managers	77	30.3	70	23.0	0.34
		Plant properties	81	31.8	89	29.2	0.67
16	Knowledge of financial support	No	88	34.6	82	26.9	0.26
		Yes	166	65.3	221	72.6	0.09
17	Financial support utilization	No	167	65.7	204	67.1	0.84
		Yes	87	34.2	98	32.2	0.77

* statistically significant differences at $\alpha=0.05$; α^g null hypothesis is refused (significant value $\alpha=0.05$).

rectly concern the necessity of HACCP system implementation [Turlejska, 2004]. Large financial resources for modernization of plants in Poland were caused by the necessity of meeting EU hygienic as well as veterinary requirements [Ullmann, 2006].

The conducted studies reported that the most frequently mentioned personal problem and that regarding the merits, specified in questionnaires, was incomprehension of the HACCP system idea by employees (prior to the accession 67%, following the accession 61% of plants), and in the second place, the quantity/quality barrier (prior to and following the accession 51% of plants). The quantity/quality barrier is defined as prevalence of quantitative manufacturing over manufacturing of products of desired quality. Difficulties in that category are presented in Figure 5. No material difference was found in the frequency of particular personal indications and those referring to the merits following the accession with relation to the pre-accession period. The smallest amount of personal difficulties and those referring to the merits was created by distinguishing Critical Control Points from Control Points, which was indicated by *ca*. 30% of plants under study. Problems connected with incomprehension of the system idea and the lack of expertise were often indicated in available literature data [Vela & Fernández, 2003; Azanza & Zamora-Luna, 2005; Baş *et al*., 2007]. Also Kafel & Sikora [2004] in domestic studies concerning barriers in the implementation of quality management systems, indicated that there were not enough training courses and competent persons in the plants.

The implementation of the HACCP system is connected with the adaptation of plants to obligatory hygiene standards included in the Annex to Regulation 852/2004 and the Food Hygiene Basic Texts: Codex Alimentarius [2003]. In the studies conducted, it was found that 94% of firms prior to the accession and 89% following the accession had to revamp their plants. No significant change was found in the frequency of indication of particular modernization difficulties following the accession with relation to the pre-accession period. Observations made by Ziajka *et al.* [2001] showed that a helpful tool in modernization of a plant is a modernization plan and its lack may lead to erroneous decisions exposing firms to unjustified expenses. It should be supposed that Polish plants did not carry out any systematic modernization strategy and therefore, with such a high frequency, they indicated difficulties connected with plant modernization.

From results obtained in the said questionnaire study, it was defined what advantages arising from the implementa-

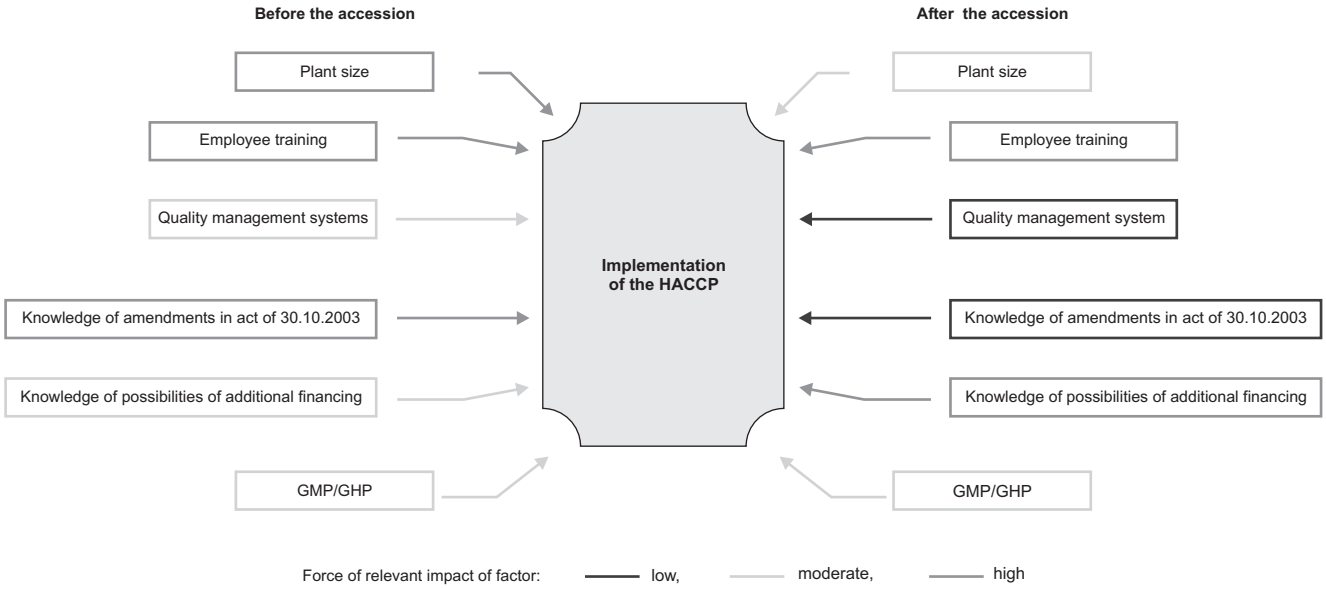

FIGURE 3. Factors substantially influencing the HACCP system implementation degree prior to and following Poland's accession to the European Union.

tion of HACCP were indicated by plants in both study stages. The advantages were considered in three categories: (1) those concerning improvement in food safety, (2) non-material (3) economic and material.

The most frequently indicated advantage concerning improvement in food safety was an increase in employees' responsibility for production hygiene (prior to the accession 74%, following the accession 66% of the plants) (prior to the accession 60%, following the accession 69% of the plants). The other advantages in this category are presented in Figure 6. It was found that merely the ordering of the documentation as an advantage following the implementation of HACCP, was declared by a significantly smaller number of plants following the accession that prior to the accession. It should be acknowledged that there were more plants that maintained documentation, which resulted from the HACCP implementation degree, activities of the official food control body checking, *i.a.* the documentation [GIS, 2006] and a larger number of certified quality systems in plants belonging to the foodstuffs sector [Strada *et al*., 2005]. For those reasons,

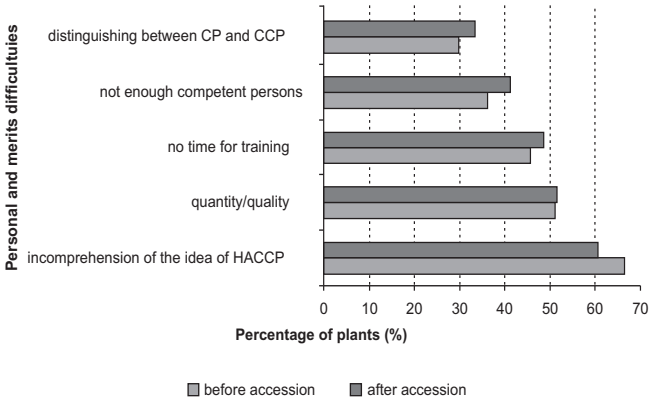

FIGURE 5. Personal and merits difficulties accompanying the implementation of HACCP prior to and following Poland's accession to the European Union.

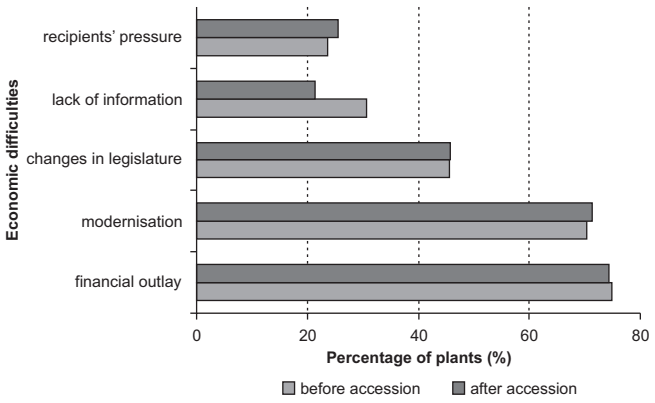

FIGURE 4. Economic difficulties accompanying HACCP system implementation prior to and following Poland's accession to the European Union.

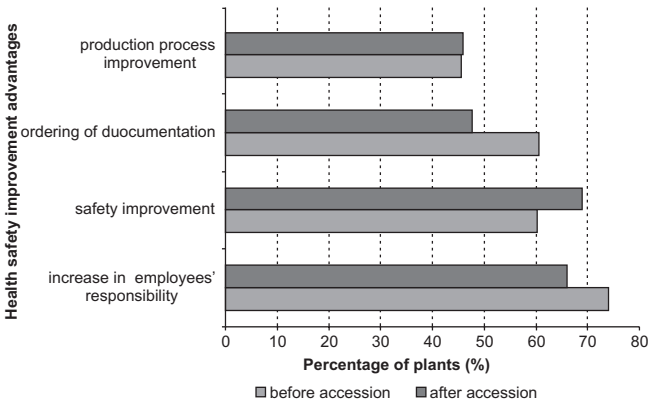

FIGURE 6. Advantages concerning health safety improvement following the implementation of the HACCP system in the plants under study prior to and following Poland's accession to the European Union.

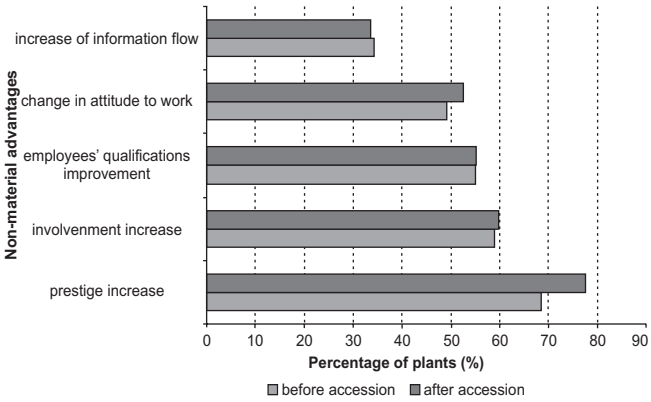

FIGURE 7. Declared non-material advantages following the implementation of the HACCP system in plants under study prior to and following Poland's accession to the European Union.

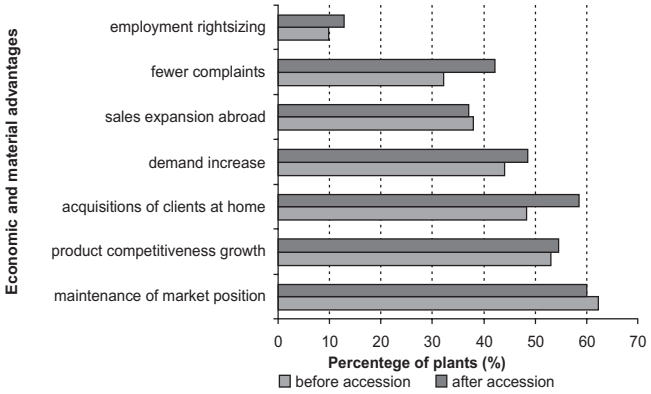

FIGURE 8. Declared economic and material advantages following the HACCP system implementation in plants under study prior to and following Poland's accession to the European Union.

after the accession, possessing documentation became a specific standard and the plants did not treat as an advantage.

The health safety improvement showed in the authors' own studies was also found in English [Panisello *et al*., 1999], Finnish [Hielm *et al*., 2006], and American studies [Kvenberg *et al*., 2000] and it was considered in the aspect of international trade [Motarjemi *et al*., 1996]. The authors' own results obtained from the study making nearly equal an improvement in product safety with an increase in employees' responsibility, should be construed in the context of transference of responsibility for product quality onto employees directly connected with production, making them responsible for Critical Control Points [Bernat & Krupa, 2004]. This complies with the system philosophy since a precise definition of responsibility and rights of persons participating in foodstuffs production is necessary [Ziajka & Dzwolak, 1998].

In the group of non-material advantages, the most important was an increase in the firm's prestige. Such an advantage was declared by 67% plants prior to the accession and 78% of the plants after the accession. A statistically significant increase was found in the number of plants declaring such an advantage following the accession. The other non-material advantages are presented in Figure 7.

In the plants under study, a high participation was reported of advantages connected with a change in employees' attitude to the work effected thereby, which was not confirmed by Henson *et al.* [1999] in the English plants. Other advantages that are specified in available literature data can be classified as non-material ones, *e.g.* clients' satisfaction and contentment [Panisello *et al.*, 1999; Beyer & Krieger, 2004], confidence in one's own products [Panisello, *et al*., 1999; Taylor, 2001], or an increase in employees' work satisfaction [Beyer & Krieger, 2004].

In the group of economic and material advantages, those most frequently indicated were the maintenance of its market position following the HACCP system implementation, which was declared by more than 60% of the plants in both study periods. Economic and material advantages are presented in Figure 8. It was found that following the accession, a significantly greater number of plants declared acquisition of new clients at home after the HACCP system implementation.

In available literature data, also other economic and material advantages following the HACCP system implementation are analysed, including reduction of overtime and raw material losses, a decrease in the number of corrective actions and a reduction in non-productive working time [Beyer & Krieger, 2004]. In the authors' own studies, an analysis of such economic advantages would be impossible due to a different knowledge level of Polish foodstuffs manufacturers on the HACCP system while this study was being conducted and a low level of the HACCP system implementation in Polish plants.

When summing up difficulties and advantages arising from the HACCP system implementation in the group of small and medium-sized enterprises of the foodstuffs sector in Poland, advantages and difficulties indicated by more than a half of plants under study were compared (Figure 9). Advantages from the HACCP system implementation in plants belong-

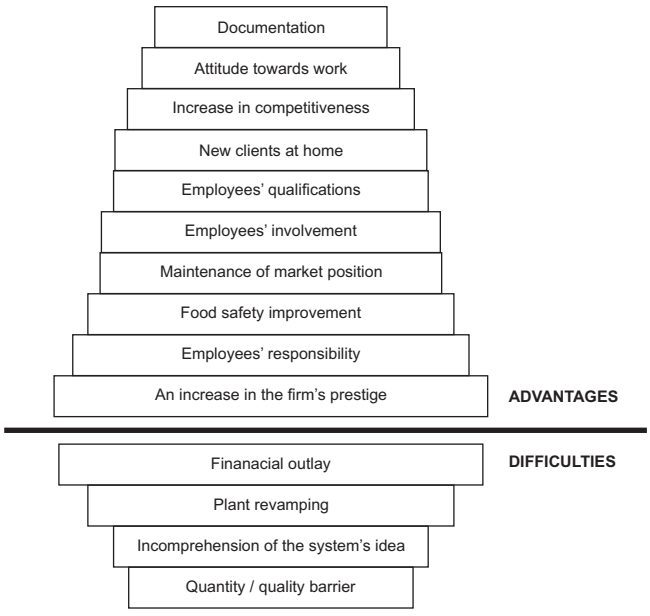

FIGURE 9. Difficulties and advantages of the implementation of the HACCP system in the group of small and medium-sized enterprises of the foodstuffs sector in Poland, indicated by more than 50% of the plants.

ing to small and medium enterprises in Poland both prior to and following the accession, considerably exceeded difficulties emerging during the system implementation process.

The HACCP system represents a standard in international foodstuffs trade [Unnevehr & Jensen, 1999]. It became a warranty of food safety and Polish manufacturers after overcoming implementation hardships now obtain numerous advantages from the application of the HACCP system in practice.

CONCLUSIONS

1. In the year preceding Poland's accession to the European Union, merely 30% of food industry plants under study assured health safety in conformity with the HACCP system regulations and those were principally large plants.

2. The degree of implementation of the HACCP system in small and medium size food industry plants was much greater after (40% of the plants), than prior to (26% of the plants) Poland's accession to the European Union.

3. A much lower percentage of small plants declaring implementation of the HACCP system as compared with the percentage of medium size plants both prior to and following Poland's accession to the European Union.

4. In the plants under study, several advantages arising from implementation of the HACCP system were indicated and the most important of them included: an increase in employees' responsibility for production hygiene, an improvement in manufactured products safety, an increase in prestige of the firm and its products, an increase in employees' involvement in their work, an improvement of employees' qualifications, an increase in competitiveness of products on the domestic and foreign markets and maintenance of its market position, both prior to and following Poland's accession to the European Union.

5. Employees engaged in the implementation of the HACCP system encountered various difficulties such as the necessity of incurring investment outlays and modernization of the plant, incomprehension of the HACCP system idea and the quantity/quality barrier both prior to and following Poland's accession to the European Union.

6. The most important factors determining the degree of implementation of the HACCP in small and medium plants prior to the accession, were: the size of the plant, employee training and the knowledge of amendments in food law, while following the accession these were: employee training and the knowledge of possibilities of acquiring additional funding for implementation related activities.

REFERENCES

1. Azanza Ma.P.V., Zamora-Luna M.B.V., Barriers of HACCP team members to guideline adherence. Food Contr., 2005, 16, 15–22.
2. Baş M., Yüksel M., Çavuşoglu T., Difficulties and barriers for the implementing of HACCP and food safety systems in food businesses in Turkey. Food Contr., 2007, 18, 124–130.
3. Bernat E., Krupa K., The owner's surveillance and production quality in the meat industry, 2004, *in*: Quality Tools in Quality Improvement and Management (eds. T. Sikora). Published by AE Kraków, Poland, pp. 142–150 (in Polish).
4. Bernat E., Majka A., The HACCP system in meat industry enterprises, 2004, *in*: Quality Tools in Quality Improvement and Management (eds. T. Sikora). Published by AE Kraków, Poland, pp. 151–155 (in Polish).
5. Beyer J., Krieger S., Kunden und Mitarbeiter profitieren. Fleischwirtschaft, 2004, 84, 59–60 (in German).
6. Codex Alimentarius. Recommended International Code of Practice. General Principles of Food Hygiene, 2003, CAC/RCP 1 – 1969, Rev. 4, 2003.
7. Czarniecka-Skubina E., The quality of catering service in its nutritional, technological and hygiene aspects. Żywn. Nauka. Technol. Jakość, 2006, 46, 25–34 (in Polish).
8. Główny Inspektorat Sanitarny 2006. The Main Sanitary Inspector's Office 2006. [www.gis.gov.pl]; accessed 10.08.2006 (in Polish).
9. Henson S., Holt G., Northen J., Costs and benefits of implementing HACCP in the UK dairy processing sector. Food Contr. 1999, 10, 99–106.
10. Hielm S., Tuominen P., Aarnisalo K., Raaska L., Maijala R., Attitudes towards own-checking and HACCP plans among Finnish food industry employees. Food Contr., 2006, 17, 402–407.
11. Kafel P., Sikora T., Barriers in the implementation of the quality assurance system in Polish enterprises. Organizacja i Zarządzanie. 2004, 118, 103–112 (in Polish).
12. Konecka-Matyjek E., Turlejska H., Pelzner U., Szponar L., Actual situation in the area of implementing quality assurance systems GMP, GHP and HACCP in Polish food production and processing plants. Food Contr., 2005, 16, 1–9.
13. Kvenberg J., Stolfa P., Stringfellow D., Garrett E.S., HACCP development and regulatory assessment in the United States of America. Food Contr., 2000, 11, 387–401.
14. Morkis G., Quality management systems in food industry enterprises 2005, *in*: A multiple-year program 2005–2006 – Economic and social conditions of development of Polish food economy following Poland's accession to the European Union, Published by IERiGŻ (in Polish).
15. Mortlock M.P, Peters A.C., Griffith C., Food hygiene and hazard analysis critical control point in the United Kingdom food industry: practices, perceptions and attitudes. J. Food Protect., 1999, 62, 786–792.
16. Motarjemi Y., Käferstein F., Moy G., Miyagawa S., Miyagishima K., Importance of HACCP for public health and development. The role of the Word Health Organization. Food Contr., 1996, 7, 77–85.
17. Panisello P.J., Quantick P.Ch., Knowles M.J., Towards the implementation of HACCP: results of a UK regional survey. Food Contr., 1999, 10, 87–98.
18. Rothkaehl J., Consequences of the EU expansion in the aspect of cereal production and grain mill processing. Przegl. Piekarniczy i Cukierniczy, 2004, 52, 4–6 (in Polish).
19. Regulation (EC) No 852/2004 of the European Parliament and of the Council of 29 April 2004 on the hygiene of foodstuffs. Official Journal of the UE L 139 of 30th of April 2004 p. 1.
20. Strada A., Morkis G., Trafiałek J., Kołożyn-Krajewska D., Safety and Quality Assurance and Management Systems: Level of Implementation in Food Enterprises in Poland, 2005, *in*: The Food Industry in Europe, Erasmus Intensive Programme in Agri-Business Management with emphasis in Food Industry Enterprises, pp. 97–114.
21. Taylor E., HACCP in small companies – benefit or burden. Food Contr., 2001, 12, 217–222.

22. Turlejska H., HACCP is still argumentative. Bezpieczeństwo i Higiena Żywności, 2004, 4, 28–30 (in Polish).
23. Ullmann H., Konzentration prägt den Markt. Fleischwirtschaft, 2006, 86, 56–60 (in German).
24. Unnevehr L.J., Jensen H.H., The economic implications of using HACCP as a food safety regulatory standard. Food Policy, 1999, 24, 625–635.
25. Vela A.R., Fernández J.M., Barriers for the developing and implementation of HACCP plans: results from a Spanish regional survey. Food Contr., 2003, 14, 333–337.
26. Ziajka S., Dzwolak W., Implementation of the HACCP system in the production of safe food in Poland. Przem. Spoż., 1998, 52, 19–22 (in Polish; English abstract).
27. Ziajka S., Dzwolak W., Cybulski A., Tarczyńska A., Conditions of implementation and operation of the HACCP system. Przem. Spoż., 2001, 55, 12–16, 26 (in Polish; English abstract).

Received March 2010. Revision received and accepted September 2010.