

MAŁGORZATA WIŚNIEWSKA, ANNA ZAMOJSKA

FOOD SAFETY CULTURE ASSESSMENT EXAMPLIFIED BY TWO COMPANIES

Streszczenie

Food safety is the most significant issue for any entity that operates in the food chain; it is also a prerequisite for entering the market and, in most of the countries, it is guaranteed by law. Advanced solutions in medicine, food science, technology and production processes, implementing the HACCP system and good practices are very useful, though they are not able to prevent food safety hazards, in particular the human factor-dependent risks. Such factors as inappropriate behaviour of employees, failure to follow set practices, procedures, norms or values are deemed to be proof of lacking food safety culture. The objective of the article is to present a methodology to measure and assess food safety culture and to explain it using the example of two medium-sized food manufacturing companies in Poland. The methodology applied includes 15 aspects of food safety culture that were categorized into 6 elements. That methodology made it possible to identify both the level of particular elements of food safety culture and the its overall level that was rated as excelling on the basis of the survey performed. The methodology at issue can be recommended for applications by other organizations in the food industry.

Słowa kluczowe: food manufacturing companies, food safety, food safety culture, assessment

Introduction

Food safety is a non-negotiable requirement; it is essential for any entity that operates in the food chain [16]. In most of the countries throughout the world, it is guaranteed by law and it is a prerequisite for entering a market. Even though there the advances in medicine, food science, technology, production methods, and the implementation of the HACCP system supported by good practices [3], food safety hazards do not decline. Referring to the reasons of that phenomenon, researcher increasingly emphasize that it is the human factor to play a key role in the food chain and

*Dr hab. M. Wiśniewska, prof. UG, Zakład Zarządzania Jakością, Katedra Ekonomiki Przedsiębiorstw,
dr hab. A. Zamojska, prof. UG, Katedra Ekonometrii, Wydz. Zarządzania, Uniwersytet Gdański,
ul. Armii Krajowej 101, 81-824 Sopot. Kontakt: m.wisniewska@ug.edu.pl*

this factor seems to be the weakest link in every system [13]. The next reason are behaviours of employees and the tolerance thereof, their failure to follow practices, procedures, norms, and values; all this is deemed to be proof of lacking food safety culture and emerging new food safety risks [4, 5, 9, 15].

Food safety culture can be understood as a way, in which an organization or a group of people reaches the level of food safety in their minds and behaviours [10]. It is a set of commonly shared values, beliefs, and behaviours relating to food safety [9]. It is the right attitude in terms of food safety [6], and it reflects how and what employees think about food safety [14]. In the reference literature, there is a fairly extensive collection of publications on food safety culture and its elements. Based on the review of reference literature and assumptions therein [1, 2, 5, 7, 12, 14, 15], the following six elements of food safety culture are to be specified: priorities and attitudes of employees (1); awareness and knowledge about the occurrence of food safety hazards (2); confidence in the food safety management system implemented in the organization (3); employees' responsibility and commitment (4); competence and training on food safety (5); and management involvement and its role (6).

It should be added that in the reference literature there is considerably less information about methods and examples of food safety culture measurement and assessment. So far, there are only two scientific papers dealing with that subject. The first one is a paper of 2012 by Seward et al. [11], which describes a food safety culture measurement method that is used a year later by Ijabadeniyi [6] in the next survey carried out in 2013. However, the author does not identify the overall food safety culture level in the companies polled. The lack of reference articles and the importance of the issue encouraged the authors of this study to take up the subject and to look into how the Polish food industry organizations approach it. Therefore, the objective of the article is to suggest a methodology to measure and assess food safety culture, and, next, to present the results obtained with this methodology in two medium-sized food manufacturing companies in Poland.

Material and survey method

The survey was carried out in January 2014, in two medium-sized companies: A and B. For the good of the organizations surveyed, the authors described only roughly the profile and other details thereof. The two companies are located in the Province of West Pomerania; the variety of products they manufacture is similar, they function in the similar market, and their supplier-customer relationships are comparable. The two companies implemented the HACCP system and the hygienic and good manufacturing practices; thus, they comply with the EC Regulation No. 852/2004 of The European Parliament and of the European Council of 29 April 2004 on the hygiene of

foodstuffs (OJ L139/1, 30.04.2004). Additionally, based on the pertinent certificates, the company A complies with the requirements of ISO 22000 and ISO 9001 systems.

To measure and, then, to assess the level of food safety culture, a modified questionnaire was applied as suggested by Seward et al. [11]. The questionnaire was modified, because it was necessary to complement the assessment scale used in the original questionnaire based on a 4-point scale only. The final (modified) questionnaire consisted of three parts. The first part included demographic information; based thereon, it was possible to characterize the profile of the respondents polled who were the employees surveyed; in the second part, the respondents were asked to explain their responses. The third part consisted of a set of fifteen statements/aspects about attitudes, beliefs, and values represented by the employees (S1 - S15) as well as of a Likert scale from 1-5 where: 1 - strongly disagree; 2 - disagree; 3 - neither agree nor disagree; 4 - agree; 5 - strongly agree (see Table 2). To better analyse and illustrate the results of the survey, the authors assigned individual names to the six core elements of the organizational culture (see Table 3). This modification by the authors helped introduce specific indicators, W1-W6, useful for the identification of the weakest and strongest areas of food safety culture in a given organization.

During the visits to the companies, anonymous questionnaires were distributed among all the employees, called food operators, who were directly involved in the production process. The surveyors accepted as true that the learned attitudes, beliefs, and behaviours of them were evidences of the existence or lack of food safety culture [4, 5, 9]. Employees were instructed how to fill in the questionnaire they received. In the two companies polled, 100% of questionnaires were returned to the surveyors.

The results were analyzed using a Statistica software 10 PL. To test the hypotheses regarding the comparison of the results obtained in the two companies surveyed, a non-parametric Mann-Whitney U test was applied, and a t-test was applied to make comparisons within one group. For all the tests, the level of $p = 0.05$.

To interpret the final results referring to the level of food safety culture in total, and then, in particular, with regard to general elements of food safety, a Kolman's assessment scale was used [7].

Results and discussion

The questionnaires were distributed among all the employees, called food operators, directly involved in the production process. In the company A, 60 respondents were polled (83% of all the employees in A) and in the company B: 24 people (80% of all the employees in B). The characteristics of the profile of respondents are presented in Table 1.

Table 1. Structure of respondents.

Tabela 1. Struktura respondentów.

Item Wyszczególnienie	Company A Zakład A		Company B Zakład B	
	Number of respondents Liczba respondentów	[%]	Number of respondents Liczba respondentów	[%]
Gender-based structure Struktura ze względu na płeć				
Women / Kobiety	53	88	0	0
Men / Mężczyźni	7	12	24	100
Structure based on years of employment Struktura ze względu na staż pracy				
to 5 years / do 5 lat	56	93	14	58,33
6-10 years / 6-10 lat	4	7	3	12,5
11-15 years 11-15 lat	-	-	2	8,33
16-20 years 16-20 lat	-	-	3	12,5
21-25 years 21-25 lat	-	-	2	8,33

Table 2 shows the structure of the respondents based on their responses reflecting their opinions on attitudes, beliefs, and values as regards food safety culture.

Table 2. Structure of respondents based on their opinions illustrating food safety culture in their workplace

Tabela 2. Struktura badanych na podstawie ich opinii ilustrujących kulturę bezpieczeństwa żywności w ich zakładzie pracy

	Statement/aspect (S) Stwierdzenie/aspekt (S)	Company A [%] of indications Zakład A [%] wskazań					Company B [%] of indications Zakład B [%] wskazań					UM Test UM
		1	2	3	4	5	1	2	3	4	5	
1	New employees are given training on food safety before they are allowed to start their work Nowi pracownicy, zanim podejmą pracę, przechodzą szkolenie z zakresu bezpieczeństwa żywności	0	0	0	3	97	0	0	8	67	25	5,12*
2	I appreciate a co-worker drawing my attention to my doing something that could affect the food safety in a bad way / Doceniam, gdy współpracownik zwraca mi uwagę, gdy robię coś, co mogłoby mieć zły wpływ na bezpieczeństwo żywności	0	0	2	85	13	0	0	8	46	46	-1,86
3	I am convinced that, for my boss, food safety is more important than production yield Jestem przekonany, że mój zwierzchnik zawsze stawia bezpieczeństwo żywności przed wydajnością produkcji	0	0	0	8	92	4	4	8	46	38	3,97*

4	It is possible for me to stop a production line or discontinue a process when I see something that might negatively impact the quality and safety of the food Mam możliwość zatrzymywania linii, przerywania procesu, gdy widzę coś, co może negatywnie wpłynąć na jakość i bezpieczeństwo żywności	0	0	0	88	12	0	4	13	42	42	-1,08
5	I am aware of how the food can be contaminated with bacteria or with other agents that make consumers sick Zdaję sobie sprawę, w jaki sposób może dojść do zanieczyszczenia żywności bakteriami lub innymi czynnikami powodującymi chorobę konsumenta	0	0	0	12	88	0	0	4	46	50	2,76*
6	Our decisions, actions, and behaviours do not change when we are audited, controlled, or supervised by our bosses Nasze decyzje, działania i zachowania nie zmieniają się wówczas, gdy prowadzony jest audit, kontrola lub gdy obserwuje nas przełożony	0	0	0	8	92	0	0	17	50	33	4,25*
7	I know how the level of food safety is measured in our plant and how the measurement is taken Zdaję sobie sprawę w jaki sposób w zakładzie prowadzi się pomiar poziomu bezpieczeństwa żywności i jak jest to wykonywane	0	0	0	88	12	0	0	17	33	50	-1,68
8	In our plant, food safety rules and procedures are verified and updated on a regular basis Zasady i procedury dotyczące bezpieczeństwa żywności są w zakładzie na bieżąco weryfikowane	0	0	0	92	8	0	4	29	29	38	0,09
9	I know that the solutions suggested by me in order to improve the food safety will be taken seriously Wiem, że jeśli zaproponuję jakieś rozwiązania dotyczące poprawy bezpieczeństwa żywności, to będą one traktowane poważnie	0	0	0	92	8	0	4	25	33	38	-0,17
10	During my shift, everyone always follows food safety rules and procedures Každy na mojej zmianie przestrzega zasad i procedur dotyczących bezpieczeństwa żywności.	0	0	0	93	7	0	0	8	54	38	-1,64
11	In the case any incident occurs and threatens food safety, intense actions are taken in order to identify its causes and to make sure it will never occur Jeśli dojdzie do incydentu, który zagraża bezpieczeństwu żywności, to w zakładzie są podejmowane intensywne działania pozwalające rozpoznać jego przyczyny i upewnić się, że takie zdarzenie więcej nie nastąpi	0	0	0	95	5	0	4	13	50	33	-0,89
12	I am convinced that the safety of employees and food are the highest priority in this plant Jestem przekonany(a), że bezpieczeństwo pracowników i żywności stanowi najwyższy priorytet w tym zakładzie	0	0	0	13	87	0	0	8	42	50	2,69*

13	When I start my work shift, the equipment and working surfaces, walls, and floors are properly prepared in terms of their sanitary and hygienic conditions Kiedy rozpoczynam pracę na mojej zmianie, to sprzęt, wszystkie powierzchnie robocze, ściany, podłogi są wcześniej przygotowane pod względem sanitarno-higienicznym	0	0	0	12	88	0	13	4	38	46	3,16*
14	Our employees are aware of their contribution to the manufacturing of foodstuffs that are safe for consumers Pracownicy są świadomi swojego udziału w produkcji żywności bezpiecznej dla konsumenta.	0	0	0	83	17	0	0	0	54	46	-2,07*
15	I do believe my family and I can consume, without question, the food products manufactured in this plant Jestem przekonany(a), że żywność, którą produkujemy możemy ja i moja rodzina spożyć bez zastrzeżeń	0	0	0	83	17	0	0	0	29	71	-3,86*
	(%) of indications / (%) wskazań	0	0	0	57	43	0	2	11	44	43	x
	Food safety culture level in total (%) / Całkowity poziom kultury bezpieczeństwa (%)	88,53					85,33					x

Explanatory note: / Objasnienie:

* Statistically significant differences in the responses of respondents in company A and B in terms ($p = 0.05$). / Statystycznie istotne różnice w odpowiedziach respondentów z zakładu A i B ($p = 0,05$).

Table 3 shows a construction description of food safety culture elements in the form of indicators (W1-W6) and average values of those indicators referring to the two companies surveyed. To better illustrate the difference between A and B, the same values are also presented in the radar graph (see Figure 1).

The analysis of the data in Table 2 shows that in the two companies surveyed, the difference between the quantity of indications was significant for almost all of the statements/aspects compared to the benchmark (“strongly agree”). The employees polled indicated level 4 (“agree”) regarding every aspect of the food safety culture except for one statement only: “New employees are given training on food safety before they are allowed to start their work” in the company A, where all the respondents strongly agreed with it. The assessment of the food culture safety was significantly higher in the company A with regard to the following statements: S1, S3, S5, S6, S12, S13. This means that the company A better cares for the safety in the above mentioned domains. For the employees in the company B, the aspects S14 and S15 were significantly more important than for the employees in the company A. This means that the employees in the company B have more confidence in their products; however, there are no differences between the companies A and B in their roles, beliefs, and behaviours with reference to such aspects of the food safety culture as: S2, S4, S7, S8, S9, S10, and S11. Moreover, the values of all the indications range between the “agree” and “strongly agree” responses. Regardless of the company surveyed, and taking into

account the number of indications, it turned out that, for the most part, the respondents agreed with the individual statements. However, the difference in the total agreement with a given statement/aspect in terms of food safety culture is significant.

Table 3. Mean values of W indicators of food safety culture in two companies and S-statements/aspects relating to them.

Tabela 3. Wartości średnie wskaźników kultury bezpieczeństwa żywności W w obu zakładach i związane z nimi stwierdzenia/aspekty S.

Food safety culture elements: W Elementy kultury bezpieczeństwa żywności - W		Number of S-statement/aspect in questionnaire Nr stwierdzenia/aspektu S w kwestionariuszu	Mean values of W in company A Wartości średnie W w zakładzie A	Mean values of W in company B Wartości średnie W w zakładzie B	UM Test Test UM
W1	Priorities and attitudes of employees Priorytety i postawy pracowników	6, 10, 12, 13	4,68	4,26	3,51*
W2	Awareness and knowledge of food safety hazards Świadomość i wiedza na temat wystąpienia zagrożenia bezpieczeństwa żywności	2, 5	4,50	4,42	0,32
W3	Confidence in the food safety management system implemented in the organization Zaufanie wobec wprowadzonego w organizacji systemu zarządzania bezpieczeństwem żywności	8, 11, 15	4,10	4,28	-2,13*
W4	Responsibility and commitment of the employees Odpowiedzialność i zaangażowanie pracowników	4, 14	4,14	4,33	-1,63
W5	Food safety competencies and training on food safety Kompetencje i szkolenia w zakresie bezpieczeństwa żywności	1, 7	4,54	4,25	2,09*
W6	Involvement and role of managing staff Zaangażowanie i rola kierownictwa	3, 9	4,50	4,06	1,80

Explanatory note: / objaśnienie:

*Statistically significant differences in values of indicators in companies A and B in terms ($p = 0.05$). / Statystycznie istotne różnice w wartościach wskaźników dla zakładów A i B ($p = 0,05$).

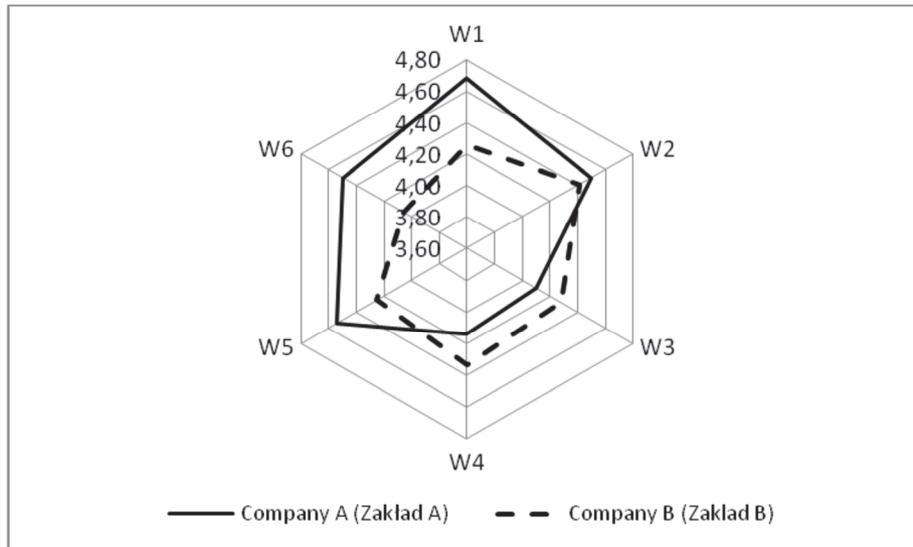


Fig. 1. Mean values of food safety culture indicators, W1-W6, in two companies surveyed

Rys. 1. Średnie wartości wskaźników kultury bezpieczeństwa żywności – W1 - W6 w obu zakładach

The analysis of the data in Table 3 and Fig. 1 that refer to the W1-W6 values and their ranges, the evaluation ratings of general elements of food safety culture were significantly higher in the company A in two cases, namely: "Employees priorities and attitudes" (W1) and "Competence and training on food safety" (W5). This means that those elements are more important for the employees. On the other hand, "Confidence in the safety management system implemented in the organization" (W3) was rated higher by the employees in the company B. It means they have greater confidence in their food safety management system. No significant differences were found between respondents' responses with regard to the following elements of food safety culture: "Awareness and knowledge of food safety hazards" (W2), "Responsibility and commitment of Employees" (W4), "Involvement and role of managing staff" (W6); this means that in the two companies the levels of food safety culture levels in respective domains are perceived in a similar way.

In the companies surveyed, the food safety culture levels in total are similar: 88.53% as for the company A and 85.33% as for the company B. According to the indications of the respondents, in the two companies the individual aspects of food safety culture referring to the statements/aspects S1-S15 are fulfilled.

In the company A, the strongest aspects of food safety culture are: training of the employees on food safety; the employees believe that the managing staff deems food safety to be more important than the production yield; everyday decisions, activities, and behaviors linked with the food safety assurance do not change when the employees

are audited, controlled, or supervised by their bosses. As regards the company B, the strongest aspects of food safety culture herein are: the employees are confident in the safety of food produced; the employees are aware of their role in producing safe foods for consumers; the employees are aware of the possibility that foods might be contaminated with bacteria or other agents and the health of consumers could be jeopardized.

In the company A, the following aspects of the food safety culture are reported to be the weakest: the employees know and believe that the safety rules and procedures are verified and updated on a regular basis; the employees believe they can contribute to improving the food safety through the solutions suggested by them; the employees believe that every staff member follows the food safety principles and procedures; the employees are sure that in the case when an incident occurs and jeopardizes the food safety, their company takes intense actions in order to identify its causes and to make sure they will never occur. The weakest aspects of food safety culture in the company B are: the employees know and believe that safety rules and procedures are verified and updated on a regular basis; the employees are sure that in the case when an incident occurs and jeopardizes the food safety, their company takes intense actions in order to identify its causes and to make sure they will never occur; the employees believe that the food safety is the priority in the company and more important than the production yield.

The attitudes, competence, and training of the employees in the company A are more visible than in B; however, the employees in the company B have greater confidence in the implemented food safety management rules and principles including the product safety, but no significant differences between the two companies are found in the following aspects: the employees are aware of and know the food safety hazards, their responsibilities and commitment as well as the involvement and role of their managing staff.

Based on the above findings and having in mind the Kolman's evaluation scale, in the two cases the studied companies represent Class "1" and the levels of food safety culture, in total and in individual elements, are identified as to be 'distinctive'. This fact is confirmed by the mean values of the W1-W6 indicators. This situation creates an environment where positive and based on deep cooperation outcomes are possible for the companies and their final customers.

Conclusions

1. The methodology described is based on fifteen aspects categorized into six suggested food safety culture elements; it was applied to measure and assess food safety culture and it helped recognize the overall food safety culture level in the companies surveyed. It proved very useful for the purpose of identifying the weakest and strongest areas of food safety culture in individual organizations.

2. The methodology as presented above was positively verified; thus, it is recommended for implementation in other food companies including their suppliers; also, it can be used as a tool of self-assessment in a company as well as a benchmarking tool when comparing levels of food safety culture in several companies.
3. The comparison of the methodology presented above with the original methodology as suggested by Seward et al. proves that the first one is more detailed and comprehensive, and the use of it makes it possible to assess the individual levels of the core elements of food safety culture.

Literature

- [1] Abidin U.Z., Fatimah U.: Measuring food safety culture: Insights from onsite foodservice operations. Iowa State University, Ames 2013, p. 54.
- [2] Ball B., Wilcock A., Colwell S.: Tool for measuring food safety climate. *J. Food Prot.*, 2010, **73** (Supl. A), 84.
- [3] Crossley S., Motarjemi Y.: Food Safety Management Tools. Report of an ILSI Europe Expert Group. ILSI, Brussels 2011, p. 5.
- [4] Griffith C.J., Livesey K.M., Clayton D.: Food safety culture: the evolution of an emerging risk factor? *Brit. Food J.*, 2010, **112** (4), 426-438.
- [5] Griffith C.J., Livesey K.M., Clayton D.: The assessment of food safety culture. *Brit. Food J.*, 2010, **112** (4), 439-456.
- [6] Ijabadeniyi O.A.: Food safety culture paramount than traditional food safety system and food safety culture in South African food industries. *World Academy of Science. Eng. Technol.*, 2013, **76**, 679-683.
- [7] Kolman R.: *Kwalitologia. Wiedza o różnych dziedzinach jakości.* Wyd. Placet, Warszawa 2009, p. 38.
- [8] Neal J.A., Binkley M., Henroid D.: Assessing factors contributing to food safety culture in retail food establishments. *Food Prot. Trends*, 2012, **32**, 468-476.
- [9] Powell D.A., Jacob C.J., Chapman B.J.: Enhancing food safety culture to reduce rates of foodborne illness. *Food Control*, 2011, **22**(6), 817-822.
- [10] Sarter S., Sarter G., Gilabert P.: A SWOT analysis of HACCP implementation in Madagascar. *Food Control*, 2010, **21**, 253-259.
- [11] Seward S., Dobmeier N., Baron M.: Assessing the food safety culture of a manufacturing facility. *Food Technology Magazine*, 2012, **66** (1), 1-9.
- [12] Taylor J.: An exploration of food safety culture in a multi-cultural environment: Next steps? *Worldwide Hospitality and Tourism Themes*, 2011, **3**, 455-466.
- [13] Trafiałek J., Pawłowska J.: Analiza efektów szkolenia pracowników firmy cateringowej z wdrożonym systemem zarządzania bezpieczeństwem żywności, zgodnym z normą ISO serii 22000. *Żywność. Nauka. Technologia. Jakość*, 2013, **1** (86), 217-229.
- [14] Wright M., Leach P., Palmer G.: A Tool to Diagnose Culture in Food Business Operators. Report from Greenstreet Berman Ltd for the FSA. GSB Ref: CL2567. October 2012. [online]. Dostęp w Internecie [15.03.2014]: http://www.foodbase.org.uk/admintools/reportdocuments/803-1-1430_FS245020.pdf
- [15] Yiannas F.: Food safety culture: Creating a behavior-based food safety management system. Springer, New York 2009, pp. 11-14.

- [16] Zielona Księga w sprawie jakości produktów rolnych: normy jakości produktów, wymogi w zakresie produkcji rolnej, systemy jakości. Komisja Wspólnot Europejskich, 2008, KOM (2008) 641, wersja ostateczna, Bruksela 15.10.2008, s. 4.

OCENA KULTURY BEZPIECZEŃSTWA ŻYWNOŚCI NA PRZYKŁADZIE DWÓCH ZAKŁADÓW

S u m m a r y

Bezpieczeństwo żywności jest cechą najistotniejszą dla każdego podmiotu funkcjonującego w łańcuchu żywnościowym, jest też warunkiem wstępu na rynek i w większości krajów jest prawnie gwarantowane. Zaawansowane rozwiązania w zakresie medycyny, nauk o żywności, technologii i w systemach produkcji, wdrażanie systemu HACCP oraz dobrych praktyk, mimo że bardzo użyteczne, nie jest w stanie zapobiec zagrożeniom bezpieczeństwa żywności, szczególnie tym, które zależą od czynnika ludzkiego. Nieodpowiednie zachowanie pracowników, nieprzestrzeganie określonych praktyk, procedur standardów czy wartości jest postrzegane jako dowód braku kultury bezpieczeństwa żywności. Celem artykułu jest przedstawienie propozycji metodyki pomiaru i oceny kultury bezpieczeństwa żywności na przykładzie dwóch spożywczych przedsiębiorstw produkcyjnych, funkcjonujących w Polsce. Zastosowana metoda polegała na 15 aspektach kultury bezpieczeństwa, skategoryzowanych według 6 elementów. Metoda umożliwiła zidentyfikowanie poziomu kultury bezpieczeństwa w poszczególnych jej elementach, jak i poziomu ogólnego, ocenionego w wyniku badania jako wyróżniający. Metoda może być rekomendowana do zastosowania przez inne organizacje przemysłu spożywczego.

Key words: bezpieczeństwo żywności, kultura bezpieczeństwa żywności, ocena 