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Research

A STUDY OF PERCEPTIONS, PRACTICES AND ATTITUDES ON FOOD HYGIENE AND HAZARD ANALYSIS CRITICAL CONTROL POINT IN THE INDONESIAN FOOD INDUSTRY

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ABSTRACT : A study of perceptions, practices and attitudes on food hygiene and hazard analysis critical control point (HACCP) in the Indonesian food industry has been conducted. This study was carried out by survey, an interview, plant visit and distribute a questionnaire to managers of small, medium and large food industries at seven provinces, i.e. DKI Jakarta, West Jawa, Central of Jawa, East Jawa, North Sumatera, South Sulawesi and Bali. The number of samples for respondents for this study were 102 food businesses and they were asked about the food hygiene practices in their business, their systems used such as HACCP, and the perceptions and attitudes toward a range of food hygiene issues. The results showed that HACCP systems were implemented at 57 percent in the large food industries, more than 15 percent and zero percent in the medium and small food industry, repectively ($P< 0.005$); 58 percent of small, 54 pervent of medium and 51 percent of large food industry managers thought their business represented a low-risk to food safety. Higher levels of food hygiene qualifications among the industry managers and higher perceptions among managers of the risk of food safety of the business were also significantly related to use HACCP in al sectors ($P<0.05$).

Keywords : *HACCP, food hygiene, food safety, perceptions, practices, attitudes.*

INTRODUCTION

Safe food supplies, both for local markets and to strengthenen competition in international trade, have developed into a major food safety and trade issue. The new and demanding food safety requirements resulted from regulations and standards have changed the ways food supply chains operate and the economic situation of the players throughout these chains.

Reduction incidence of food borne illness requires controls throughout the food chain to minimize the likehood that food becomes contaminated with pathogens, to eliminate pathogens after contamination or to prevent growth of pathogens to become high numbers in foods. This is achieved by implementing Good Hygiene Practices (GHP), Good Manufacturing Practice (GMP) and Hazard Analysis Critical Control Point (HACCP). In addition, the reduction the public health risks from contamination of or food supplies, industry managers and legislators are increasingly turning to risk-based food hygiene management systems such as Hazard Analysis Critical Control Point (FAO/WHO, 1997e; Hathaway, 1999).

Current Indonesian legislation issued by National Standardization Body (BSN) has established the Indonesian Food Safety Authority and Procedures in matters of food safety and adopted Codex HACCP system : Guidelines for apllication become Indonesian National Standard (SNI) 01.4582-1998 and BSN Directive 1004-1999 (Suprapto, 1999). Therefore, food businesses or food industries must be chosen or accepted also a hazard analysis-based approach to food hygiene management. The requirements of these regulations include some of the generally recognized Codex principles of HACCP (CAC, 1997), although the adoption and implementation of all seven HACCP principles is not a current legal requirement for all business/industry under the regulations, especially with regard to small business/industry. However, the regulations have determined the HACCP principles as a key for food safety management philosophy in Indonesia.

A drawing of this HACCP implementation in Indonesia has been further enhanced by the publication of the Ministry of Food Affair and Institute for Research and Development of Agro-Based Industry Report on the Monitoring Activity of Food Safety Practices in the Food Industries in 1997 (Kantor Menteri Negara Urusan Pangan dan BBIHP, 1997). This report suggested not only the accelerated implementation of food hygiene practices but also increased implementation of

HACCP in high-risk food premises such as meat processing, fish-product processing, sauce processing and packaged or bottled drinking water.

The potential difficulties of applied HACCP in small and medium catering business and small and medium food enterprises have been widely discussed. The possible barriers to its development in these sectors are as follow through : (a) a lack of financial resources and purchasing power (Jouve, 1994), (b) more complicated food-handling practices (Sheppard *et al*, 1990) and (c) a lack of technical expertise and available personnel (Stevenson, 1990). In contrast, for many large food industries or food manufactures, HACCP has become important mandatory and voluntary trading standard in international food trade (Casswell *et al*, 1996).

Nevertheless, only limited data exist either about food hygiene management in general on the Indonesian food industry or more specify the application of HACCP. The studies that do exist have tended to use local rather than national samples, focused on one industry sector, or have adopted a case study approach to examine the use of HACCP by individual businesses.

The objectives of this study were : (a) to identify the general food hygiene and use of HACCP to risk-perceptions, attitudes and practices in small, medium and large food industry ; (b) to explore the relationship between food hygiene practice and the three small, medium and large enterprise sectors, and (c) to asses the impact of variables such business size, risk and status on hygienic practices within each sector.

MATERIALS AND METHODS

Materials

The materials used of this study consist of a questionnaire that was designed to food hygiene practices and food safety management systems, and letters. The content of this questionnaires asked about food hygiene and food safety management systems (i.e. hygiene practices, HACCP training of managers, full HACCP implementation systems, the temperature monitoring of foods, inspection of foodstuffs on delivery, microbiological testing and documentation of food hygiene practices), risk perceptions and attitudes.

The letters were purposed to collect secunder data or to get some information related to food safety matters of business in line with network-instititution (e.g. Ministry of Health, Ministry of Agriculture, Center for Standardization Ministry of Industry and Trade, Ministry of Fishery and Marine Exploration, National Agency for Drug and Food Control).

Methods

The study of perceptions, attitudes and practices on food hygiene and hazard analysis critical control point in the Indonesian food industry was conducted from March to Nopember in 2000 and 2001 respectively. The methods used for this study was conducted by a survey, an interview and application a questionnaire to small, medium and large food industry in DKI Province, West Jawa Province, Central of Jawa Province, East Jawa Province, North Sumatera Province, South Sulawesi Province and Bali Province. The number samples of small, medium and large food industry that be surveyed, interviewed and applicated a questionnaire in the seven provinces above totally there were 102 food industries that consist of 42 small food enterprises , 30 medium food industries and 30 large food enterprises, which have achieved SP certificate (certification and registered for small industry by Ministry of Health) and MD certificate (certification and registered for medium and large food enterprises by Ministry of Health) and SNI certificate (certification and registered for Medium and Large food enterprises by Ministry of Industry and Trade).

The basic educational criteria of judment for chosing and collecting to small, medium and large food industry which have achived SP and MD certicate from Health Ministry of Indonesia and SNI certificate from Ministry of Industry and Trade, based on the three aspects as followis : (a) the food premises or food industries themselves was guessed willing to produce of food that meet with food safety, quality and nutrition for public health goal, (b) the food premises or food industries was guessed have also traded food products honestly and responsibility, based on the achievement of SP, MD and SNI certificate registered by industries themselves, and (c) food industries themselves were expected have already and would always given food safety and quality assurance so that with this system they were try to prevent the food contamination for public health goal.

Frame Works of Study

The frame work of this study were included : Literatur Study, Making and Preparing the quaestionnaire relates to food hygiene and food safety management systems, Conducting survey and interview to food industry at seven provinces, Data collecting, checking and processing, and Descriptive and Statistical Analysisis. Concisely, a step of the

study of perceptions, practices and attitudes on food hygiene and HACCP system in the Indonesian food industry was presented in figure 1.

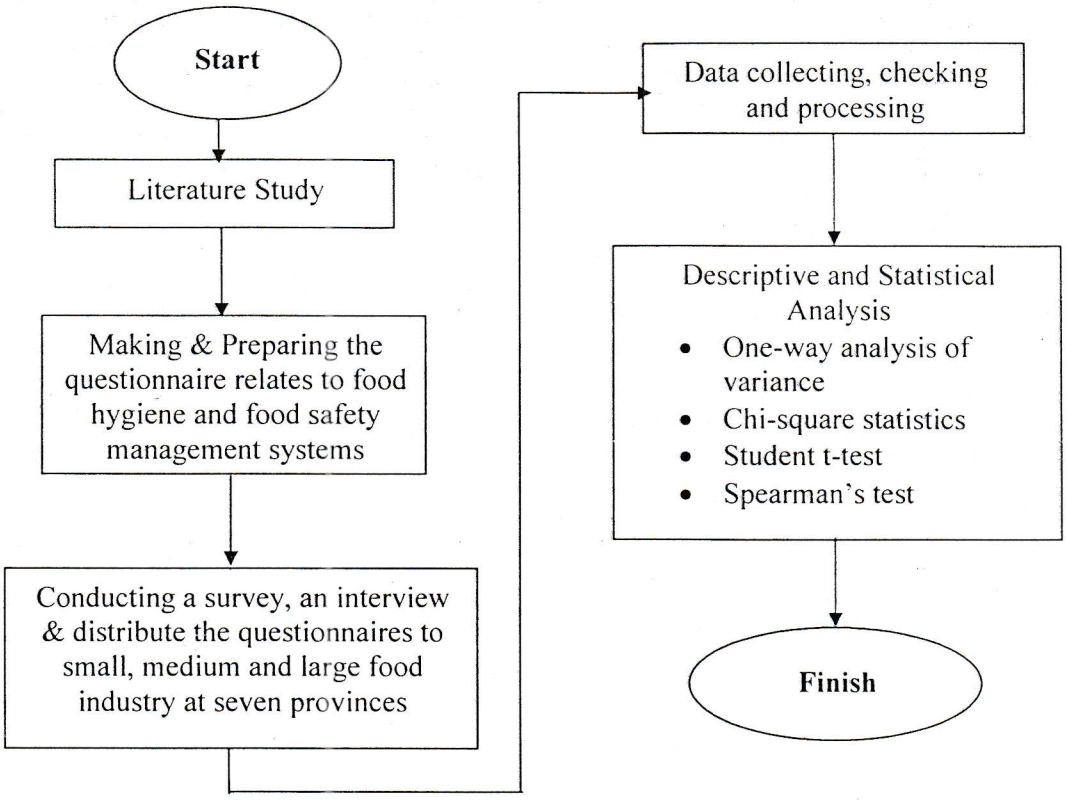

Figure 1. The steps of the study of perceptions, practices and attitudes on food hygiene and HACCP in the Indonesian food safety.

The results of survey, an interview and response of the questionnires were conducted analyze through descriptive analysis developed by Hair *et al* (1987). To test if there were differences among three sectors of food industries' characteristics with regard to their perceptions, attitudes and practices on food hygiene and HACCP management system; a one- way statistical analysis of variance with Statistical Package for the Social Science (SPSS) test was used. Test of significance were based on Chi-square statistics and student t-tests (Moore and Mc.Cabe, 1987) to determine whether small, medium or large food industries more likely to implement food hygiene practices and food safety management systems. Spearman's test was also used in analysis of Likert scale results.

RESULTS AND DISCUSSION

Perceptions of The Risk To Food Safety

Food safety expectation are often based on how well an industry especially managers are capable of performing, i.e. the concept of As Low As Reasonably Achievable (ALARA) rather than stated degree of stringency. Managers' perceptions of the risk to food safety posed by their business practices based on the results of the survey, interview and response when they were asked to asses what risk to food safety, low, medium or high, were presented at Table 1.

Table 1. Managers perception of the risk to food safety posed by their business practices (n = 102).

Risk levels (*)	Operation (%) of food industry		
	Small	Medium	Large
High	10	18	21
Medium	20	23	28
Low	58	54	51
Don't know	12	5	-

Note : (*) = A $\chi 2$ test revealed no significant differences between responses from the three food industry sectors ($P>0.05$).

Based on Table 1, it was shown that the most of food industry sectors identified themselves as low-risk and only 21 % of large

food industries, 18 % of medium food industries and 10 % of small food industries identified themselves as high-risk business. Yet catering food services/industries, meat and poultry processing industries, milk and milk product processing industries and fish & fish products processing industries were widely regarded as high-risk, because of the food products they handled and statistical evidence. Suggesting to proposes as a possibility that outbreaks of food poisoning were most commonly associated with these sectors. While variations in responses across food industry sectors did not prove statistically significant, slight differences were also seen between food industries within the same factors.

Accurate interpretation of this risk data should be become interested in the handling practice of the food processing involved. Food processing handling a combination of raw and cooked meat, raw milk and processed milk products, fish and fish products, and egg products have tends to increased risk of cross contamination were more likely to identify themselves as high to medium-risk food business ($\chi 2 = 32$; $P<0.001$).

Meanwhile, the use and implemention of HACCP among the whole sample was also found related significantly to a number of other factors, notable (to note) higher risk perceptions among food industry managers, higher levels of food hygiene qualifications among managers, and being part of a local, regional/national, or multinational chain in particular (Table 2).

Table 2. Relationship between the use and implementation of HACCP to managers' risk perceptions and training, product handling and food industry status (n = 102)

Characteristics	Using and implementing HACCP	
	Yes (%)	No (%)
Managers' perceptions on food safety risk		
• High risk	31	15
• Medium risk	25	27
• Low risk	45	58
Probability	$\chi 2 = 11$	$P<0.005$
Status of the food industry		
• Local/regional chain	3	92
• National chain	36	7
• Multinational chain	61	1
Probability	$\chi 2 = 58$	$P<0.001$
Managers' levels of food hygiene qualification		
• Unqualified	14	27
• Basic	30	45
• Intermediate	21	16
• Advanced	35	12
Probability	$\chi 2 = 13$	$P<0.01$

Based on Table 2, it can be seen that most food industry managers thought their food business represented as a low-risk to food safety with responses Yes (45%) and No (58%). Managers' risk perception on food safety risk have positive implications for the enthusiasm with both HACCP implementtation and good hygienic practices in general will be adopted. In this case, food industries whose managers perceived them to be high-risk food were more likely to use and to implement of HACCP. Although the issue of the risk in term of food safety was a highly contenious subject, however risk might be evaluated in terms of the attributable food poisoning cases to that type of food business, it might be refer to the type and range of product handle.

There was evidence which suggest that most managers in the food industry have limited understanding in the principles and application of the HACCP strategy. In addition to its application of HACCP within the Indonesian small and medium food industry sectors was limited. Therefore, in small and medium food industries, HACCP must be able to adopt flexibility to the different working pattern in operation and great, often unexpected variations in potential demand and workloads.

Furthermore, the lack of financial resources, technical expertise, knowledge and expertise in HACCP, management commitmentto obtain this knowledge and small staff base only; both of them resulting in sufficient understanding of the function of HACCP principles and add to the difficulties in applying HACCP.

Larger food industries can invest resource in training for successful implementation of HACCP, whereas/meanwhile smaller and medium food industries may have other priorities. The later point was confirmed by a survey and an interview of 72 small and medium food industries at seven provinces region in Indonesia which found that small and medium food companies were less likely to invest in hygiene and food safety than larger ones. The results of the survey, an interview and plant visit also showed that small and medium food catering industries faced special problems regardingHACCP, such as different menus and equipment, different system of drink dispensing, and different methods of food preparation and service which made a HACCP system even harder for that type of business and hence justifies the need for assitance.

Meanwhile, time constraint and resource requirements of HACCP implementation have mentioned as crucial factors influencing acceptance and implementation of the system by food operators not only in large food industries but also in small and medium food industries. Based on response by respondents about perceptions and opinions of food operators regarding HACCP not implemented in their companies due to three concerns, i.e. (1) high cost of training employee, (2) high cost of laboratory facilities and prerequisites program; and (3) high cost of operating the system.

Practices of Food Hygiene and HACCP

Food safety is results of several factors i.e: legislation should be established at a minimum hygiene requirements; official controls should be in place to check food business operators' compliance and food business operators should establish and operate food safety programmmes and procedures based on the practices of food hygiene and HACCP principles. The results of survey, an interview and responses from respondents that be asked to identify or to know how the food industry was arrange food hygiene practices and food safety management systems were implemented was shown at Table 3.

Table 3. The relationship between each food industry and implementation of food hygiene practices and HACCP (n = 102).

Food safety management systems and hygiene practices	Operation of Food Industry (%)		
	Small	Medium	Large
Aspect of staff training	29	40	90
Probability	$\chi2 = 87$	P<0.001	
Monitoring of staff for personnel hygiene and illness/infections	29	47	77
Probability	$\chi2 = 84$	P<0.001	
Cleraning and sanitation schedules	36	63	97
Probability	$\chi2 = 55$	P<0.001	
Food handling and storage program	37	73	93
Probability	$\chi2 = 47$	P<0.001	
Stock rotation	84	90	97
Probability	$\chi2 = 4$	P<0.01	NS
HACCP training of Managers	14	37	73
Probability	$\chi2 = 121$	P<0.001	
Full HACCP Implementation systems	0	23	57
Probability	$\chi2 = 194$	P<0.001	

Table 3. The relationship between each food industry and implementation of food hygiene practices and HACCP (n = 102) (continued).

Food safety management systems and food hygiene practices	Operation of Food Industry (%)		
	Small	Medium	Large
Temperature monitoring of foods	30	80	93
Probability	$\chi2 = 53$	P<0.001	
Inspection of foodstuffs on delivery	40	73	93
Probability	$\chi2 = 44$	P<0.001	
Microbiological testing	7	33	77
Probability	$\chi2 = 137$	P<0.001	
Documentation of food hygiene practices	30	67	97
Probability	$\chi2 = 60$	P<0.001	

Note : NS = Not Stattistically Significant at the 0.05 level.

According to Table 3, it can be seen that among of three food industry sectors have a statistically significant different factors in the food hygiene practices by individual food industries as well as in HACCP implemented. Almost of the large food industries were three or four times more likely than small food industries and two times more likely than medium food industries in the implementing basic food hygiene practices and HACCP system. This patterns were reflected by : (1) Aspect of staff training that received by 90% of large food industries staffs compared to 40% of medium food industries and 29% of small food industries; (2) Monitoring of staff for personnel hygiene and illness/infections that received by 77% of large food industries compared to 47% of medium food industries and 29% of small food industries; (3) Cleaning and sanitation schedules that received by 97% of large food industries compared to 63% of medium food industries and 36% of small food industries; (4) Food handling and storage that received by 93% of large food industries compared to 73% of medium food industries and 37% of small food industries; and (5) Documentation of food hygiene practices that received by 97% of large food industries compared to 67% of medium food industries and 30% of small food industries.

In accordance with Table 3 was also shown that among of three food industry sectors have a statistically significant different factors in the HACCP implementation by individual food industries. Large food industries, generally were fifty times more likely than small food industries and two and half times more likely than medium food industries to be using HACCP. This patterns were reflected and supported by : (1) The HACCP training managers received by 73% of large food industries compared to 37% of medium food industries and 14% of small food industries; (2) Monitoring of temperature during a process of foods that received by 93% of large food industries compared to 80% of medium food industries and 30% of small food industries; (3) Inspection of foodstuffs on delivery, that received by 93% of large food industries compared to 73% of medium food industries and 40% of small food industries; and (4) Microbiological testing that received by 77% of large food industries compared to 33% of medium food industries and 7% of small food industries. However, only routine procedure such as stock rotation was being praticed by most of food industries in each sector. In addition among food industries that implementing HACCP, where managers had received HACCP training, then 65% were able to identify that they had adopted all seven of the HACCP principles. This compared with only 30% in food industries where managers had not been formally trained in HACCP ($n = 24$; $\chi 2 = 5$; $P<0.05$ and $\chi 2$ adjusted for Yates' correction).

The Monitoring Activity of Food Safety Practices in the Food Industry Report in 1997 recommended that food safety control in all Indonesian food industry based on the principles of HACCP systems (Kantor Menteri Negara Urusan pangan dan BBIHP, 1997). This recommendation was incorporated into Indonesian National Standard (SNI) HACCP regulations in 1998, although the adoption of full HACCP system in line with the Codex principles is not curret legal requirement (CAC, 1997). Nevertheless, the findings of this study show that HACCP has made only a limited impact on the food industry at the present time.

Most of food industries are carrying out general food hygienic practices such as aspect of staff training on basic food hygiene , monitoring of staff for personnel hygiene and illness/infections, cleaning and sanitation schedules, food handling and storage, temperature monitoring of foods and stock rotation. These were a prerequisite practices that are foundation of any successful transition to HACCP approach (NACMCF, 1998; Sperber *et al*, 1998). The role of microbiological testing is of particular interest, although this is rarely used in the Indonesian medium food industries and very rarely used in Indonesian small food industries. Conventional end product testing is less practical within small food industries due to the short of times between production and consumption, and consequently the HACCP system have proposed an alternative approach based on a philosophy of prevention. Nevertheless, an understanding of the use of microbiological criteria within HACCP plans is arguably fundamental to their success (Buchanan, 1995). Microbiological testing can also play an important role in the initial hazard analysis, risk assessment, and verification of the HACCP plan or simply to demonstrate the implications of poor food-handling practices upon microbiological risks (Shepperd *et al*, 1990).

Attitudes Toward HACCP Systems

The attitudes of management for small, medium and large food industries toward HACCP management system are very important in the development of food safety implementation. The results of survey of food industry's attidudes in the implemetation of HACCP and based on attitude scaling used to

determine respondents' attitude toward HACCP systems was presented at Table 4.

Table 4. Managerial attitudes of the food industry sectors toward three statements about HACCP system (n = 102).

Attitude statements from respondents (*)	Managerial Group	Attitudes		
		Agree (%)	Disagree (%)	Neither Agree/ Disagree (%)
1. Formal hygiene systems, e.g. HACCP are difficult to apply in your food business size	Large	34	43	23
	Medium	36	39	25
	Small	54	12	34
2. Formal hygiene systems, e.g. HACCP are difficult to apply in your sector of food industry	Large	18	55	27
	Medium	24	46	30
	Small	49	18	33
3. It is easy to get information on HACCP	Large	63	20	17
	Medium	40	24	36
	Small	39	21	40

(*) respondent were invited to respond on a five-point Likert scale from strongly agree to strongly disagree. All agree and disagree responses were re-coded and merged for this analysis.

According to Table 4, it can be seen that food industry sector was found to be significantly related to the responses for all three statements ($P<0.005$). Partition of the $\chi 2$ tables to reveal the spesific relationships among different food industry sectors showed that small food industries were significantly more likely than non-small food industries to agree with statements 1 and 2. Meanwhile large food industries were most likely to agree with statement 3. Based on to put across the whole of sample, food industries that implementing HACCP were significantly more likely to disagree with statements 1 and 2 and also to agree with statement 3 about the easy of getting information on HACCP ($P<0.001$).

A further analysis using Spearman's ρ showed that food industries with greater numbers of food handlers were significantly less likely to agree with statement 1 ($\rho = + 0.30$; $n = 102$; $P<0.01$). Most of food industry sectors agree with statement 1 so that this having a relatively negative attitude toward the development and implementation of HACCP were also more likely to agree with statement 2 ($\rho = + 0.8$; $n = 102$; $P<0.001$).

Several studies have assessed the effectiveness of food hygiene and HACCP training in exchange the knowledge, attitudes and practices of food handlers or workers. Some positive impact of training upon food handlers' or workers' knowledge (Cunningham, 1993; Manning, 1994; Sudibyo *et al*, 2001) while others have criticized traditional knowledge based training methods as having little impact on attitudes or behaviors (Ehiri *et al*, 1997).

The data presented in this paper merely evaluated the levels of training held by different staff within the food industry sampled. However, food industry managers in the sample had obviously implemented HACCP without any formal training. This have a negative impact upon the likehood that they were able to identify and they had a full seven-principles system in place. These findings suggest that the HACCP training of manager is important in ensuring that the system is properly implemented and maintained, preventing and potential abuse of the system due to lack of understanding of HACCP systems (Mayes, 1994). They also expected to draw attention to the problem of food industry/food business in using expertise or external consultants to implement HACCP and over-looking the need managerial HACCP training. Ownership was an important part of any HACCP system with managerial understanding and commitment fundamental to its ongoing effectiveness (NACMCF, 1998).

Generally, a negative attitude was found toward the possible application of HACCP in small and medium food industries, although managers of the two food industry sectors more likely to have positive attitudes. Such negative attitudes toward the applicability of HACCP may even prove unfounded, because it has been suggested they could reflect little more than a lack of understanding of the HACCP concept (Ehiri *et al*, 1997). This supports the notation that food operators will become more enthusiastic about HACCP once they actually experience the HACCP system. Therefore, more effective communication was needed to promote HACCP to small and

medium food industry managers. Studies have shown that half the food operators sampled were unaware of food hygiene and HACCP (Kantor Menteri Negara Urusan Pangan and BBIHP, 1997).

This research/study provides valuable information to the Indonesian government and food industry sectors alike as they try to overcome barriers to the future adoption of HACCP. The small and medium food industries were clearly significant different behind large food industries in their current use of the HACCP system. It was needed encouraging to small and food industries managers in handling of high-risk food to implement HACCP system, where food business status was particularly important to its current use.

Meanwhile, the existing support from National Agency for Drug and Food Control (NADFC) by introduction the Food Stars Awards for food safety was important program for small and medium food industries also. The food stars awards system were consist of three levels, i.e. the One Star Award provides basic food safety training to every one in the business; the Two Stars Award is aligned with Codex principles of food hygiene and help business develop good food safety practices; and the Three Stars Award introduce HACCP principles (Nababan *et al*, 2004). The food star systems enables food industry to be recognized for its good safety practices and encourages them to go beyond the minimum standards required by legislation and reach for the stars.

CONCLUSIONS

Most of food industry sectors have perceptions of the risk to food safety as low-risk, however catering food industries, meat and poultry processing industries, fish and fish product processing industries, milk and milk product processing industries have been widely as high-risk foods.

Practices of food hygiene and HACCP on the three industry sectors were have a statistically significant different factors in the food hygiene practices by individual food industries as well as in the HACCP implemented. Large food industries have three or four times more likely than small food industries and two times more likely than medium food industries to implementing basic food hygiene practices and HACCP systems.

The attitudes of food industries managerial toward HACCP system showed that small food industries more likely to agree with statement 1 (HACCP are difficult to apply in their food business size) and statement 2 (HACCP are difficult to apply in their sector of food industry). In contrast, large food industries more likely to agree with statement 3 (It is easy to get information on HACCP).

Finally, since most of food industries have limited understanding of HACCP and of the procedures to implement it, it was necessary for every regulatory authority clarifies the goals of the strategy, and provides effective education and information to ensure uniformity in the application of HACCP principles.

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REFERENCES

Buchanan, R.L.(1995). "The role of microbiological criteria and risk assessment in HACCP". *Food Microbiol. 12* : 421- 424.

CAC (Codex Allimentaris Commission) (1997). *Hazard Analysis and Critical control Point System and Guidelines for its application. Alinorm 97/13A*. Codex Alimentarius Commission, Rome.

Casswell, J.A. and Hooker, H. (1996). "HACCP as international trade standard". *Amer. J. Agricul. Econom. 78* : 775 – 779.

Cunningham, C.J. (1993). " A survey of the attitudes and perceptions of foodservice operators in the Hamilton – Wentworth region". *Can. J. Public. Health 84* : 107 – 111.

Ehiri, J.E., Morris, G.P. and Mc.Ewen, J. (1997). "Evaluation of food hygiene training course in Scotland". *Food Control 8* : 137 – 147.

FAO/WHO (1997e). *International Code Practice – General principles of food hygiene. CAC/ECP Rev. 3., 1997*. Food and Agricultural Organization/World Health Organization, Rome.

Hair, J.F., Ralphe, E.A., Ronald, L.T. and Williams, C.B. (1987). *Multivariate Data Analysis with Reading, 3rd Ed.* Macmillan, New York.

Hathaway, S.C. (1999). "Management of food safety in international trade". *Food Control 10 (2)* : 247-253.

Jouve, J.L. (1994). "HACCP as applied in the EEC". *Food Control 5 (3)* : 181-186.

Kantor Menteri Negara urusan Pangan dan BBIHP (1997). *Laporan Kegiatan Pemantauan Pelaksanaan Tata Cara memproduksi Pangan Yang Aman.* Kantor Menpangan dan BBIHP Depperindag, Jakarta.

Manning, C.K. (1994). Food safety knowledge and attitudes of workers from institutional and temporary foodservice operations. *J. Amer. Diet. Assoc. 94* : 895 – 897.

Mayes, T. (1994). "HACCP Training". *Food Control 5 (3)* : 190 –195.

Moore, D.S. and Mc.Cabe, G.P. (1987). *Introduction of the Practice of Statistics.* W.H. Freman and Company, New York.

Nababan, H., Rahayu, W.P., Sparinga, R., Fardiaz, D., Doughty, I. And Theobald, C. (2004). *Reaching for Stars – The Indonesian approach to food safety education. Poster paper, presented in 4th Asian Conference on Food and Nutrition Safety, March 2-5, 2004*; Nusa Dua, Bali, Indonesia.

NACMCF (National Advisory Committee on Microbilogical Criteria for Foods) (1998). "Hazard analysis and critical control point principles and application guidelines". *J. Food Protect. 61* : 1246 – 1259.

Sheppard, J., Kipps, M. and Thomson, J. (1990). "Hygiene and hazard analysis in food service". In *Progress in Tourism, recreation and hospitality management, ed. by Cooper, C. Vol.,2: 192 - 226.* Belhaven Press, London.

Sperber, W.H., Stevenson, K.E., Bernard, D.T., Deibel, K.E., Moberg, L.J., Hontz, L.R. and Scott, V.N. (1998). "The role of prerequisite programs in managing a HACCP system". *Diary Food Environ. Sanit. 18* : 418 – 423.

Stevenson, K.E. (1990). "Implementing HACCP in food industry". *Food Technol. 44 (5)* : 179 – 181.

Sudibyo, A., Rahayu, S.E., Rohaman, M.M., Ridwan, I.N., Sirait, S.D., Aprianita, N., Sutrisniati, D. dan Ressytustra (2001). "Pengembangan dan Penerapan Sistem HACCP Pada Industri Pangan Di Indonesia". *Warta IHP Vol. 18 No. 1 – 2* : 7 – 18.

Suprapto (1999). Sistem Akreditasi dan Sertifikasi HACCP. Makalah Disiminasi pelaksanaan akreditasi dan sertifikasi HACCP, 7 Desember 1999. Badan Standardisasi Nasional (BSN), Jakarta.